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Highlights

Handoff Management

Malicious User Node

Fraction Math Course

Critical Function in Mobility

Discovering Thoughts, Inventing Future

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Optimized Model of Recommendation System for E-Commerce Website

By Fares Aqlan, Xu Dezhi & Abdullah Alqwbani
Central South University, China

Abstract- The purpose of this work is to optimize the recommendation system by creating a new model of recommender system with different services in a global e-commerce website.

In this model the most effective data sources are integrated to increase the accuracy of recommendations system, which provides the client more intuitive browsing categories interface.

The sources used for this model are the user's searching log on the global website, and data referred extracted from search engines, more clicked URLs, highly rated items, and the recommendation algorithms of new users and new items. In additions, user's interests based on locations, and the hot releases items recommended by the admin or shop owner of the e-commerce website according to the website marketing strategy.

When the users browse the website, the data sources will automatically combine to incorporate the derived structure and associate items for each category into a new browsing recommendation interface.

Keywords: ecommerce, data mining, recommendation system, clustering algorithm.

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Optimized Model of Recommendation System for E-Commerce Website

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When the users browse the website, the data sources will automatically combine to incorporate the derived structure and associate items for each category into a new browsing recommendation interface.

The advantages of this model will assist the users to discover their real interested items with flexibility and high efficiency; it also provides some solutions for some serious problems and challenges that exist in the current recommendation services.

Data mining technology and clustering algorithms have been proposed and applied to perform the idea of this work. ASP.NET is the implementation tool for the application website, Microsoft SQL server is used for database management.

Keywords: ecommerce, data mining, recommendation system, clustering algorithm.

I. Introduction

The global systems internet with World Wide Web has revolutionized the human life like nothing before. Since 1997, the web has progress into a true economy and a new frontier for business [1]. The WWW became more important as a source for the basic data and a place for trading, which called Electronic Commerce (EC).

Electronic commerce includes the use of all kinds of information and communication technology in the business processes among the trade. Moreover, it helps to get a share in the market and improve customer service by creating a Web page and supporting the investors' relations or communicating electronically with customers [2]. Electronic commerce is more than ordering goods from an on-line catalog. It involves all aspects of an organization's electronic interactions with its stakeholders, the people who determine the future of the organization. Such stakeholders include customers, suppliers, government regulators, financial institutions, mangers, employees, and the public at large [3].

Nowadays many sites have a good business and become well known ecommerce sites, such as ebay.com, Amazon.com, taobao.com and others. Business is evenhanded to the process of shopping on the web site. It becomes the way of shopping in wide field including personal need, house need or business need.

Fast growing of Internet technologies presents complicated challenges and opportunities to organizations and guiding them to develop new managerial roles and practices [4]. These explosive developments of the internet and E-commerce technology have led to the daily growth of recommendation systems.

Recommendation systems typically suggest commodities (information, items or services) that are of interest to users based on customer demographics, features of items, and/or user preferences (e.g., ratings or purchasing history) [5]. Recommendation services are used by E-commerce websites to suggest items to their consumers.

Along with EC areas, the B2B (Business to Business) Recommendation system is being spotlighted as an interesting research area considering its size and the potential impact it has overall. Now various recommender systems are being used in seller-centric E-marketplaces, intermediary-centric E-marketplaces, and buyer-centric E-marketplaces etc [6].

However, in many global e-commerce websites, well-defined recommendation systems are not available; moreover, in some other e-commerce sites, the recommendation systems are too coarse and less intuitive to distinguish properties according users interests, which will lead to very bad user experience [7]. To address these problems, in this project we propose building a new model of recommendation system that depends on hierarchical structure for emerging e-commerce products according to users' behavior

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preference, which can be derived from searching logs and data referred extracted from search engines, highly clicked URLs, top rated items, users interests based on the same area customers, recommendation algorithms for the new items and also the new users. We also create a personalized recommendation strategy managed by the admin of the website.

II. Motivation

The E-commerce environment includes all online activities and business operations achieved between multiple parties using electronic techniques.

With the huge development of internet and E-commerce websites; when consumers choose their needs of items and commodities, they confront some serious problems of data overloading. Therefore; many website researches and projects have focused on recommendation system development, in order to provide users more individual recommendation services.

Recommendation system has become serious business tools used by many of the largest commerce websites, in order to provide the users more effective and efficient way to find their interested products. The recommender systems work like salesman who provides users advices and services to help them find the commodities and items they are interested in. However, with the wide use of recommendation services, many common challenges and problems come out, such as real-time, sparsely of information, cold start problem and recommendation quality.

In addition, with the rapid development of web and e-commerce business, a large number of growing user interaction to the application provides a number of very valuable data and information. This interaction forms include users of e-commerce sites click browse, clinch a deal to buy goods online sales and online collection of goods. This increasing interaction behavior leads to the emergence of the information overload problem. In additions, most recommender systems still meet some serious problems and challenges, such as sparsely data, real-time, cold start and the quality of recommendation results [8].

Therefore need a system that provides services which provide solutions to overcome these common problems by using the interactive information to find user interests and preferred orientation with high quality and real-time techniques.

The goal of this project is to build a new model of personalized recommender system. We have proposed and applied some data mining ideas and clustering algorithms that optimize the recommendation services on a global E-commerce websites.

Our optimized recommender system helps consumers to find their needs and save their efforts and time in complicated operations. For e-commerce sites, our ideal personalized recommendation system will directly increase online sales of commodities brought in, increase the orders-size by turning browsers into buyers.

III. Purposed Recommender System

The traditional recommendation technologies have their own advantages and also many shortcoming points [9]. So to solve these issues we have build a new model of recommender system which based on hybrid recommendation techniques and combined with data mining clustering technology to overcome the shortcoming points and provide the best recommendation results which meets all kind of users' interests and needs.

Our system belongs to a complete personalized recommender system, using data mining combined with hybrid recommendation methods. The new model of recommender system provides more adaptive and scalable services; as it is highly considering the recommendation quality, real-time recommendation, and proposed solutions for problems such as cold start and other issues. In the following we introduce the architecture structure, project algorithms and technologies of our E-commerce recommendation model.

a) Basic Architecture of Recommender System

The tremendous development of the Internet has led millions of companies to set up shop on the Internet and over 100 million consumers are eagerly participating in the global online marketplace [10].

From this quick development of e-commerce websites; we start to get destruct with the recommendation systems methods and advantages to meet users' need and interests.

The enhancements of this project are designed to meet such needs including the recommendation functions and site features.

The recommendation functions are designed to provide the users the ability to discover their real interest ed items with flexibility and high efficiency, which will sav e users' own efforts and time.

Our recommendation system include five parts of functions, first part recommend the items which will be derived from user's searching logs on our website and data referred extracted from search engines, through the searching log and search engines are considered to discover user's attributes and interests.

The second part of our model functions include the most rated items; the convenience of this function is to compare products through the multi-products website, which save more time and effort during all customers' visits.

The third part of our system propose and apply some algorithms which will recommend the new items of the website, as well as, some algorithm to recommend

items for our new users. The advantage of this part is to solve the cold start problem of recommendation system.

The forth part of our new model propose the algorithms which do the recommendation according to the user's interests based on locations, our system collect the interest data of same location users, as different location users have different interests; since each location has its own habits, needs and life traditions. But through this function, the users easily can find the most interested items by his location users on our global website.

The last part of our recommendation system model includes the items which can be recommended by the admin or shop owner of the website according to the website marketing strategy.

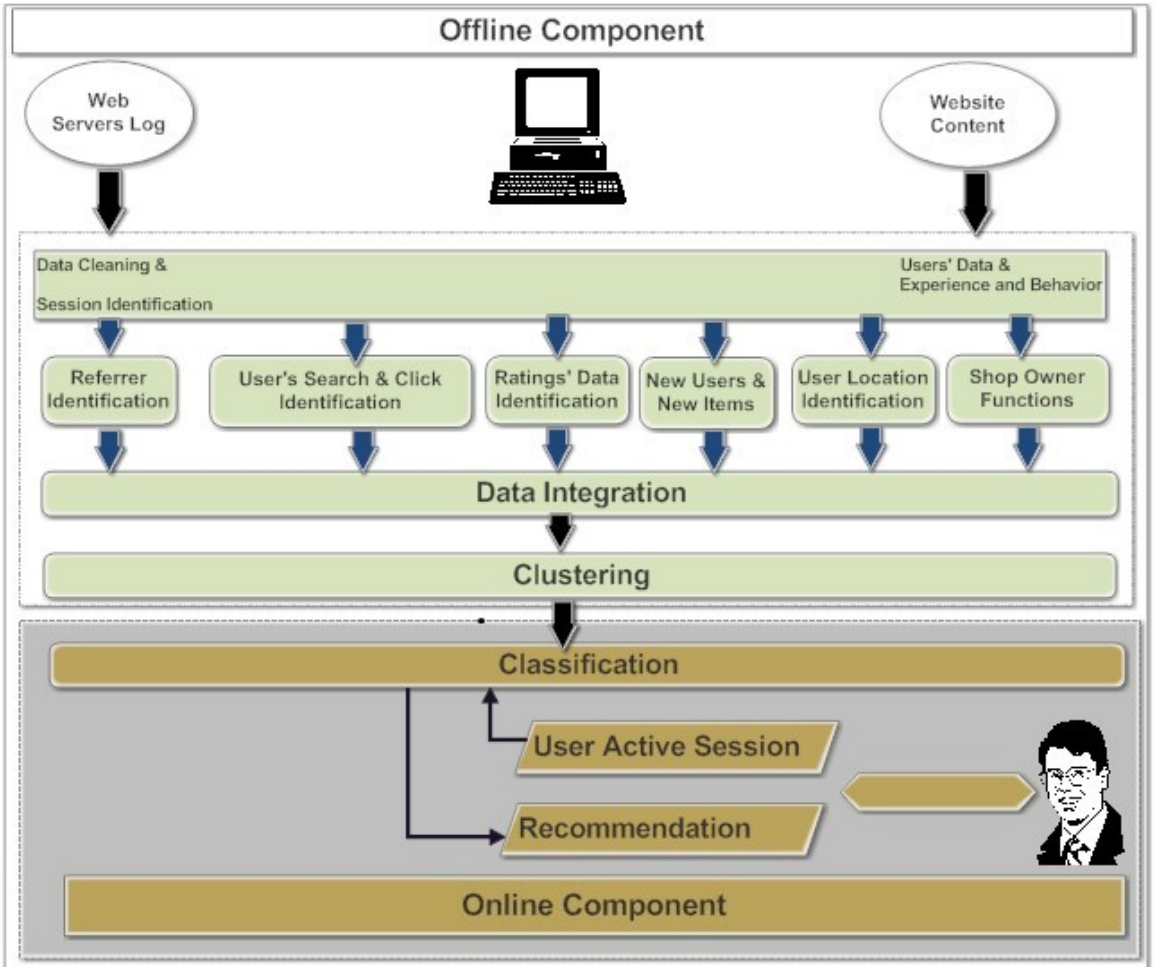

Figure 1 : The Schematic Architecture of Purposed Model

The schematic architecture of our purposed recommender system is summarized as shown in figure1.

b) Logical Schemas of Database

The followingFigure 2 shows the database architectural structure of the E-commerce website which represents the logical schema. SQL server is used for this database.

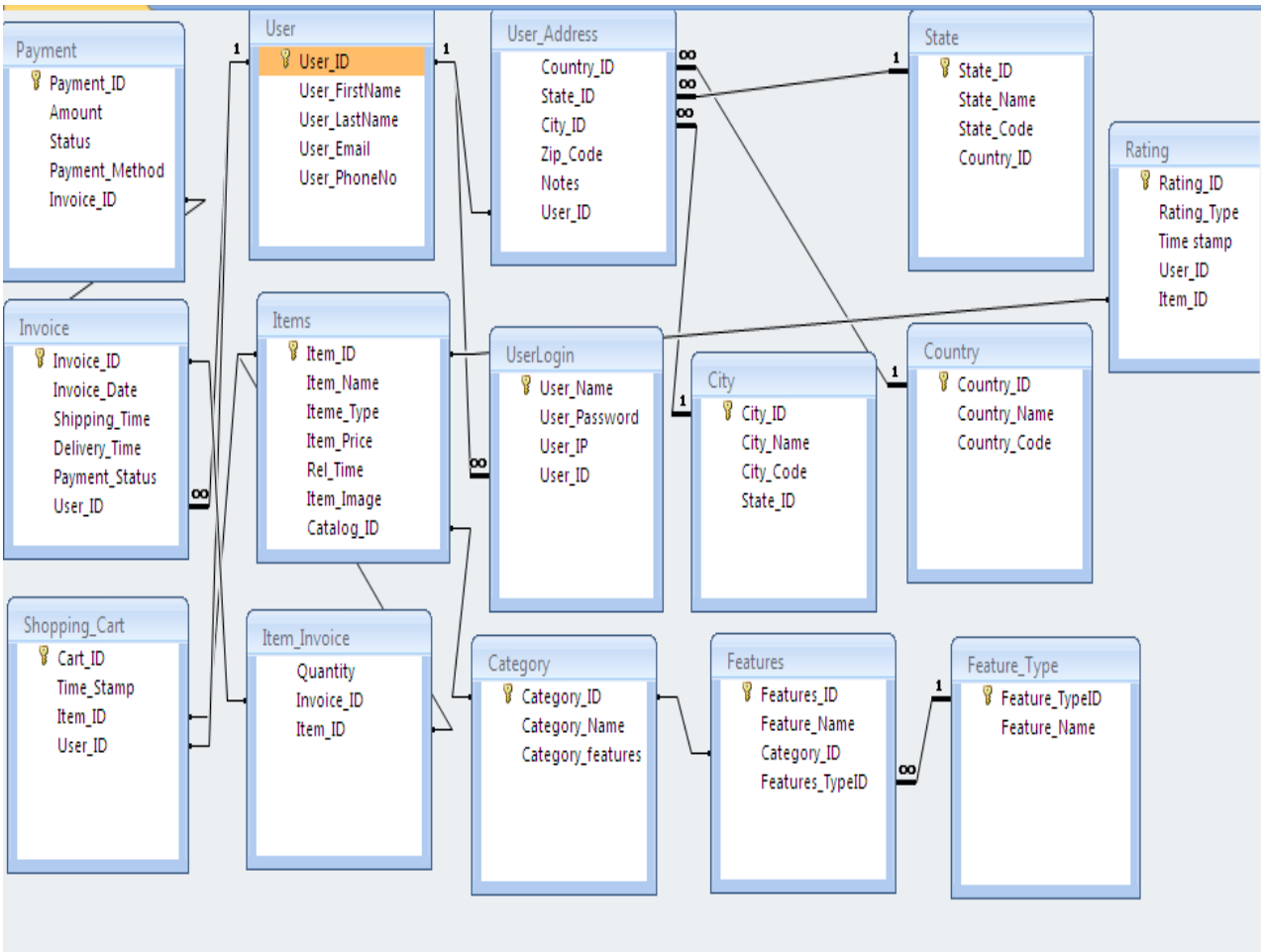

Figure 2 : logical schemas

According to data shows on figure, we can deal with the all enhancements features that mentioned in this paper project.

IV. Enhancement

To enhance our new model of recommender system, first we have to enhance the relational database. The enhance operation is divided into two parts: The process model step which focuses on the operation process of database stored data. Second step is the online recommender which analyzes the recommendation type of system, as well as, the recommendation algorithms used and proposed for this project.

a) Process Model

The core of recommender system is the recommendation algorithms models, as a different algorithm requires different data, so the system needs to manage the input data to provide a high quality of output results. The main data as shown in logical schemas figure above include: User, Item, and Rating.
Due to E-commerce website deals with a huge amount of data which growing rapidly, it makes the algorithms model take a long time, and a big consumption for system resource. That seriously affects the real-time recommendation.

As a result, the recommender system using offline process model to output results. And online recommendation model then uses the output results with the system input data to recommend items for the user.

The process model based on the incremental updates of input data, so when the new ratings data of users reach a certain limit value, it needs to deal with process model again.

- Data preprocessing

According to different algorithms' required data, the system deals with insert data using input data model.

- Model calculation

The recommender system according to data amount updates, regular operates models, calculates the update data, modify the model output results, to ensure the quality of recommendation.

The process model of our recommender system can be displayed as it shown in the following figure 3:

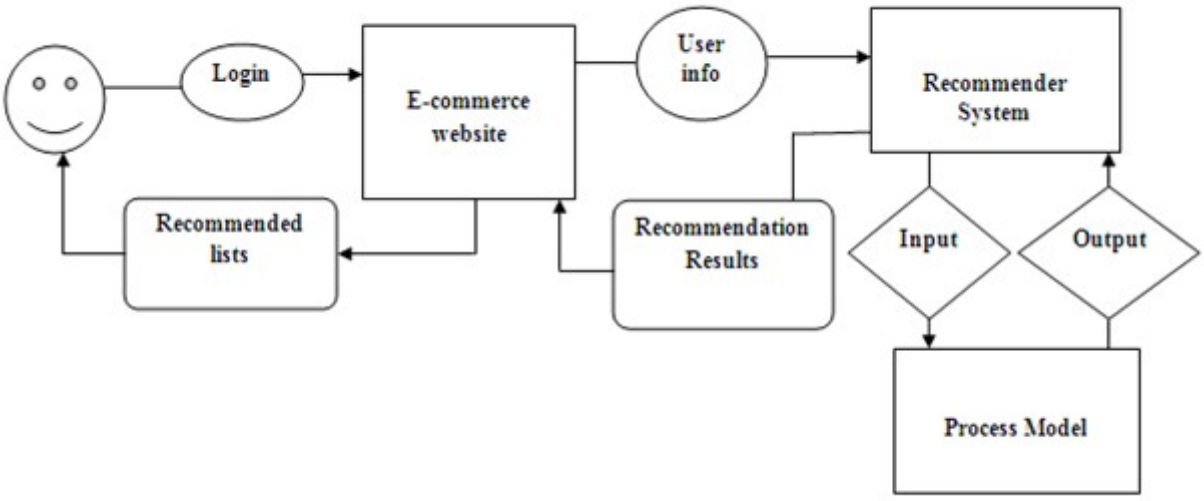

Figure 3 : Process Model of Recommender System

b) Online Recommender

The personalized E-commerce recommender system mainly used to recommend items for users based on their interests. The main functions of online recommender are to analyze the recommendation type, and choose the related input and output data of algorithm model, to predict recommendation results, and provide it for users. The main process of online recommender is as shown in the following figure 4:

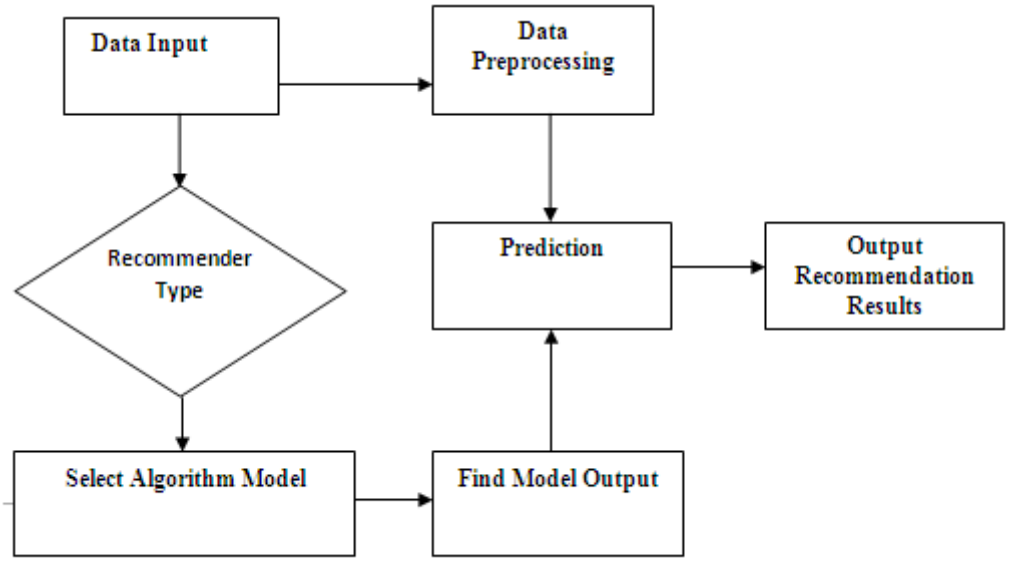

Figure 4 : Online Recommender Process

i. *Predictive Recommendation*

According to the process model of input and output data calculate the predictive recommendation results.

The online recommender uses a real-time recommendation model to provide a high quality recommendation. When a user login the E-commerce website, and browse items, the recommender system reads his/her profile data, user rating data and purchased log to predict interested items, and feedback direct to the user the Top 10 items that user most likely interested in.

c) Recommendation Algorithms

In this project, the recommendation algorithms are based on the hybrid recommendation model; they are kind of hybrid algorithms which based on the combination of user-based collaborative filter with content-based methods.

We use the data mining methods to overcome the single push shortcomings of recommender

techniques. Specifically, we use the STC algorithm to analyze the data mining of search engine and search log data. We have also applied neighbor clustering algorithm to complete data mining work as a clustering technique for ratings data. For the classification algorithm, we have applied support vector machine (SVM). We have also proposed some matrixes that determine the users' locations in order to provide recommendation results based on location.

In the following, we introduce the project algorithms and its applications technique.

i. *STC Algorithm*

The STC algorithm clustering that has been applied in previous work [12] is an efficient method of clustering search results, but because it's clustering process only start from the characteristics of the document itself, and it gets the clustering results based on the document attributes. So for our best knowledge, this is not enough for a personalized recommendation system. In this project, we combine the user personal interests' model with on STC algorithm, which improves the STC algorithm strategy.

Suffix Tree Clustering (STC) has three logical steps: (1) document "cleaning", (2) identifying base clusters using a suffix tree, and (3) combining these base clusters into clusters.

After the suffix tree construction, each node on the document can be used as a base cluster. So as to reduce the clusters numbers, we have to combine some base clusters into a big cluster, this process called "Combine Base Clusters". In order to better implementation of the personalized recommendation, the clusters should be ordered according to the user's interests.

To measure the user interest into any document, we use the following formulas which show the steps of our recommender system technique using search data identifications:

1. *Basic Data Construction*

Using the Google engine to query on a keyword, the results will show many pages which include this keyword inside its contents. For the search results of Web page, we use the data structure to explain the steps of operation:

```
Struct SearchResult
 {
Char *FileName;   //
file name
 File fp;          //
file pointer
 };
```

For each unit of search result, we use data structure CatalogSnippet to declare the results after document cleaning operation:

```
Struct CatalogSnippet
{  long Sn;          // Seach Snippet ID
   char *URL;      // URL address
   char *URLName;   // URL name
 char *Content;      // content of search snippet
   CatalogSnippet *Front;    // the front pointer of
search snippet
   CatalogSnippet *Rear;     // the rear pointer of
search snippet
 };
```

The search results on Web including a lot of snippets, the operation of data analyzing and cleaning will create some CatalogSnippet examples. So we need to apply the following operation to analyze and clean the search information on the website:

2. *Web Data Cleaning*

Input: FileName of search results on the Web

Output: the linked table of search snippet CatalogSnippetList

Method:

Step1: Read FileName into memory

Step2: remark snippets, if it is "<HEAD>", then proceed operation onto the head of Web catalog file.

Or

Step3: remark snippets, if it is "<BODY>", then apply operation onto the body of Web catalog file.

Step4: Return CatalogSnippetList;

The Web file is semi-structured data, so to facilitate process, we need to structure the data, and clean all the return results. After the data cleaning operation, we get a list that contain all search results, so we move to next step, clustering analyze.

3. *Clustering Analysis*

The clustering analyze process will return a large number of search engine data, such as catalog snippets, and then divide it into classes or small clusters. Make the most similar objects into one cluster, and different data objects into different clusters.

By comparing the cluster methods, we decide to use an improved STC algorithm method as basic clustering algorithm for search data of our personalized recommender system.

Specifically, there are three steps to improve STC algorithm:

1. Create suffix tree structure, so we add each complete cleaned catalog snippet into the suffix tree.
2. Determine the base clustering.
3. Combine the base cluster with clustering results.

The improved STC algorithm combines the cluster results with user interest profile data to provide sorted cluster results.

4. *Personalized Recommendation Strategy*

The clustering analyze of search results will provide better clean and sorted information, as the improved STC algorithm did implement the measurement of similarity on base clustering combined

with content-based technology, as well as, they process the cluster results as sorted data.

These kind of results and techniques help to return users more specific recommendation according to his search information collected by our algorithms, it also arrange the results as Top N more interested and searched items to provide it on the recommendation system interface.

ii. *Neighbor Algorithm*

The clustering analyze used to divide the stored data of database into significant sub classes. This classification operation is based on the similarity and difference between data.

The algorithm function of neighbor clustering can be constructed as follows:

For given finite sample set {U}, that includes n samples, assign a number C of clusters where $\{K_{i,j} = 1,2,A,C\}$

For each model, if the sum of sample's distances to the cluster center achieves the minimum value,

The mathematical model of clustering can be given by:

$$\min \sum_{j=1}^{C} \sum_{U \in K_j} \|U - v_j\|$$

$$v_j = \frac{1}{\sum_{i=1}^{n} x_{ij}} \sum_{i=1}^{n} x_{ij}\, U$$

Where C is the number of clusters, $v_j$is the mean vector of sample j.

So if the model sample i assigned into the centre of cluster j ,

Then $x_{ij} = 1$; else $x_{ij} = 0;$

$\sum_{i=1}^{n} x_{ij} = 1$ means that model sample i only can be assigned into centre of one cluster.

The clustering analysis classifies models according to the closeness degree between samples features. The basic similarity has the following two functions:

1. *Distance Function*

Sample uses 13 d of features variables for description; each sample can be seen as a point in the empty space, using some distances to indicate the similarity between sample points. The closer sample points, the more similar features they have, and far away distance between different sample points.

So the distance function can be displayed using the following formula:

For non-negative conditions,

$f(u,x) \geq 0;\ f(u,u) = 0;$ and for Symmetry we have $f(u,x) = f(x,u);$ which meet

the triangle inequality $f(u,x) + f(x,d) \geq f(u,d)$.

2. Distance measurement method using Euclidean distance:

$$f(i,j) = \sqrt{|u_{i1} - u_{j1}|^2 + |u_{i2} - u_{j2}|^2 + A + |u_{in} - u_{jn}|^2}$$

Where $m_i = (U_{i1}, U_{i2}, A, U_{in})$ and $m_j = (U_{j1}, U_{j2}, A, U_{jn})$ are two n-dimensional data objects.

If each attribute of data is given a weight, then the weighted Euclidean distance is expressed as:

$$f(i,j) = \sqrt{w_1|u_{i1} - u_{j1}|^2 + w_2|u_{i2} - u_{j2}|^2 + A + w_n|u_{in} - u_{jn}|^2}$$

3. Similarity coefficient: The two sample points are more similar, the similarity coefficient is closer to 1; and the simiarity coefficient is closer to 0 when two sample points are more different.

Phase angle cybermetrics: Using vector of included Angle cosine formula to measure the angle's similariy degree between samples $U(u_1, u_2, A, u_n)$ and $X(x_1, x_2, A, x_n)$.

The angle cosine formula is:

$$sim(i,j) = \frac{\sum_{i=1}^{n} u_i \cdot x_i}{\sqrt{\sum_{i=1}^{n} u_i^2 \ \sum_{j=1}^{n} x_j^2}}$$

Pearson correlation coefficient:

The correlation coefficient of sample i and sample j is as the following:

$$sim(i,j) = \frac{\sum_j (v_{ci} - \bar{v}_i)(v_{cj} - \bar{v}_j)}{\sqrt{\sum_i (v_{ci} - \bar{v}_i)^2 \sum_j (v_{cj} - \bar{v}_j)^2}}$$

Where $\bar{v}_i$is mean value, $\bar{v}_i = \frac{1}{n}\sum_{c=1}^{n} v_{ci}$, and $\bar{v}_j = \frac{1}{n}\sum_{c=1}^{n} v_{cj}$

iii. *Support Vector Machine (SVM)*

The support vector machine is used to classify data; this task is called machine learning [13]. For given data points which belong to one or more classes, we use SVM to decide which new data point will contain the class.

Suppose x_1, x_2, A, x_n, where $x_i \in R^d, i = 1, A, m$ are d-dimensional training samples. The corresponding mark of each sample is y_1, y_2, A, y_n, where $y_i \in \{1, -1\}$, and $i = 1, A, m$ indicating the class to which the vector belongs.

For linear SVM, the hyperplane $w \cdot x + b$ will classify the training samples, then

$$w \cdot x_i + b > 0 \ \ if\ y_i = 1$$

$$w \cdot x_i + b > 0 \ \ if\ y_i = -1$$

This can be rewritten as:

$$w \cdot x_i + b \geq 1 \ \ if\ y_i = 1$$

$$w \cdot x_i + b \leq -1 \ \ if\ y_i = -1$$

Or

$$y_i(w \cdot x_i + b) \geq 1, \forall\, i \in \{1,2,A,m\}$$

So according to the theory, hyperplane can classify the samples, and also maximize the distance between the classes. In the following figure, we have three hyperplane (H_1, H_2, H_3), we can see that H1 does not separate the classes. H2 does, but only with a small margin. H3 separates them with the maximum margin. The following figure 5 shows the maximum margin hyperplane:

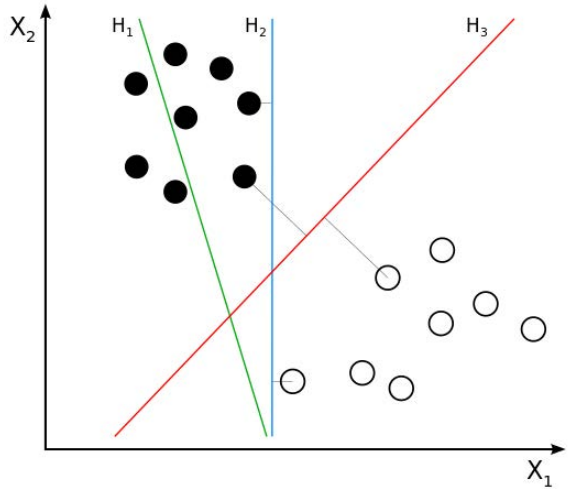

Figure 5 : Maximum-Margin Hyperplane

The classification distance of $w \cdot x + b$ can be written as:

$$d(w,b) = \sum_{x_i | y_j = 1} \min \frac{w.x_i + b}{\|w\|} - \sum_{x_j | y_i = 1} \max \frac{w.x_i + b}{\|w\|}$$

This can be summarized as:

$$d(w,b) = \frac{1}{\|w\|} - \frac{-1}{\|w\|} = \frac{2}{\|w\|}$$

So the maximum $d(w,b)$ problem according to constraints conditions converted into minimum $\frac{\|w\|^2}{2}$ problem. This optimization problem has been solved by the saddle point given by (Christopher, 1998):

$$M(w,b,a) = \frac{1}{2}(w.w) - \sum_{i=1}^{m} a_i \{[(x_i.w) - b]y_i - 1\}$$

Where a_i is Lagrangian multiplier. According to above saddle point, we have:

$$w = \sum_{i=1}^{m} a_i\, y_i x_i$$

Which declare that only a few a_i will be bigger than 0, x_i is the support vector that lie on the margin and satisfy condition $y_i(w \cdot x_i + b) = 1$.

So by substitute the above formula, we get the following points which show that SVM reduces to the following optimization problem:

Maximize (a_i) we get:

$$W(a) = \sum_{i=1}^{m} a_i - \frac{1}{2}\sum_{i,j} a_i a_j y_i y_j (x_i.x_j)$$

And to the constraint from the minimization:

$$a_i \geq 0, \qquad i = 1, A, m$$

$$\sum_{i=1}^{m} a_i\, y_i = 0, i = 1, A, m$$

So W can be computed by: $w = \sum_{sv} a_i\, y_i x_i$, $a_i \geq 0$

Where sv is the support vector.

As well as, in the hyperplane function, for constant C, it can be displayed as the following:

$$C = \frac{1}{2}[(w.x^*(1)) + (w.x^*(-1))]$$

Where $x^*(1)$ declare that belongs to first class of support vector, and $x^*(-1)$ declare that belongs to the second class of support vector.

According to above, we get the function of the best classification hyperplane as follows:

$$f(x) = \mathrm{sgn}(\textstyle\sum_{sv} a_i y_i (x_i . x) - C)\ ,$$

x_i is the support vector, a_i is Lagrangian multiplier, and C is constant.

Above we have described the training samples classification by using linear SVM, also the support vector and the basic principles of best hyperplane. But if the training samples cannot be classified by linear SVM, then the above principles will be useless. In this situation, we use soft margin to solve problems, soft margin will choose a hyperplane that classify samples as cleanly as possible.

For non-negative slack variables $\xi_i \geq 0, i = 1, A, m$, so the function becomes:

$$w \cdot x_i + b \geq 1 - \xi_i \ \text{ if } y_i = 1$$

$$w \cdot x_i + b \leq \xi_i - 1 \ \text{ if } y_i = -1$$

Then by using Lagrangian multiplier, the optimization problem can be computed by:

For, $0 \leq a_i \leq T$, $\sum_i a_i y_i = 1$

By minimization we get:

$$\sum_{i=1}^{m} a_i - \frac{1}{2}\sum_{i,j} a_i a_j y_i y_j (x_i.x_j)$$

Where $i = 1, A, m, T > 0$ is a constant.

iv. *User's Location Matrix and Algorithms*

There have been some previous works into geolocation technology and software which determine the user's geographic details including country, city, ZIP code, and so on.

The user's location information is effective for recommendation system to provide more specific recommendation results according to the user location interest and preference identification.

Since our recommender system builds a preference or interest profile for each user enter our website, so our recommender system will use the user's interest profile to create session-interest matrix to indicate the user's interest based on user's location.

To create the aforementioned session-interest matrix, we need to process the following three steps:

- Session-IP Scope Matrix

The system generates all users' session IP address from user session data identification. Then our Support Vector Machine (SVM) will classify all IP addresses in some classes according to the first two segments of session-IP scope list. By creating this matrix, we use value 1 for each session user location in the matrix, so each row contains only one value as 1 and others take 0.

- IP scope-Interest matrix

We create this matrix, in which the columns represent users' interests based on aforementioned user profile data, and its rows represent the same IP addresses of session-IP scope matrix created in step 1. The IP scope-interest matrix indicates the highest interest of website users according to their behavior and experiences on our E-commerce website. To fill the matrix, we use 0 and 1 numbers to make its rows and columns represent user session and his interest value.

- Session-Interest matrix

In this part, we create session-interest matrix by multiply the previous obtained matrixes in step 1 (Session-IP scope matrix) and step 2 (IP scope-Interest matrix). The following steps show the method of creating this matrix:

1. *Input:* Session-IP Scope Matrix, IP scope-Interest matrix
2. *Output:* Session-Interest matrix
3. *Fill:* Fill the rows of Session-IP Scope Matrix by sessions

Fill the columns of IP scope-Interest matrix by interests

4. For $(P_i \epsilon\ session\ matrix)$
{ If (P_i has interest data) then
For
$(interest\ U_j \epsilon\ interest\ matrix)$
{ If $(P_i[interest\ profile] include\ U_j)$
then
Session-interest $[P_i, U_j]$
=1;
Else
Session-interest $[P_i, U_j]$ =0; } };

According to these steps, we have used values 0 or 1 to fill the elements of session-interest matrix, the output information is a referrer matrix based on user's location and his/her interest profile data. Since every customer who visit our website has an IP address, but not all users have interest profile such as new users who do not have any rated information or purchased data. So to solve this issue, we have process the classification and clustering algorithms on two matrixes, one for users who do not have interest profile. For such users, we use the data integration based on similar users coming from the same location. The system generates the interest items for users who have similar IP addresses with our current user.

For this process, we use k-mean clustering algorithm to generate identification data based on clusters of same location users according to the classification on session-IP scope list.

v. *Algorithms Integration*

The recommendations based on STC algorithm, user profile, neighbor clustering, IP session matrix and support vector machine (SVM) will combine the item's features with user preference. These algorithms will also divide the items according to difference features and catalogs. Then summarize the user's preference value on these different features with measuring their interest into item's lists, until we get the user preference model. According to user's different interest, we use the user-profile data with STC algorithm to measure user's interest by ordering clustering based on their interest model data. This process will integrate the search engine data and user search behavior on our website, in order to generate their interest's information and build an interest model for each user.

For user preference model, we use neighbor clustering, which generate the users who have similar preference level into different features of items. These users became neighbors, to provide real-time recommendation. In addition, combining with content-based recommendation technology can promote the recommendation of new items.

In the E-commerce business, a user buy items not only related to item's features or preference; as the user's basic information (age, occupation, location,… etc) have also a certain relevance.

So considering adjust and analyze the user information; when making recommendation, and choosing a nearest neighbor; it will help to make the user similarity comparison results as weighted to provide a high quality recommendation. The project will uniformly process the user's information, in order to facilitate the comparison.

By combining the neighbor clustering algorithm of content-based technology, we get the clusters units, and then compare the users of each cluster unit to get the similar users. So the hybrid recommendation by combined user information is recommended on the basis of content recommendation technology.

For the classification results of support vector machine (SVM), it helps to predict the user's nearest neighbor, and proceed a weighted adjustment operation, to further improve the quality of recommendation.

Because of the reliable results of prediction recommendation based on demographic information for limited data volume; so after the classification operation by support vector machine, we get the similarity degree between users according to the comparison results of users' information. These similarity degrees are used as weighted values for predictive ratings process.

We also have used IP session matrix with support vector machine (SVM) to classify and divide the users according to their locations, and use the identification data based on location to provide user a useful and helpful recommendation including the most interested items by same location users.

V. Implementation

a) Identification Based on Search Data

The following steps show our recommender system technique using search data identifications:

i. *Update User-Interest Profile*

The user interest profiles are automatically generated based on the type of content viewed by the user. A system generates user interest profiles by monitoring and analyzing a user's access to a variety of hierarchical levels within a set of structured data.

User's interest is constantly changing, so the update of user interest profile based on user interests must be considered. The retrieve information of user input as the sources information for user interest profile updating process. The profile update algorithm is as follows:

Input : search query, user interest U_i
Output: User interest U_i
Method:
Step1: Extract keywords from search query;
Step2: Define Constant c, $0 \le c \le 1/M$*;*
Step3:
For (Keyword L of query)
{
if (keyword L in group$\{L_1, L_2, L_3 \ldots, L_m\}$*)*
{
find rel of keyword L in the group (assume L=l_p*);*
$(l_p, w_p + c) \rightarrow (l_p, w_p)$
continue;
}
Else
{
extract node $(l_q, w_q = min\{w_j / 1 \ll j \le M\})$;

if (c>w_q*)(L,c)→* (l_q, w_q) *else continue;*
}
}
step4: w_j *units;*
Step5: Return U_i*;*

ii. *Improve STC Algorithm*

The STC algorithm clustering that has been discussed above is an efficient method of clustering search results, but because it's clustering process only start from the characteristics of the document itself, and it gets the clustering results based on the document attributes. So for our best knowledge, this is not enough for a personalized recommendation system. In this project, we combine the user personal interests' model with on STC algorithm, which improves the STC algorithm strategy.

In order to better implementation of the personalized recommendation, the clusters should be ordered according to the user's interests. To measure the user interest into any document, we use the following formula:

$$\text{Score}(c_i) = \sum_{j=1}^{M} \text{count}(l_j, c_i) x w_j$$

Where count (l_j, c_i) as the occurrences number of j keyword l_j into i document c_i for user interests model. w_j is the weight of l_j.

To combine base clusters we use Single-Pass algorithm which has a better timeliness compared with Single-Link algorithm.

The basic process of Single-Pass process is as follows:

1. Assign the D_1 *cluster* C_1
2. For i=2 to N do
(a) Calculate similarity S_{ij} *between* D_i *and* C_j *for all j.*
(b) Find the cluster j with largest similarity S_{ij} *between* D_i *and cluster j.*
(c) If S_{ij} *> threshold, then assign* D_i *to cluster j and recalculate cluster representative for j, else create a new cluster for* D_i

Cluster representative status such as if the cluster is represented by its centroid.

Here, use the user interest degree to measure the similarity of different documents, similarityS_{ij}. And use the Score value average of document cluster as the cluster centroid. The process steps are as follows:
Traverse each base cluster queue, and convert base cluster into one document;
Measure the Score value of each document;

Use Single-Pass cluster algorithm to combine all the original base clusters of the same document cluster; order the results according to centroid value;

By comparing the results of user interest's measurement, the Single-Pass algorithm we have used in this project to combine base clusters did improve the algorithm efficiently compared with Single-Link algorithm used by previous works. As an implementation result for the above algorithms on search engine data and search information on our E-commerce website, we could check all the info we need via the management system as we see in following figure 6:

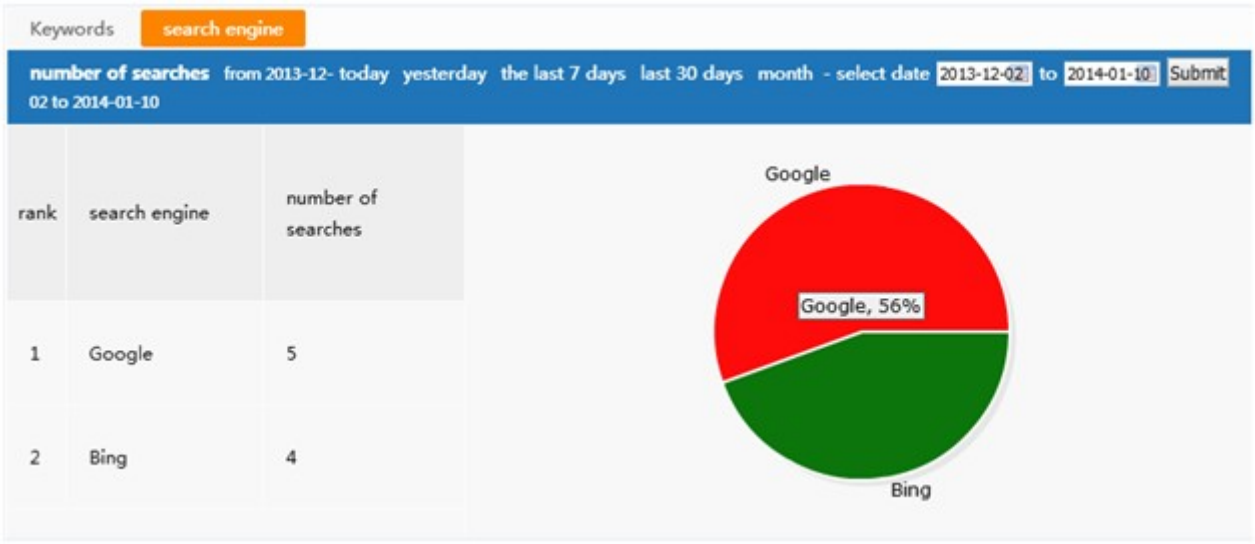

Figure 6 : Search Engine Results

According to the data analyze of search data, our recommender system generates all the information need to recommend items based on search engine data, query keywords and clicked URLs on the website.

a) Identification Based on Rated Items

Recommendation system can be defined as a program that predicts a user's preferences using information about the user, other users and the items in the system.

According to our database figure 2, we can see three tables for this section, which are users table, items table and ratings table. The rating table data explain the items rated by users and ratings degree, the following table shows the process of the rating:

Table 1 : Users Ratings

UserID	ItemID	Rating
User 1	1	5
User 2	2	4
User 3	3	2
…	…	…
User N	K	I

Every item has its own features; the items table data declares the features of items such as item ID, title, price, item type and so on. The following table shows items Eigen's data:

Table 2 : Items Features

ItemID	Home goods	Technology items	…	ETC
1	1	1	…	0
2	0	0	…	1
…	…	…	…	…
K	1	0	…	0

By combining the ratings table and items features table, we get the following table:

Table 3 : Ratings and Features

UserID	ItemID	Home goods	Technology items	…	Rating
User 1	1	1	1	…	5
User 1	2	0	0	…	4
User 1	5	0	1	…	1
User 2	1	1	0	…	2
…	…	…	…	…	…
User N	K	1	0	…	1

Table 3 shows the rating value of each item and the user who rated the item. As the above info show the user rating and items features, but it doesn't reflect the user interest into different features of items. So we need to convert the user ratings of the items, make each rating value declare the interest degree of each feature, and then explain the user interest into different features of items, as shown in the following steps:

- Initialize relatively matrix of user preference

Create user preference matrix CP, the matrix row include eachuser, the column show the Eigen's, and the values on the matrix:

$$\mathrm{CP_{ij}}\ (\mathrm{i} = 1,2,\mathrm{A},\mathrm{N},\mathrm{j} - 1,2,\mathrm{A},\mathrm{M})$$

Show the interest value of user *i* into Eigen *j*, convert into 0 matrix.

- Calculate the interest value of each user into the corresponding Eigen or feature.

According to combination between user ratings and items Eigen's shown in table 3*; input the data of matrix P, as the following:*

1. *Generate the rating matrix of user i, e.g. the row 1 equal to sub matrix of i* $\boldsymbol{P^i}$

$$\boldsymbol{P^i} = \begin{matrix} \mathbf{1} & \mathbf{1} & \mathbf{1} & \mathbf{1} & \mathbf{0} & \mathbf{0} & \mathbf{5} \\ \mathbf{1} & \mathbf{2} & \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{1} & \mathbf{4} \\ \mathbf{1} & \mathbf{5} & \mathbf{0} & \mathbf{1} & \mathbf{1} & \mathbf{0} & \mathbf{1} \end{matrix}$$

The row 2 of $\mathrm{P^i}$ shows the user rated items ID 1,2,5, the last row as the user entirely ratings value for each item ID 5,4,1, the other 3-6 rows show the features of item ID 1,2,5

2. Generate last row of $\boldsymbol{P^i}$, which means the user entirely ratings value of items, and then respectively times the row of items Eigen's value

$$\boldsymbol{RP^i = P^i(:, 3{:}M-1) * P^i(M)\ such\ as;\ RP^i} = \begin{matrix} \mathbf{1} & \mathbf{1} & \mathbf{5} & \mathbf{5} & \mathbf{0} & \mathbf{0} & \mathbf{5} \\ \mathbf{1} & \mathbf{2} & \mathbf{0} & \mathbf{0} & \mathbf{0} & \mathbf{4} & \mathbf{4} \\ \mathbf{1} & \mathbf{5} & \mathbf{0} & \mathbf{1} & \mathbf{1} & \mathbf{0} & \mathbf{1} \end{matrix}$$

- Add the column vectors of $\mathrm{RP^i}$, and for the Eigen's declared rows we need to respectively divide by the other frequency number (columns with value 1), which fetch the $\mathrm{RP^i}$ columns divided by the entirely ratings value, and then we get $\mathrm{CRP^i}$

Forexample $\mathrm{CRP^i}(5\ \ 3\ \ 1\ \ 4\ \ 10/3\ )$ show the rating value of user 1 into items Eigen's 1 until 4.

Divide the Eigen's value rows by the entirely ratings value, we get the interest data $\mathrm{CIP^i}$ of user i into each Eigen.

$$\boldsymbol{CIP^i} = (\mathbf{3/2}\ \ \mathbf{9/10}\ \ \mathbf{3/10}\ \ \mathbf{6/5}\ )$$

- Iterate Steps (1) to (3) until we get the interest data of every user, we get the user interest data matrix $\mathrm{CIP^i}$.

Each column data is divided by the sum of all row vectors multiplied by the general users:

$$\boldsymbol{CP^i} = \frac{\boldsymbol{CP^i} * \boldsymbol{N}}{\sum_{i=1}^{N} \boldsymbol{CP^i}}$$

- Input the $\mathrm{CP^i}$ into the initialized relatively matrix of user preference CP, without involve of Eigen value keeps the value 0.

The algorithms process for rated items can be displayed by the following figure 7:

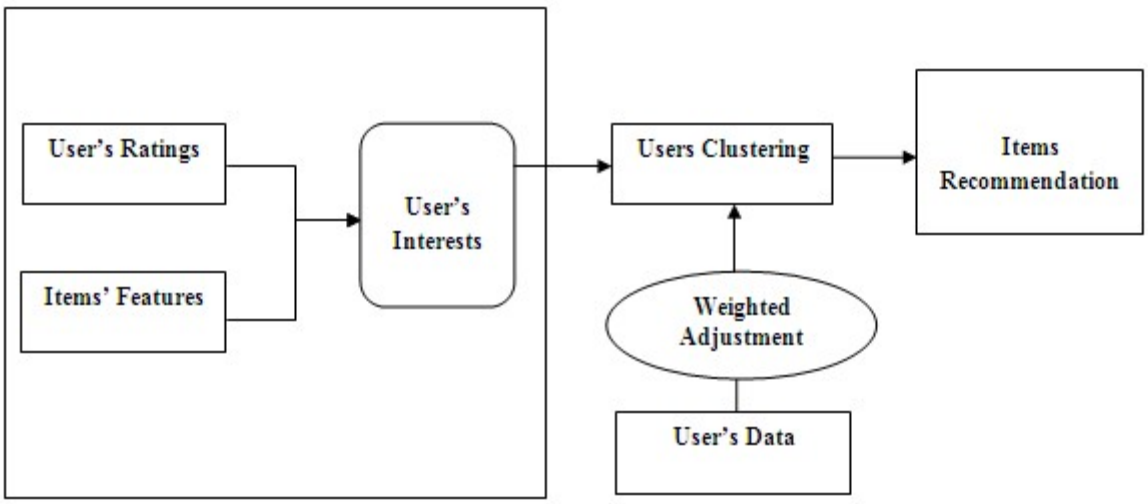

Figure 7 : Content-based and User's Data Recommendation

According to the methods mentioned above, our recommendation results based on the rated items did boost the recommendation quality and achieves greater results for the current systems. It also provides solutions for some problems exist in hybrid recommender system, such as non support for multi-criteria ratings and scalability problem.

c) Cold Start Solutions

i. *New items recommendation*

Content based algorithm recommendation is to classify items based on features of the item, and then pick other items from same class to recommend.

This algorithm can be used to recommend the new items of E-commerce website, although the new items don't have ratings or ordered information's, but the features of new items can be used to compare and find the most similar items on our product catalog, then find the interested users on it, and recommend the new items to them.

First, for the new items features, we create a feature matrix called TestItem form, as a new item to follow up the types, in the form of 0-1.

Second, preferences match of relative users: After the classification of relative preference on behalf of the matrix itemAvg & TestItem, we measure the D-value E, which is integrity, the greater we got, declare the new item classification belongs to the user preference or interests. Then select the classification user to do recommendation.

$$e_i = \frac{\sum_{j=1}^{p}(\text{itemAvg}_i^p - \text{TestItem}^p)}{P}, i = 1,2,A,\text{numCatogries}$$

P represents the number of new items features with value 1, the features number. itemAvg_i^p is the features corresponding column of new items in class i, and e_i is the D-value of new items feature in class i.

ii. *New users recommendation*

One of the cold start problems is new users who have not any interesting data or purchased items log. So to do the recommendation for these new users, we use the following method which uses the information of users to find their similar neighbors in order to give them high quality recommendation contents.

We compute a feature weight. Each feature weight is calculated separately for each user.

- Users Input Data: as we can see on the database figure 2 , the new users data can be called newuser, and the original users data called UserInfo.
- Feature Weight Calculation, For each user, we assign a weight to each feature in a feature set based on the particular user's past behavior.

1. Comparison between new user and original user

For new users, because we don't have any ratings information or either purchased data, so we can't recommend items according to user interests or content based classification. So we use the new user's data to compare and find the similarity with other original users, and then according to the similarity degree do a prediction rating for the new user. The similarity degree between users can be calculated according to the following formula:

$$S^i = \frac{|newUser^t - UserInfo^t|}{\max t - \min t}$$

This formula declares the similarity between users info on the term *t*.

2. Weight Calculation

Considering all user information terms, according to different extent a , calculate the comprehensive weights of similarity degree between on behalf of the user as the following:

$$W = \sum_{i=1}^{3} a_i S^i \text{ , of which } \sum_{i=1}^{3} a_i = 1.a$$

3. Prediction recommended

According to the weight and ratings data, calculate the ratings info of new users:

$$newUserRate = W * UserRate$$

And then finally according to prediction ratings result, recommend the top rated items.

$$(User \times Item)\ Matrix + Similarity\ Function = Top - K\ most\ similar\ users$$

The recommendation algorithm for new users can be displayed as the following figure 8:

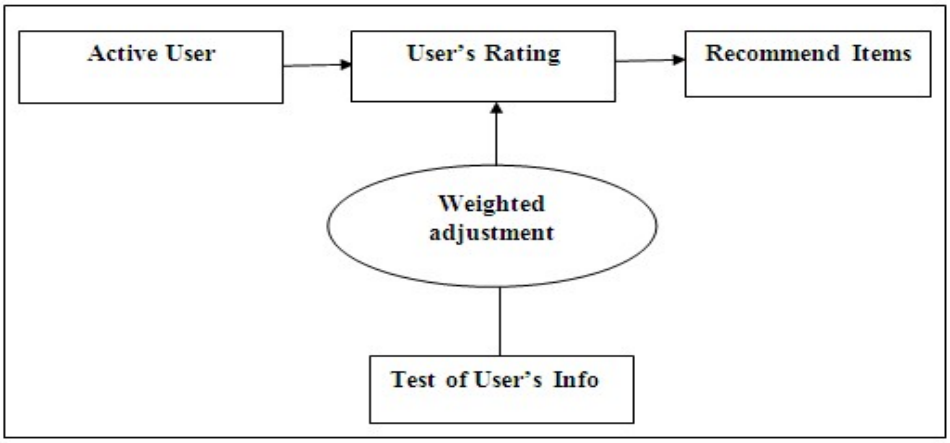

Figure 8 : Recommendation Process for New Users

d) Identification Based on Location

The user location identification data based on the input of two clustered matrixes, which are session-IP scope matrix and Interest Scope matrix, as well as, the user session vector. The output is a list of recommended items for the user based on his location identification, that represented by session-interest clustered matrix.

When the user views our website, the recommender system algorithms based on location will process the following steps to recommend a list of interest items:

First, the system construct session-IP scope matrix for the current user, to determine the location that user belongs to. The matrix row is filled by value 1 for each session user location in the matrix, so each row contains only one value as 1 and others take 0.

Second, the system create IP scope- interest matrix, the columns values used to represent the user interest and preference according to his profile data, and its rows represent the same IP addresses of session-IP scope matrix; Since it has one row, so it's also called the user's location vector.

Third, by multiply the two clustered matrixes, we get a new matrix called session-interest matrix, which used to indicate the user location and interest data. Then according to matrix values, the system recommends items for user depend on his location.

Fourth, the user visit our site and he may has an interest profile or not, so considering this point, we use k-mean classification algorithm to find the closest neighbor for user, and recommend items for user based on his neighbor interest. The classification algorithm (KNN) calculates the similarities between users to provide the current user a list of most interest items by his same location users.

According to algorithm calculation, the more much value is gotten, the more similarity of user profile for our current user session. The recommendation weight for current user session is obtained, and the more much weighted value is obtained, the more prioritization of interest items to recommend user. The implementation results of recommendation matrix based on location give us clear information for user's location and a whole picture about their visits log to our website. The following figures 9 and 10 show the results via management system of our application website:

Visits Overview				view all
	PV	unique visitors	IP	per capita Views
today	1	1	1	1.00
yesterday	22	8	8	2.75
average daily	31	6	6	

Figure 9 : Users' Visits Overview

The recommender system generates the location address of users according to stored data by the visits overview of system. The relational database provide a detailed address including city, province and country for each user browse our website. The following figure 10 indicates the traffic trends of users via management system:

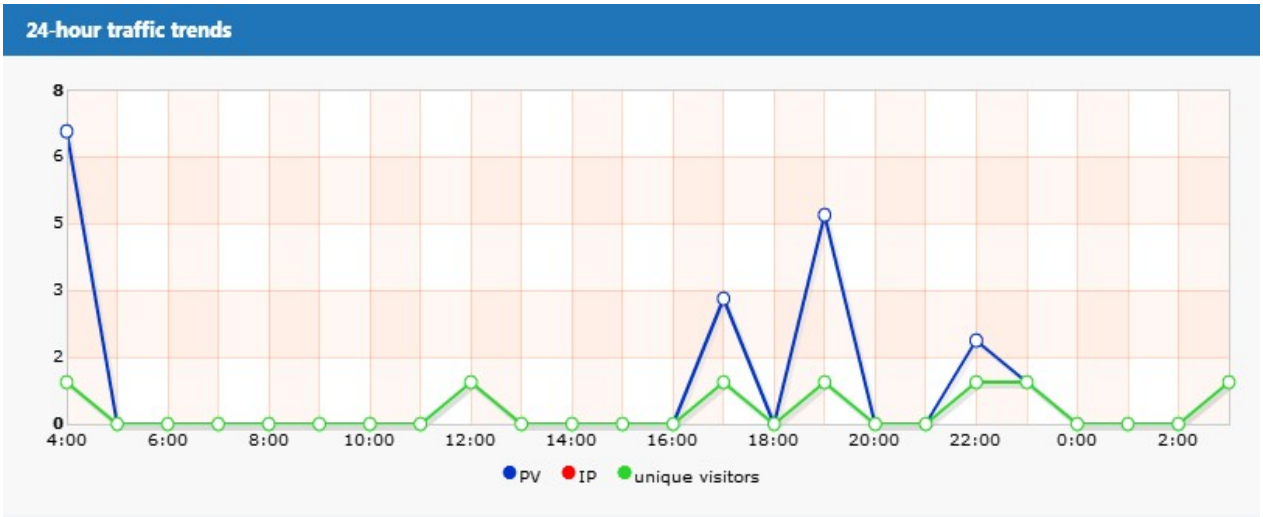

Figure 10 : 24-Hour Traffic Trends

e) Prediction Accuracy Evaluation

➢ Prediction accuracy of rating methods

To measure the recommendation quality standard of the system, there are many methods to use; such as Precision vs. Recall, Clicks, Click through rate and direct user feedback...etc [14]. Here we use two main methods to test the quality and accuracy of recommendation algorithms.

1. Mean Absolute Error

MAE is a quantity used to measure how close predictions are to the eventual outcomes, it measures the error between new user's predication ratings and the ratings data of real original users. The smaller value of MAE outcome, the better quality of recommendation system we got.

$$MAE = \frac{\sum_{i=1}^{N}\sum_{j=1}^{K}(Testrate - TestResult)}{N * K}$$

Where Testrate is user rating matrix, TestResult is user's predication rating matrix, N is the number of users, and K as the rating terms number.

2. Comprehensive evaluation index

$$Precision = \frac{|\{items\ in\ test\ set\} \cap \{the\ recommended\ items\}|}{|\{the\ recommended\ items\}|}$$

$$Recall = \frac{|\{items\ in\ test\ set\} \cap \{the\ recommended\ items\}|}{|\{items\ in\ test\ set\}|}$$

Because of the precision and recall rate to a certain extent is a pair of contradictory indicators, as the high precision rate means our recall rate is low, so in order to balance the two indexes, we use the Comprehensive evaluation index F-measure, the higher value of ***F-measure*** outcome; the better quality of recommendation system we got.

$$F - measure = \frac{2 * Precision * Recall}{Precision + Recall}$$

$$= \frac{2}{1/Precision + 1/Recall}$$

VI. Conclusions

The goal of this work is to enhance and optimize the recommendation system of E-commerce website by providing a new developed and useful model of recommender system. Our system provides some new functions to solve the main serious problems and challenges exist in the current recommendation systems. It provides functions that meet the user and consumer expectations and needs, taking the full consideration of online recommendation system development from the following points:

1. Enhancing recommendation results based on search engine, search data and clicked URLs. Our system use some clustering algorithms to generate and enhance the user search experience in order to build a user interest and preference profile.
2. Enhancing the rating functions by proposing some clustering methods to enhance the functions of rated items which will generate these data as sources to provide a high quality of recommendation results.
3. Proposing solutions for current recommendation system, such as cold start problem. Our system proposed and applied some algorithms which provide solutions for new items and new users recommendation.

4. Proposing a new function for recommendation system, as our system build a new interface which provide recommendation results according to the data identification based on user's location.

ASP.NET is used as a programming language to build this project, and ORACLE is used as a database engine. By the extra services that our E-commerce application site renders; it will be more flexible and efficiency to use comparing with other similar internet (B2B) sites.

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Design and Implementation of Information Retrieval using Ontology

By Dr. V. S. Dhaka & Aditi Sharma
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GJCST-E Classification : *H.3.3*

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Keywords: ontology, fine-grained, user's preferences, search engines.

I. Introduction

Over the past few years, the World Wide Web (WWW) has become the largest and most admired means of communication and dissemination of information. Users often feel disoriented and lost in this information overload which continues to develop. Therefore, the ultimate need nowaday is that of predicting the user needs in order to improve the usability and approaches to make the search adapting to satisfy the user requirement user retention of a web site. We propose. The approaches conversed here are derived from ontology and active user profile. The presented approach aims to effectively personalize search results according to each user's information need by accurately identifying the user context, updating user profile timely, recommending documents according to similar users and by reorganizing the information satisfying the needs. The Web pages are customized according to the characteristics (interests, the social category, the context) of an individual. Personalization technology enables the lively insertion, customization or hint of content in any format that is pertinent to the individual user, based on the user's implicit actions and inclinations.

a) Dynamic User Profile and Ontology

Personalization needs user profile and to construct a user profile, some basis of information concerning the user required to be collected. This information may be collected explicitly and implicitly. Explicit profile creation is not preferred as it puts an additional saddle on the user. Additional issues related to explicit profile creation are the user may not accurately report their interests; the profile, so created, remains inert while the user's interests may keep altering interests may keep altering over time. Hence, the user needs to update the profile. Implicit profile building based on observations of the user's actions describes model considers the frequency of visits to a page, the amount of time spent on the page, how recently a page was visited and whether or not the page was book marked. A set of m finite number of users is termed as U. An ith user(ui)is indicated as a person who poses the question /query to search engine through web browser.

NewUserisauserwhoposesthequeryfirsttimeusingtheemployedsearchengine. Newuserset

$$NU \subseteq U;$$

OldUseristheuserwhohascreatedthequerypreviouslyonthesearchengine.

$$\text{Hence} \quad OU \subseteq U;$$

ActiveUser(denotedasa)istheuserwhoiscurrentlyworking;solivelyuser,attime,iseitherafreshuseroranoldusr

$$ui \in U\{ui:1 \leq i \leq m\}$$

$$\text{and} \quad U = OU \cup NU$$

Query Topic (denoted as QT) is a search query that comprises of one or more keywords/ terms. extent/ dimension of query are number of terms present in it. New Query is a query created by the user firstly. Old Query is a query that has previously been searched by a user. W(u,j)is weight given to the jthquery topic for the user u.

Context is the description of a user's aim / need for information reclamation. In this chapter, context is implicitly defined which are update do over time to reproduce changes in user interests/requirements. Contexts are extracted from Word Net in terms of concepts.

II. The Proposed Approach

In this information age, it is a deplorable state that, despite the information overload, we fail regularly to identify relevant information. In particular, in the field of education, several terabytes of content related to various educational institutions such as universities, colleges are downloaded from the Internet every week, and the demand for these resources is still rising. But this is not satisfactory in terms of access to information that the generic search engine in terms of overtime on bad links and relevance links. There can be many reasons, the most important in terms of lack of

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recognition of context and semantics of the user query to get the required results.

To address these critical issues of information retrieval, the proposed system is designed. The proposed system retrieves semantically relevant results for the user account application semantics and context of the request. The semantics of the query is analyzed using the following procedures:

- The user's request is first analyzed and syntactically by the analysis.
- The synsets related to key words in the query are retrieved .
- The keywords of the ontology of domain are collected to form the refined query.

The results obtained in the proposed approach are more relevant by adopting the following procedure:

- "The refined queries which are entries in the search engine are formed on the basis of the semantic analysis on user request.
- "The Web links retrieved for all the refined queries newly formed are again classified according to the information specific to a domain.

The low-level design of our proposed system is demonstrated as follows:

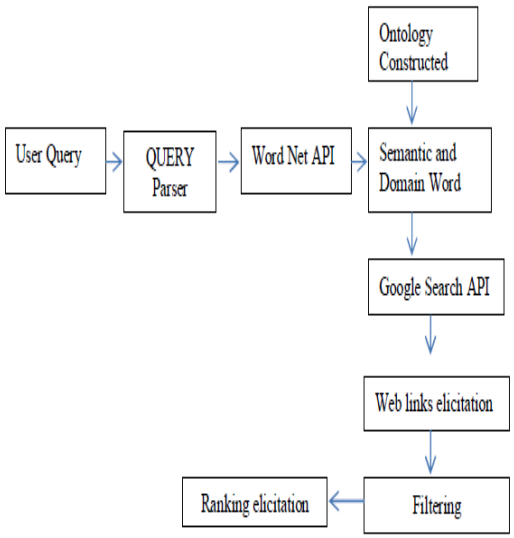

Figure 1 : Low Level Design of Proposed System

a) High Level Design

The three major components of the proposed System are as follows Ontology Construction

- Refined query formation
- Ranking of retrieved links

i. Ontology Construction

Elementary knowledge that the main body of this component description forms, institutional construction of suggestion. Other spheres of learning and organizations of related concept, gathered from various websites and other origins, such as Word only. These concepts centralized in a stratified form in the foundation territory related keyword of ontology. These key words are used to train the purification inquiry.

ii. Refined Query Formation

Improvement, to provide better search result, uses this module the inquiry that is assigned by the user. In this part, the inquiry analysis that is assigned by the user, the speech recognition part of inquiry words and expressions. Then, about in keyword the retrieval of synonym collection in the inquiry contains. The key words territory, the semantic query related extract completes from the main body. This step will cause the more semantic related words the restoration of quantity. Then is used in the open country training purification inquiry these key words. These inquiry fine inquiries, the key words expand, have the related semantics of involving.

iii. Modules

- Query parsing
- Synsets retrieval
- Keywords extraction
- Refined query formation

b) Filtering and Ranking of Retrieved Links

The collaborative filtering is a universal Web technology produces the personalized suggestion. Example of the use includes iTunes, Netflix Corporation in Amazon, lastfm, Stumble Upon Corporation, with Delicious.

Collaborative filtering is a technology utilized chiefly to predict individuals' inclinations. The initiative of collaborative filtering has its basis in information filtering, which leads a reader's pick by filtering a large amount of information and obtaining inclinations collaboratively based on inclinations shared by like readers.

Collaborative filtering works by first sifting through an individual's inclinations or purchase history to find a group of individuals, or a 'neighborhood', with similar inclinations or purchase histories, and then envisaging what else the individual will like, based on the collective inclinations or purchase histories of other individuals in the neighborhood. The predicted inclinations can then be used to make product or service recommendations to the individual.

i. Strengths

- Intuitive, easy to comprehend and implement.
- No data structure assumptions.

ii. Weaknesses

- Requires a large sample to make meaningful recommendations.
- Erroneous recommendations result when close neighbors don't exist.

- Direct insights into the drivers of the exhibited inclinations are difficult to derive.
- Does not unswervingly use product or item content information and customer profile or behavior information for making recommendations.

iii. Modules:

- Retrieval of web links
- Filtering and Ranking of retrieved links

III. Results

a) Parsing of The Input Query

The query given by the user is parsed by m n sea of query parser and the output is:

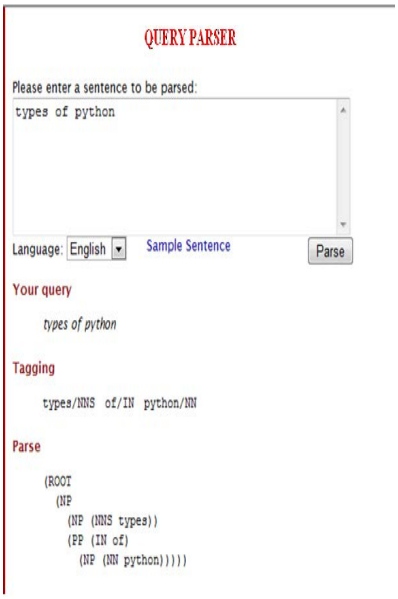

Figure 2 : Query Parser Results Screenshot For Query

b) Retrieval of Synsets from Wordnet

Now the related synsets for the words present in the query are retrieved from the wordnet.

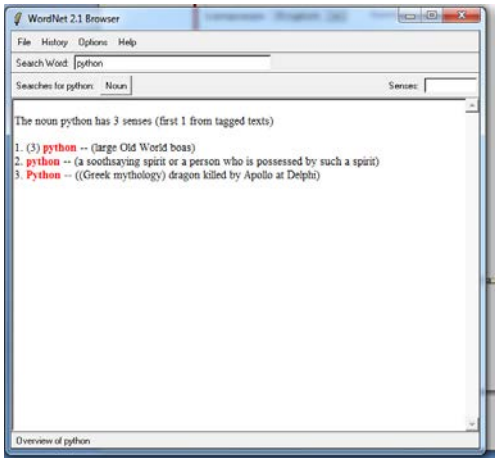

Figure 3 : Wordnet Results Screenshot for Query

c) Extraction of Domain Keywords from Ontology:

The domain keywords that are semantically related to the words in the query are extracted from ontology.

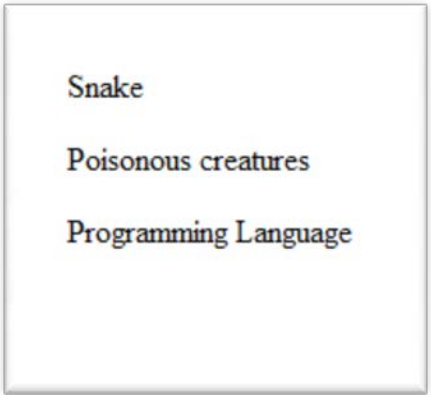

Figure 4 : Jena Api Results Screenshot for Query

The query 'Python' will be expanded with" programming language ",for the users fascinated in computer programming language, and with" snake ',for the users fascinated in "wild life". To get the appropriate context of query topic, the Word Net is used to retrieve appropriate context using the following algorithm and the user profile is updated accordingly.

d) Web Links Retrieved:

i. User Query:

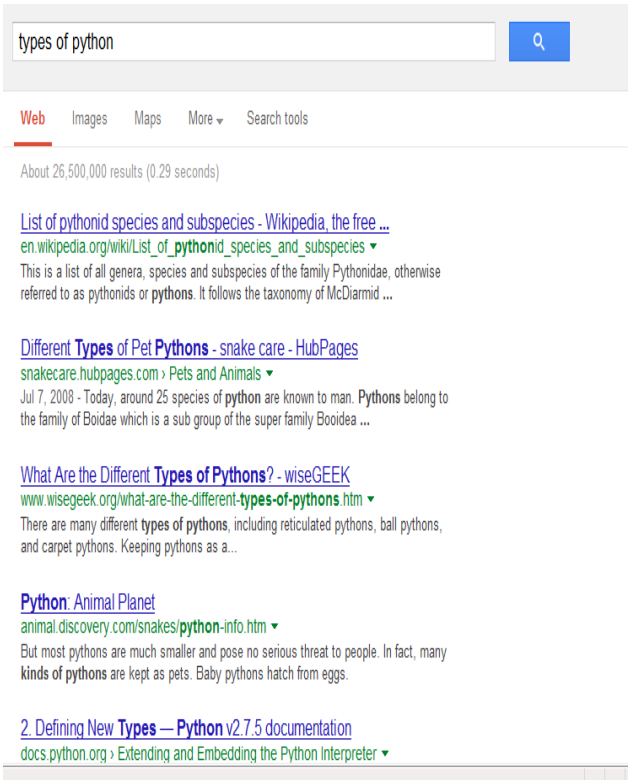

Figure 5 : Google Results Screenshot for Query

ii. With Refined Query

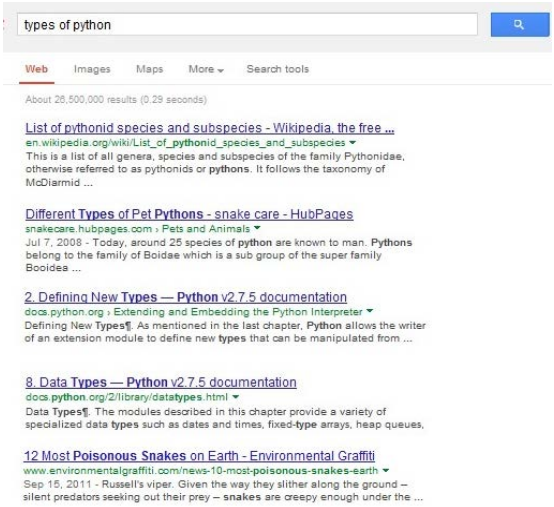

Figure 6 : Refined Query Results Screenshot

IV. Summary and Conclusion

The design and implementation of the proposed approach using Dynamic User profile and Ontology.

The experiments designed are first discussed, followed by the experiment frame work and environment. The overview of the proposed system. In addition ,it gives details of the query parser tool and implemented for query expansion using ontology and re-ranking of documents with using user profile. Evaluation of Context aware applications is quite difficult as they depend on context. The contexts or situations of interest depends on user to user and can't be generalized.

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HANDOFF MANAGEMENT: A Critical Function in Mobility Management for Fourth Generation (4G) Wireless Networks

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Abstract- Efficient mobility management techniques are critical to the success of next-generation wireless systems. Handoff management, which is one of the two basic functions of mobility management, has become more critical in fourth generation wireless networks which support multimedia services. The paper treats basic issues involved in handoff management aspect of general mobility management in wireless communication systems. The relevance of mobility management, handoff management, and general mobility management protocols are explained. The taxonomy of handoff mechanisms, causes of delays in handoffs, and security in handoff procedures are elicited. The paper concludes highlighting some open areas of research in providing seamless services.

GJCST-E Classification : C.2.1

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Abstract- Efficient mobility management techniques are critical to the success of next-generation wireless systems. Handoff management, which is one of the two basic functions of mobility management, has become more critical in fourth generation wireless networks which support multimedia services. The paper treats basic issues involved in handoff management aspect of general mobility management in wireless communication systems. The relevance of mobility management, handoff management, and general mobility management protocols are explained. The taxonomy of handoff mechanisms, causes of delays in handoffs, and security in handoff procedures are elicited. The paper concludes highlighting some open areas of research in providing seamless services.

I. Introduction

First and second generation of wireless networks are based on circuit switched infrastructure. These networks support voice and low data rate services such as short message service (SMS). However, the air interface technologies of such networks are inadequate to support high data rate services such as multimedia, streaming services, file transfer and gaming. Next-generation wireless systems are designed to support these high data rate services. These networks are envisioned to have an IP-based infrastructure with the support of heterogeneous access technologies. IP-based wireless networks are better suited for supporting the rapidly growing mobile data and multimedia services, since they can bring the successful Internet service paradigm to mobile providers and users. In addition, IP-based wireless networks can integrate seamlessly with the Internet to allow mobile users to access the information, applications and services available over the Internet. Moreover, IP technologies provide a better solution to integrate different radio technologies transparently in such a way that users perceive them as one communication network. Currently, several IP-based architectures are proposed for integrating heterogeneous wireless networks to provide ubiquitous communications (Akyildiz, 2004).

One of the research challenges for next-generation wireless systems is the design of intelligent mobility management techniques that take advantages of IP-based technologies to achieve global roaming among various wireless networks. Mobility management enables mobile wireless networks to locate roaming terminals for call delivery and to maintain connections as the terminal is moving into a new service area. Thus, mobility management supports mobile terminals (MTs), allowing users to roam while simultaneously offering them incoming calls and supporting calls in progress (Akyildiz & Ho, 1996).

Mobility management contains two components: location management and handoff management. Location management enables the system to track the attachment points of MTs between consecutive communications. Handoff (or handover) management enables the network to maintain a user's connection as the MT continues to move and change its access point to the network. Moreover, when a user is in the coverage area of multiple wireless networks, for example, in heterogeneous wireless environments, handoff management provides always best connectivity (Gustafsson, 2003) to the user by connecting the user to the best available network (Zhang, 2003). In next-generation wireless systems, there are two types of mobility for MTs: intra-system (intra-domain) and inter-system (inter-domain) mobility. Intra-system mobility refers to mobility between different cells of the same system. Intra-system mobility management techniques are based on similar network interfaces and protocols. Inter-system mobility refers to mobility between different backbones, protocols, technologies, or service providers. Based on intra-and inter-system mobility, the corresponding location management and handoff management can be further classified into intra- and inter-system location management and handoff management.

Efficient mobility management techniques are critical to the success of next-generation wireless systems. Efficient location management design implies minimized signaling overhead for location update and paging as well as minimized update and paging delay.

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Similarly, efficient handoff management support implies minimum latency and packet loss during handoff. In particular, handoff latency is critical for real-time applications such as voice, real-time video, and streaming services and packet loss during handoff is important for both real-time and non real-time applications. Hence, handoff management has become more critical in fourth generation (4G) wireless networks which support multi-media services. For instance, services such as FTP require zero packet loss during handoff. Similarly, Internet-based gaming services require very low handoff latency. Therefore, efficient handoff management design implies minimized handoff failure rate, packet dropping rate, and handoff latency. In addition, Quality-of-Service (QoS) requirements, scalability, and robustness are also important.

With the increasing demands for new data and real-time services, wireless networks should support calls with different traffic characteristics and different Quality of Service (QoS) guarantees. In addition, various wireless technologies and networks exist currently that can satisfy different needs and requirements of mobile users. Since these different wireless networks act as complementary to each other in terms of their capabilities and suitability for different applications, integration of these networks will enable the mobile users to be always connected to the best available access network depending on their requirements.

This integration of heterogeneous networks will, however, lead to heterogeneities in access technologies and network protocols. To meet the requirements of mobile users under this heterogeneous environment, a common infrastructure to interconnect multiple access networks will be needed. Although IP has been recognized to be the de facto protocol for next-generation integrated wireless, for inter-operation between different communication protocols, an adaptive protocol stack is also required to be developed that will adapt itself to the different characteristics and properties of the networks (Akyildiz et al., 2004a). Finally, adaptive and intelligent terminal devices and smart base stations (BSs) with multiple air interfaces will enable users to seamlessly switch between different access technologies.

For efficient delivery of services to the mobile users, the next-generation wireless networks require new mechanisms of mobility management where the location of every user is proactively determined before the service is delivered. Moreover, for designing an adaptive communication protocol, various existing mobility management schemes are to be seamlessly integrated. Each of these schemes utilizes IP-based technologies to enable efficient roaming in heterogeneous network (Chiussi et al., 2002). Therefore, efficient handoff mechanisms are essential for ensuring seamless connectivity and uninterrupted service delivery.

II. Issues in Wireless Network Handoff Management

a) *Importance of Mobility Management*

Mobility in wireless networks can take different forms (Akyildiz et al, 1996) such as:

- *Terminal Mobility*: the ability for a user terminal to continue to access the network when the terminal moves;
- *User Mobility:* the ability for a user to continue to access network services from different terminals under the same user identity when the user moves;
- *Service Mobility*: the ability for a user to access the same services regardless of where the user is

In addition, a terminal or a user may be considered by a network to have ''moved'' even if the terminal or the user has not changed its physical location. This may occur when the terminal switched its connection from one type of wireless network to another, e.g., from a wireless local area network to a cellular network.

Mobility management is the fundamental technology to enable the seamless access to next-generation wireless networks and mobile services. Future IP-based wireless networks support all types of multimedia services including real-time services such as voice and video streaming as well as non-real-time services such as email, web- browsing, and FTP. Basic requirements of mobility management in next-generation wireless networks should include: first, the support of all forms of mobility; second, the support of mobility for both real-time and non-real-time applications; third, the support of users seamlessly moving across heterogeneous wireless networks in the same or different administrative domains; fourth, the support of an on-going user application session to continue without significant interruptions as the user moves. This session continuity should be maintained when a user changes its network attachment points or moves from one type of wireless network to another; and last, the support of global roaming, i.e. the ability for a user to move into and use different operators' networks. Finally, location management in next-generation wireless networks is critical to provide location based services.

In order to satisfy the above requirements, next-generation wireless systems with mobility management should have two basic functional capabilities:

- *Location Management:* This is a process that enables the system to determine a mobile device's current location, i.e. the current network attachment point where the mobile device can receive traffic from the system.
- *Handoff Management*: This is a process that enables a mobile device to change its network attachment point while keeping its on-going traffic uninterrupted. If the network attachment point

change involves the roaming into another network with a different operator, then network access control is also involved in the handoff process. Network access control includes authentication (verify the identity of a user), authorization (determine whether a user should use the network service), and accounting (collecting information on the resources used by a user).

b) Handoff Management

Handoff management is the process by which a mobile node keeps its connection active when it moves from one access point to another. There are three stages in a handoff process.

First, the initiation of handoff is triggered by either the mobile device, or a network agent, or the changing network conditions. The second stage is for a new connection generation, where the network must find new resources for the handoff connection and perform any additional routing operations. Finally, data-flow control needs to maintain the delivery of the data from the old connection path to the new connection path according to the agreed upon QoS guarantees. Depending on the movement of the mobile device, it may undergo various types of handoff. In a broad sense, handoffs may be of two types: (i) intra-system handoff (horizontal handoff) and (ii) inter-system handoff (vertical handoff). Handoffs in homogeneous networks are referred to as intra-system handoffs. This type of handoff occurs when the signal strength of the serving BS goes below a certain threshold value. An inter-system handoff between heterogeneous networks may arise in the following scenarios (Mohanty, 2006) - (i) when a user moves out of the serving network and enters an overlying network, (ii) when a user connected to a network chooses to handoff to an underlying or overlaid network for his/her service requirements, (iii) when the overall load on the network is required to be distributed among different systems.

The design of handoff management techniques in all-IP based next-generation wireless networks must address the following issues: (i) signaling overhead and power requirement for processing handoff messages should be minimized, (ii) QoS guarantees must be made, (iii) network resources should be efficiently used, and (iv) the handoff mechanism should be scalable, reliable and robust.

c) General Mobility Management Protocols

Mobile IP is the most widely used protocol for macro-mobility management. In addition to Mobile IP, three macro-mobility architectures are discussed in the section. These protocols are: Session Initiation Protocol (SIP)-based mobility management, multi-tier hybrid SIP and Mobile IP protocol, and network inter-working agent-based mobility protocol.

i. *Mobile IP*

Mobile IP (Perkins, 2008) is the most well-known macro mobility scheme that solves the problem of node mobility by redirecting the packets for the MN to its current location. It introduces seven elements:

1. Mobile node (MN) – a device or a router that can change its point of attachment to the Internet.
2. Correspondent node (CN) – the partner with which MN communicates.
3. Home network (HN) – the subnet to which MN belongs.
4. Foreign network (FN) – the current subnet in which the MN is visiting.
5. Foreign agent (FA) – provides services to the MN while it visits in the FN.
6. Care-of-address (CoA) – defines the current location of the MN; all packets sent to the MN are delivered to the CoA.
7. Mobile IP protocol has three steps:

(i) agent discovery,
(ii) registration, and
(iii) routing and tunneling.

Over the past several years a number of IP micro-mobility protocols have been proposed, designed and implemented that complement the base Mobile IP (Campbell & Gomez, 2001) by providing fast, seamless and local handoff control. IP micro-mobility protocols are designed for environments where MHs changes their point of attachment to the network so frequently that the base Mobile IP mechanism introduces significant network overhead in terms of increased delay, packet loss and signaling. For example, many real-time wireless applications, e.g. VOIP, would experience noticeable degradation of service with frequent handoff. Establishment of new tunnels can introduce additional delays in the handoff process, causing packet loss and delayed delivery of data to applications. This delay is inherent in the round-trip incurred by the Mobile IP as the registration request is sent to the HA and the response sent back to the FA. Route optimization (Perkins & Johnson, 2001) can improve service quality but it cannot eliminate poor performance when an MH moves while communicating with a distant CH. Micro-mobility protocols aim to handle local movement (e.g., within a domain) of MHs without interaction with the Mobile IP-enabled Internet. This reduces delay and packet loss during handoff and eliminates registration between MHs and possibly distant HAs when MHs remain inside their local coverage areas. Eliminating registration in this manner also reduces the signaling load experienced by the network. The micro-mobility management schemes can be broadly divided into two groups:

1. tunnel-based schemes and
2. routing-based schemes.

In tunnel-based approaches, the location database is maintained in a distributed form by a set of FAs in the access network.

Each FA reads the incoming packet's original destination address and searches its visitor list for a corresponding entry. If an entry exists, it is the address of next lower level FA. The sequence of visitor list entries corresponding to a particular MH constitutes the MH's location information and determines the route taken by downlink packets. Mobile IP regional registration (MIP-RR) (Fogelstroem et al., 2006), hierarchical Mobile IP (HMIP), and intra-domain mobility management protocol (IDMP).

(Misra et al., 2002) are tunnel-based micro-mobility protocol. Routing-based approaches forward packets to an MH's point of attachment using mobilespecific routes. These schemes introduce implicit (snooping data) or explicit signaling to update mobile-specific routes. In the case of Cellular IP, MHs attached to an access network use the IP address of the gateway as their Mobile IP CoA. The gateway decapsulates packets and forwards them to a BS. Inside the access network, MHs are identified by their home address and data packets are routed using mobile-specific routing without tunneling. Cellular IP (CIP) and handoff-aware wireless access Internet infrastructure (HAWAII) are routing-based micro-mobility protocols.

d) Handoff Management Protocols

Handoff or handover is a process by which an MN moves from one point of network attachment to another. Handovers can be classified as either homogeneous or heterogeneous. A heterogeneous handover occurs when an MN either moves between networks with different access technologies, or between different domains. As the diversity of available networks increases, it is important that mobility technologies become agnostic to link layer technologies, and can operate in an optimized and secure fashion without incurring unreasonable delay and complexity. Supporting handovers across heterogeneous access networks, such as IEEE 802.11 (Wi-Fi), global system for mobile communications (GSM), code-division multiple access (CDMA), and worldwide interoperability for microwave access (WiMAX) is a challenge, as each has different quality of service (QoS), security, and bandwidth characteristics. Similarly, movement between different administrative domains poses a challenge since MNs need to perform access authentication and authorization in the new domain. Thus, it is desirable to devise a mobility optimization technique that can reduce these delays and is not tightly coupled to a specific mobility protocol. In this section, we describe different types of handovers and investigate the components that contribute to a handover delay. Some inter-technology and media-independent handover frameworks are then described.

e) Taxonomy of Handoff Mechanisms

Different types of handovers may be classified based on three parameters as follows: (i) subnets, (ii) administrative domains, and (iii) access technologies.
Inter-technology: this type of handover is possible with an MN that is equipped with multiple interfaces supporting different technologies. An inter-technology handover occurs when the two points of attachment use different access technologies. During the handoff, the MN may move out of the range of one network (e.g., Wi-Fi) into that of a different one (e.g., CDMA). This is also known as vertical handover.

i. *Intra-technology*

This type of handoff occurs when an MN moves between points of attachments supporting the same access technology, such as between two Wi-Fi access points. An intra-technology handover may happen due to intra-subnet or inter-subnet movement and thus may involve the layer 3 trigger.

ii. *Inter-domain*

When the points of attachment of an MN belong to different domains, this type of handoff takes place. A domain is defined as a set of network resources managed by a single administrative entity that authenticates and authorizes access for the MNs. A administrative entity may be a service provider or an enterprise. An inter-domain handover possibly involves an inter-subnet handover also.

iii. *Intra-domain*

Handovers of this type occurs when the movement of an MN is confined within an administrative domain. Intra-domain movement may also involve intra-subnet, inter-subnet, intra-technology, and/or inter-technology handovers as well.

iv. *Inter-subnet*

An inter-subnet handover occurs when the two points of attachment belong to different subnets. The MN acquires a new IP address and possibly undergoes a new security procedure. A handover of this type may occur along with either an inter- or an intra-domain handover and also with either an inter- or an intra-technology handover.

v. *Intra-subnet*

An intra-subnet handover occurs when the two points of attachment belong to the same subnet. This is typically a link layer handover between two access points in a WLAN networks, or between different cell sectors in cellular networks. It is administered by the radio network and requires no additional authentication and security procedures.

f) Delays in Handoff

All the layers in the communication protocol stack contribute to the delay in a handoff.

i. *Link layer delay*

Depending on the access technology, an MN may go through several steps with each step adding its contribution to the overall delay before a new link is established. For example, a Wi-Fi link goes through the process of scanning, authentication, and association before being attached to a new access point. For intra-subnet handovers, where network layer configurations are necessary, link layer contributes the maximum to the overall delay.

ii. *Network layer delay*

After completion of the link layer procedures, it may be necessary to initiate a network layer transition. A network layer transition may involve steps such as: acquiring a new IP address, detecting a duplicate address, address resolution protocol (ARP) update, and subnet-level authentication.

iii. *Application layer delay*

The delay of this type is due to reestablishment and modification of the application layer properties such as IP address while using session initiation protocol (SIP). The authentication and authorization procedure such as extensible authentication protocol (EAP) includes several round-trip messages between the MN and the authentication authorization and accounting (AAA) server causing delay in handoff.

g) Security in Handoff Procedures

Whenever an MN connects to a point of network access, it establishes a security context with the service provider. During the handover process, some or all the network entities involved in the security mechanism may change. Thus the current security context changes as well. The MN and the network have to ensure that they still communicate with each other and they agree upon the keys to protect their communication. However, during handovers in networks like GSM/GPRS and UMTS no authentication is used. This makes the handover procedures vulnerable to a hijacking attack. An attacker can masquerade as an authentic mobile station (MS) just by sending message at the right frequency and time slot during handover. As long as the attacker does not know the encryption and/or integrity keys currently being used, he cannot insert valid traffic into the channel. However, if an attacker can gain access to the key(s) (e.g. because of a missing protection on the backbone network), he can impersonate the MS. In fact, in GSM/GPRS, UMTS and WLAN networks, no standard protection mechanism in the backbone network has been specified. Many GSM operators do not protect the radio link between their fixed networks and the BSs. In UMTS, during a handover, the keys used to protect the traffic between the MS and the previous BS are reused in communication with the next BS. While the keys are being transmitted, they can be intercepted by an adversary, if the wireless link is not protected.

Usually an authentication process happens before location updates and call setups. The same mechanisms cannot however, be applied in establishing connection during a handover process because of the stringent time constraint. In GSM, for example, the time between the handover command and the handover complete or handover failure message is restricted to 0.5- 1.5 s. The generation of an authentication response, however, takes about 0.5 s at the MS side. Thus an authentication overhead will cause connection disruption. Mobility and Handoff Management in Wireless Networks 481. As we have seen earlier in this chapter, efficient cell prediction mechanisms can reduce the signaling overhead between the MS and the old BS. The free time slots may be used to forward authentication traffic between the MS, the old BS and the new BS. The MS can precompute an authentication challenge and the encryption and integrity protection keys before the actual change of channel. When the MS and the new BS establish connection, the MS sends the pre-computed authentication response for the new BS to check. If the checking yields positive results, a handover complete message is sent and the old BS releases its resources. Otherwise, a handover failure happens and the MS falls back to the old channel.

III. Conclusion

This paper has discussed some essential issues on handoff management in the general context of mobility management in next-generation mobile wireless networks. The mobile IP has been seen as the most widely used protocol for macro-mobility scheme that solves the problem of node mobility.

Future wireless network will be based on all-IP framework and heterogeneous access technologies. Design of efficient handoff management mechanisms will be playing ever important role in providing seamless services. Some open areas of research that will play dominant role include QoS issues, user terminals, handoff management in wireless overlay networks, and cross-layer optimization.

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A Novel Approach to Detect Malicious User Node by Cognition in Heterogeneous Wireless Networks

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Abstract- Cognitive Networks are characterized by their intelligence and adaptability. Securing layered heterogeneous network architectures has always posed a major challenge to researchers. In this paper, the Observe, Orient, Decide and Act (OODA) loop is adopted to achieve cognition. Intelligence is incorporated by the use of discrete time dynamic neural networks. The use of dynamic neural networks is considered, to monitor the instantaneous changes that occur in heterogeneous network environments when compared to static neural networks. Malicious user node identification is achieved by monitoring the service request rates generated to the cognitive servers. The results and the experimental study presented in this paper prove the improved efficiency in terms of malicious node detection and malicious transaction classification when compared to the existing systems.

Keywords: cognitive networks, network security, OODA, dynamic neural networks, malicious node detection.

GJCST-E Classification : C.2.1

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A Novel Approach to Detect Malicious User Node by Cognition in Heterogeneous Wireless Networks

G. Sunilkumar [α] , Thriveni J [σ] , K. R. Venugopal [ρ] & L. M. Patnaik [ω]

Abstract- **Cognitive Networks are characterized by their intelligence and adaptability. Securing layered heterogeneous network architectures has always posed a major challenge to researchers. In this paper, the Observe, Orient, Decide and Act (OODA) loop is adopted to achieve cognition. Intelligence is incorporated by the use of discrete time dynamic neural networks. The use of dynamic neural networks is considered, to monitor the instantaneous changes that occur in heterogeneous network environments when compared to static neural networks. Malicious user node identification is achieved by monitoring the service request rates generated to the cognitive servers. The results and the experimental study presented in this paper prove the improved efficiency in terms of malicious node detection and malicious transaction classification when compared to the existing systems.**

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I. Introduction

Now a day's Provisioning of security in networks has become challenge to researchers. The mechanisms currently employed are lack of adaptability to the unknown dynamic network conditions. The layered architecture adopted by the current network deployments lacking intelligent communication, lead to reduced network performance and unaware circumstances that arise at each level of the network architecture lead to reduced network performance. The amendments in the layered architecture are carried out post occurrences of problems or malicious activities. The need for secure intelligent and adaptable mechanisms is mandatory. Such mechanisms can be realized based on cognition loop or the OODA loop [1] [2]. Where the network conditions are observed, orientations and adoptions are achieved by intelligence, decisive actions are formulated and these decisions are applied to the network at the acting stage of the OODA loop. Such intelligent and adaptable networks are known as "Cognitive Networks" [3].

The cognitive network approach to secure networks from malicious user nodes or malicious activity is comparatively new and unique. Machine leaning techniques like fuzzy logic, self-organizing maps, neural networks can be used to incorporate intelligence into cognitive systems [4]. In this paper we introduce a discrete time dynamic neural network methodology to incorporate intelligence [5] [6]. Adoption of Cognition is based on the network metrics, parameters and patterns [7]. The cognitive network facilitates output in the form of certain actions that can be implemented for modifying the reconfigurable network policies, network components or network elements.

a) Difference between cognitive radio and cognitive network

i. *Cognitive radio (CR)*

The Cognitive radio [1] (CR) is defined as "a radio that is aware of its environment or surroundings and adapts it intelligently". The cognition itself is an elusive quality which appears to be cognitive or intelligent prior to implementation is often dismissed as merely "adaptive" afterwards. A number of factors motivate CRs. CR is a transceiver system that is solely designed for using the best available wireless channel or resource in vicinity. Such kind of radio automatically detects the available bandwidth or spectrum resources and then it changes its transmission or reception parameters for permitting more synchronized wireless communication in a provided spectrum band even at the same location.

The need for cognition is driven by the complexity of the radio systems themselves. The existence of software defined radio (SDRs) capable of implementing a near endless number of different waveforms with different modulation schemes, power levels, error control codes, carrier frequencies, etc., means that controlling the radio becomes a problem of combinatorial optimization. Such problems are often computationally hard and lend themselves to solutions based on meta heuristic optimization methods based on simple search guided by higher level strategy. The application of such meta heuristic, which often appear to learn and innovate in turn, characteristic of work in artificial intelligence.

ii. *Cognitive Networks*

In order to achieve the seamless adaptation of radio link parameters, opportunistic use of underutilized spectrum, to get the higher flexibility in modulation and

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waveform Selection, the scientific or research society has seen an extraordinary progress in system or network development by implementing cognitive techniques. Cognitive Network is the best solution to attain the above mentioned requirements.

Cognitive Network [3] can be defined as an intelligent network encompassing the cognitive process which can perform a goal of achieving current network circumstances, planning, taking certain decision, acting on those perceived conditions, extracting or learning from the consequences of its previous or current actions, all while following end-to-end goals. The important component of cognitive network is its Cognition Loop that senses the circumstances, plans the actions to be taken and even according to input from sensors and network policies. It decides which solution or decision might be most effective for achieving end-to-end purpose. These characteristics facilitates the network systems to learn from the past about the situations, plans, decisions, actions and then using experiences for improving the decision in future.

b) Objectives

In this paper, we have considered the use of cognition engines to identify the malicious users that are present within a heterogeneous network offering services. Malicious activity inducted through network transactions can be identified by monitoring the service request rates of the user's nodes [8] [9] [10]. In order to analyze effectively, instantaneously and to adapt the diverse network service rates, we introduce the discrete time dynamic neural network cognition engine. Access control mechanisms are critical in provisioning of network security. The proposed cognition mechanism considers the Physical Architecture Description Layer (PADL) structure for access control [11].

c) Organization

This paper organization is as follows. Section two explains about literature survey. The background is discussed in the section three. The proposed system model is explained in section four. The Performance Evaluation and conclusions are discussed in the subsequent sections.

II. Literature Survey

R.W. Thomas et al [3] provides the definition and introduction of "Cognitive Networks". In this research work, Software Adaptable Networks is considered to achieve cognition in networks. This paper also discusses a case study to demonstrate the concepts of cognitive networks based on the OODA Loop. The case study is targeted to maximize the time taken to connect between a source node and one or more destination nodes. The case study considers both multicast and unicast communication models. A network of learning automata is considered for the realization of the cognition layer. Finite Action Learning Automata is used to achieve cognition and the case study is compared with a non-cognition model Directional Reception Incremental Protocol [12]. The Finite Action Learning Automata achieves a 11% performance improvement in solution finding. The major drawback of the algorithm proposed in this paper is that it is not applicable for link failures which occur in the real world scenario.

R S Komali et al [7] discuss about the effects of local and global information acquisition in cognitive networks. In this paper the cost of acquiring information, processing and network overheads arising from information accumulation is clearly discussed. The authors propose a Local δ Improvement Algorithm and compare it with the δ Improvement Algorithm [13] [14] and prove its efficiency. The authors of this paper conclude that utilizing both global and local information to achieve cognition, degrades system performance and an optimum global and local knowledge can be utilize to achieve cognition without effecting network performance. The major drawback is that there is no clear conclusion drawn as to the information global or local ratio to be considered to achieve cognition.

Daojing He et al [8] have proposed a trust based node misbehavior detection scheme for medical sensor networks. The trust is computed based on the rate of transmission and leaving time of the medical sensor nodes. Based on the trust computation malicious nodes are identified. The model is compared with TrE [15] trust model.Performance improvement in terms of packet delivery and malicious node detection is proved using simulation and experimental test beds. The drawback of the system is that it is applicable to centralized systems supporting only unicast transmissions.

Tao Jun et al [9] developed an intrusion detection algorithm based on user behavior. Utilizing the statistics variance method based on the user nodes behavior in transmission rates the intrusions are detected. The paper also discusses the preventive measures incorporated in the case of Address Resolution Protocol [16] attacks. The algorithm proposed in this paper achieves a detection rate of about 0.9975 when compared to the system described in [17] which achieves a detection rate of about 0.9929. The authors have evaluated the proposed algorithm on the KDDCUP 1999 datasets [18] which has limited network user node features and is inconclusive.

S C Lingareddy et al [11] presented a paper that describes a mechanism for securing of wireless networks by the cognitive neural network approaches where the participating users are uniquely identified by implementing their respective Physical Architecture Description Layer (PADL) attributes. In this work they employ the certain data from Physical Layer and the Radio Layer in order to create the Physical Architecture

Description Layer (PADL), which is used to authenticate the system that tries to access the wireless network. Here the cognitive security manager (CSM) maintains the integrity of the entire network by analyzing the Physical Architecture Description Layer (PADL) of all the nodes within the network.

Zhang Wenzhu and Yi Bohai [19] have introduced a multi domain cognition system. The authors have proposed two cognition models namely a Local Single-Domain Cognitive approach and a Local Multi-Domain Cognition approach. A multidimensional edge detection theory [20] is adopted to achieve cognition in the Local Single-Domain Cognitive approach and similar concepts have been extended to achieve cognition in the Local Multi-Domain Cognition approach. Multi domain systems considered in this paper is defined in [21]. The concept of Local Multi-Domain Cognition approach is still very naive and can be further improved upon.

G Sunilkumar et al [22] presented a research work that not only Monitors activity of user node but also performs an effective function of taking preventive measures if user node transactions are found to be malicious. In this research work the intelligence in cognitive engine has been realized using self-organizing maps (CSOMs). In order to realize the CSOMs Gaussian and Mexican Hat neighbor learning functions have been evaluated. The research simulation made in this work proves the efficiency of Gaussian Learning function that is found to be better for cognition engine. The cognition engine being considered in this research work is evaluated for malicious node detection in dynamic networks. In this work the implemented concept results in higher Intrusion detection rate as compared to other similar approaches.

III. Background

The authors in [11] have proposed a secure Cognitive Framework Architecture for 802.11 networks based on the OODA Loop. The core of the architecture i.e. the Cognitive Security Manager incorporates the cognition process using robust access control mechanisms based on the PADL. The authors of this paper adopt a similar access control mechanism to identify the nodes within the network. Intelligence to achieve cognition is realized using a multilayer feed forward neural network trained based on the back propagation algorithm. User behavior monitored and analyzed to achieve the Cognition Process. Access control mechanisms coupled with cognition processes is introduced. The use of Multilayer Feed Forward neural networks cannot effectively handle the network dynamics in heterogeneous environments and exhibits reduced malicious node detection. To achieve better malicious node detection rates the proposed model considers the use of discrete time dynamic neural networks to achieve cognition.

IV. Proposed System Model

a) Cognitive Network Modelling

Let's consider a network on which cognition is to be realized represented as C_G^N . The cognitive network can be represented as a graph defined as

$$C_G^N = (C_E^N, C_L^N) \quad (1)$$

Where C_L^N represents the set of network connections or links that exists between the network elements represented by C_E^N. The cognitive network element set consists of a set of cognitive servers represented as C_S^N, router elements set represented as C_R^N and client nodes set represented as C_C^N. The network clients set constitute of wireless and wired type to realize a heterogeneous network. The network elements set can thus be defined as

$$C_E^N = \{C_S^N \cup C_R^N \cup C_C^N\} \quad (2)$$

All the links that constitute towards the link set C_L^N are assumed to be bi-directional in nature and can of wired or wireless nature. A sample network graph is as shown in Figure 1.

The router set C_R^N are assumed to be secure and are trusted network elements. The client nodes or the leafs of the network graph shown above and are assumed to constitute of trusted or normal users set represented as C_n^N and malicious or untrusted users set represented as C_m^N. Hence the client node set can be defined as

$$C_C^N = \{C_n^N \cup C_m^N\} \quad (3)$$

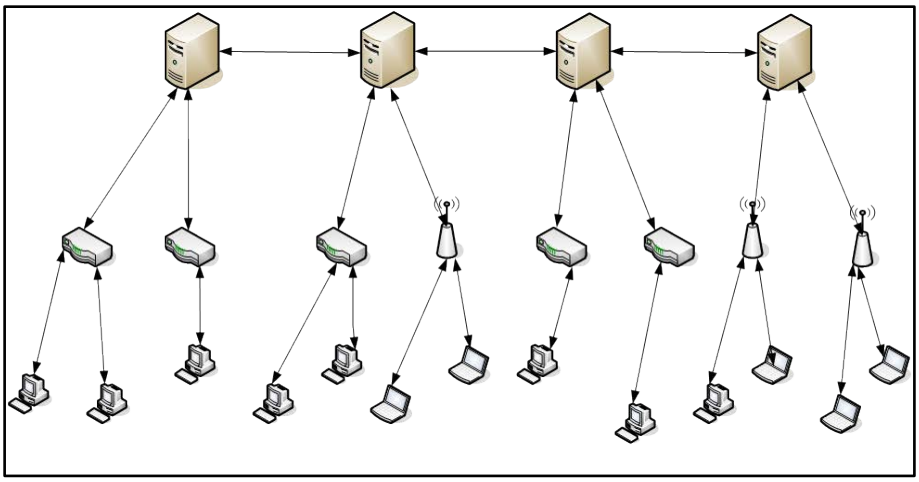

Figure 1 : Cognitive Network Model Graph

The objective of the cognitive network discussed here is to identify the number of malicious users C_m^N in the cognitive network C_G^N. The cognitive server is assumed to host a set of services S for the users to access.In the cognitive network model the routers set only forward the data received from the client nodes to the cognitive servers. Cognition is achieved by incorporation the Cognition Loop also known as the OODA Loop. The cognition process is carried out on the cognitive servers which intercommunicate to facilitate higher malicious user detection rates. A packet level communication model is considered in this system wherein the user nodes request for services using a packet based transmission system. The PADL based user identification approach is adopted for accurate identification of user nodes. User node behavior is observed based on the transmitted data and the transmission rate. Transmission rate is defined as

$$C_{ca\,x}^N = \frac{C_{Pk_x}^N}{t} \quad (4)$$

Where $C_{Pk_x}^N$ represents the transmitted packet set of user x and t is time interval.

The transmission rate of the data sent by C_n^N to the cognitive server C_S^N is assumed to vary between $0\ mbps$ and $C_{ca\,n}^N\ mbps$. The malicious client nodes C_m^N that are randomly deployed in the network are assumed to maintain a varying transmission rate of up to $C_{ca\,m}^N\ mbps$. The transmission rate of a user node is proportional to the quantum of service packets transmitted to the server per unit time. The bandwidth available with the cognitive server C_S^N or the supported transmission rate is represented as $C_{S_{maxld}}^N$ .Normal nodes request for services S offered by the C_S^N at a rate $C_{ca\,n}^N$ and it can be stated that $C_{ca\,n}^N \ll C_{S_{maxld}}^N$. Malicious activity is induced by introduction of additional packets into the network where by the transmission rate of the malicious node $C_{ca\,m}^N > C_{ca\,n}^N$. Malicious users in the ideal scenario try to compromise or attain control of a greater number of service hosts in order to perform untrusted activities. Such untrustworthy behavior is modeled by inducing additional service request packets and which can be observed by the incremental transmission rate. Identification of malicious users where in there is no increased injection of service packets is also considered.

User node activity in the cognitive network C_G^N is observed by monitoring the service packet request rate measured in terms of the transmission rates of the service packets. Let the service transmission rate of a client node x be represented as $C_{ca\,x}^N$ i.e. the observed service request rate of the cognitive server C_S^N is also $\approx C_{ca\,x}^N$ assuming lower network losses. The cognitive process adopted relies on dynamic neural network based intelligence for analysis of the service request packets. A discrete time dynamic neural network is adopted for orientation of the cognitive process incorporated. The decision phase of the cognition cycle relies on the service request packet analysis results obtained from the output of the dynamic neural networks. The action or the control strategies phase of the cognition cycle is achieved based on the decisions and is implemented on the cognitive servers C_S^N . The algorithm adopted to implement the action is discussed in the latter section of this paper. The cognition cycle is represented in Figure 2.

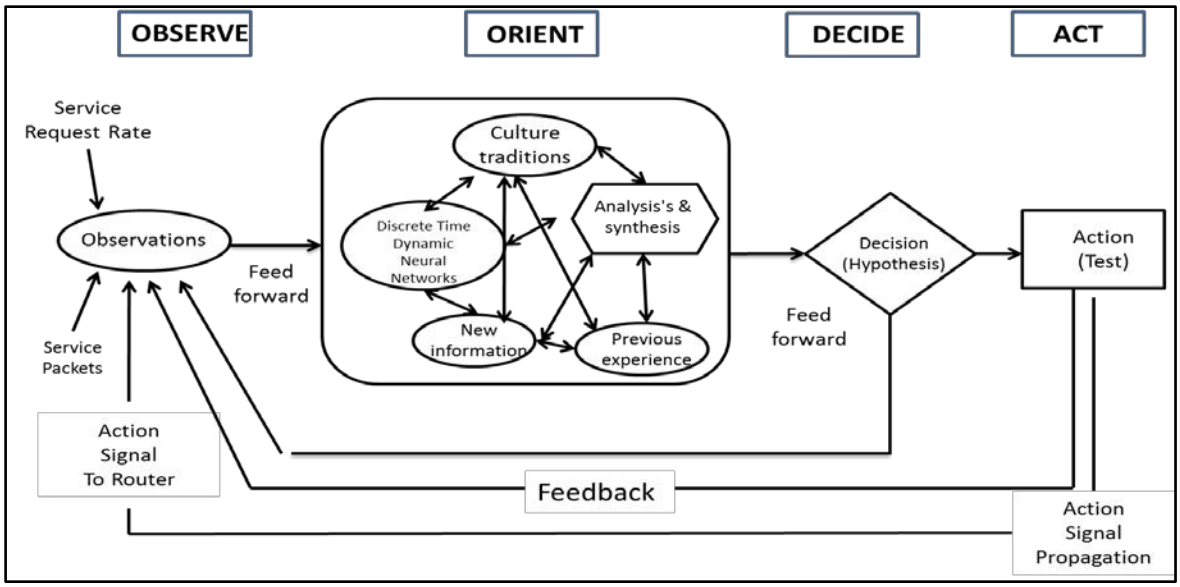

Figure 2 : Cognition Cycle

b) Discrete Time Dynamic Neural Network

Dynamic Neural networks [23] are adopted to impart intelligence similar to that of the biological neuron. The cognition process discussed in this paper adopts a discrete time dynamic neural network model for the purpose of understanding and learning about the user node behavior in terms of the service request packets received by the cognitive server C_S^N . The back propagation algorithm is adopted for the training of the dynamic neural network. The network dynamics of the client nodes to be observed can be represented as a first order differential equation defined as

$$\frac{\Delta x}{\Delta t}\Big|_{t=kt} = \frac{x((k+1)T) - x(x(kT))}{T} \quad (5)$$

Where the sampling period is represented by T and k Represents the instance of sampling and $x(y)$ is the input service requests to be observed by the cognitive server C_S^N at the y^{th} time instance.

The client node behavior to be observed can also be defined as

$$\frac{\Delta x}{\Delta t} = x(k+1) - x(k) \quad (6)$$

When $T = 1$

The discrete time dynamic neural network unit can be graphically represented as shown in Figure 3 given below.

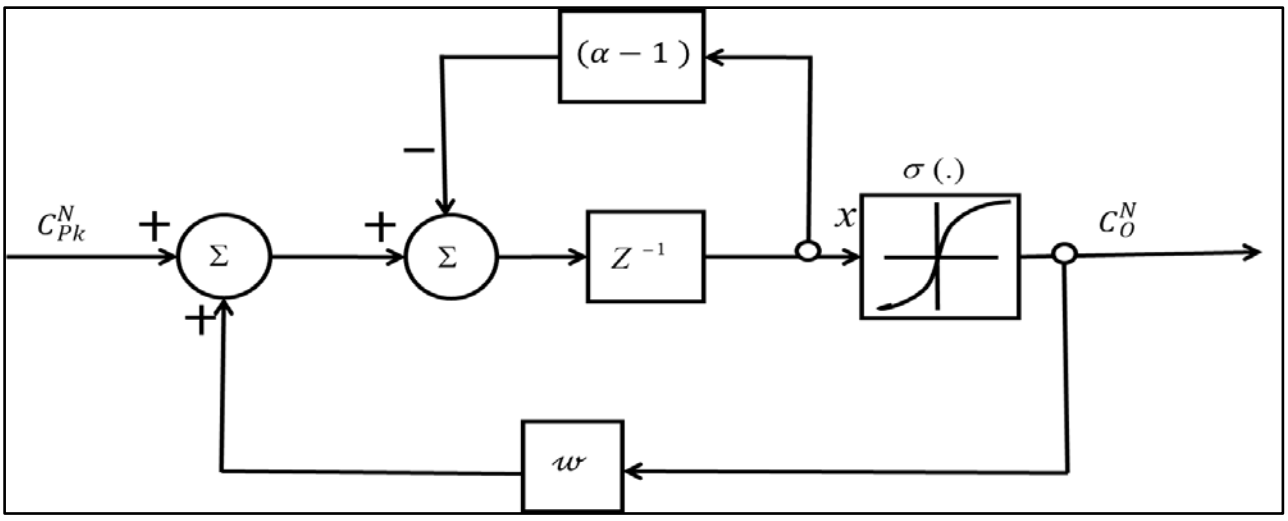

Figure 3 : A neuron structure of the Discrete Time Dynamic Neural Network

From Figure 3 the equivalent model of the discrete time dynamic neural network can be represented as

$$x(k+1) = \left(\left(C_{Pk}^N\right) + \left(w \times C_O^N(k)\right) - \left((\alpha - 1)(x(k))\right)\right) \quad (7)$$

The output of the dynamic neural networks is the learning or the cognitive observations represented as $C_O^N(k)$ is defined as

$$C_O^N(k) = \sigma \times \big(x(k)\big) \tag{8}$$

Considering a set of service packets transmitted from the user nodes in the topology represented as $x_d(k)$. Where $k = 1,2,3,4, \ldots \ldots P$. The learning algorithm of the dynamic neural network can be defined as

$$x(k+1) = \Big(\big(C_{Pk}^N\big) + \mathbb{f}(x(k), w) - \big((\alpha - 1)(x(k))\big)\Big) \tag{9}$$

Where,

$$\mathbb{f}(x(k), w) = \sum_{i=1}^{p} \alpha_i \sigma(b_i x + c_i) = \alpha^T \sigma(bx + c) \tag{10}$$

The learning error of the neural network model is defined as

$$E(k) = \tfrac{1}{2}(x_d(P) - x(P))^2 + \tfrac{1}{2}\sum_{k=0}^{P-1}[x_d(k) - x(k)]^2 \tag{11}$$

Considering

$$e(k) = x_d(k) - x(k) \text{ and}$$

$$e(P) = x_d(P) - x(P)$$

The learning error can be defined as

$$E(k) = \frac{1}{2}e^2(P) + \frac{1}{2}\sum_{K=0}^{P-1} e^2(k) \tag{12}$$

Based on the parameters α the partial derivatives of the error index is defined as

$$\frac{\partial E}{\partial \alpha} = -\left(\sum_{k=0}^{P-1} z(k+1)x(k)\right) \tag{13}$$

Where $z(k+1)$is the Lagrange multiplier.

Based on the weight parameter w the partial derivatives of the error index is defined as

$$\frac{\partial E}{\partial w} = \sum_{k=0}^{P-1} z(k+1)\mathbb{f}_w(x(k), w) \tag{14}$$

Where $z(k+1)$is the Lagrange multiplier.

The dynamic neural networks increments the parameters α and the weight w to minimize the learning error. The rate at which α is incremented represented as $\Delta\alpha(k)$ is defined as

$$\Delta\alpha(k) = -\left(\eta_\alpha \frac{\partial E}{\partial \alpha}\right) \tag{15}$$

$$\Delta\alpha(k) = \eta_\alpha \sum_{k=0}^{P-1} z(k+1)x(x) \tag{16}$$

The weight update rate is represented as $\Delta w(k)$ is defined as

$$\Delta w(k) = -\left(\eta_w \frac{\partial E}{\partial w}\right) \tag{17}$$

$$\Delta w(k) = -\eta_w \sum_{k=0}^{P-1} z(k+1)\mathbb{f}_w(x(k), w) \tag{18}$$

The dynamic neural networks update the parametersα and w of the forward layers based on the following definitions

$$\alpha(k+1) = \alpha(k) + \eta_\alpha \sum_{k=0}^{P-1} z(k+1)x(k) \tag{19}$$

$$w(k+1) = w(k) + \eta_w \sum_{k=0}^{P-1} z(k+1)f_w(x(k), w) \tag{20}$$

The back propagation learning for the discrete time dynamic neural network model enables to observe the service packet transmission rates of the cognitive server C_S^N by adopting a multi iterative process. The observations of the neural network are utilized for decision making and action planning at the cognitive servers C_S^N.

a) Cognitive Decision Making and Action Planning

In this section we propose an action control adopted to limit the service request rates to the cognitive server C_S^N. Let p_{dat} represent a fraction of the service request packet set from the users to the server through the routers i.e. $0 \leq p_{dat} \leq 1$. By dropping or limiting the service requests received from the C_m^N cognition could be achieved. Let the packet dropping factor which is multiplicative in nature be represented as μ. The packet dropping factor is adapted based on the presence of malicious users identified in the network topology. Let us define a constant r that is additive in nature and is introduced to increase the acceptance of service request packets when the number of normal users are greater i.e. $C_n^N > C_m^N$. The action control strategy is realized by the cognitive server set C_S^N and is executed when the service requests rates observed exceed the limit of the maximum transmission limit $C_{S_{maxld}}^N$ or when the current service request limit drops beyond the minimum supported transmission bandwidth $C_{S_{minld}}^N$. The service requests received by the server are monitored every u second. Here u is the monitoring time interval is considered to smaller than the round trip time between the server $C_S^N$and the user nodes C_C^N. The action control mechanism is not just as it tends to drop or limit the user service request immaterial of the kind of user C_n^Nor C_m^N based on the observations C_O^N. To eliminate such unjust actions let us consider the service request rate of the cognitive server C_S^N received to be represented as $C_{ca\,C_S^N}^N$ and it is defined as

$$C_{ca\,C_S^N}^N = \frac{\left(C_{S_{minld}}^N + C_{S_{maxld}}^N\right)}{p_{dat}\,(h)} \tag{21}$$

Where $p_{dat}\,(h)$ represents a constant and is a fraction of the service request packets sent from $C_C^N$to C_S^N.

If the service request load $C_{ca\,C_{ca}^N}^N$ is below the predetermined threshold $C_{S_{minld}}^N$ then the service request acceptance is increased by a small volume represented as δ. The cognitive servers monitor and accept the client service requests through the controlled router represented as $C_R^N(h)$. This action control strategy is invoked every u second wherein the server load $C_{ca\,C_S^N}^N$ is adjusted to be within the limits set by $C_{S_{minld}}^N$ and $C_{S_{maxld}}^N$

based on the observation C_O^N. From the discussion presented here it is clear that the action control strategy adopted in the cognition cycle is designed to balance and service the user request for services S offered by the server C_S^N limiting the service requests from malicious users C_m^N and not effecting the normal user C_n^N service requests by a great extent. It is observed that the action control strategy in the cognitive process is a feedback based strategy. The observed service rates C_O^N of the client nodes C_C^N by the dynamic neural networks enables effective decision making and control strategies to be adopted to achieve cognition. The cognition process discussed is capable of handling service rate controls between the predefined limits, heterogeneous client nodes, heterogeneous service traffic rates and server bandwidth control limits established by $C_{S_{maxld}}^N$, $C_{S_{minld}}^N$.

The integrity and security provisioning of cognitive server C_S^N and the services S it offers is considered as the objective of the research work presented here. Let the clients C_C^N induce service requests i.e. the traffic load be represented as $D_r(t)$ through router r has for C_S^N at the time t . The action strategy signal represented as $C_{sig}^N(t)$ is considered as the response to the observed traffic C_O^N by the server C_S^N, the instantaneous response traffic rate is represented by $D_r^{'}(t)$. The rate $D_r^{'}(t)$is considered as a function of the controlled traffic rate $C_{ca\,r}^N(t)$ and the offered traffic rate $D_r(t)$ in accordance to the action control strategy. The total traffic rate observed by the cognitive server C_S^N is defined as

$$\sum_{r=1}^{C_C^N} D_r^{'}(t) \tag{22}$$

Where $D_r^{'}(t)$is the traffic rate through each deployment router $C_R^N(h)$

Based on the total traffic observed and the discrete time dynamic neural network analysis the C_S^N orients itself and the orientation results is defined as

$$C_O^N = \sigma\left(\sum_{r=1}^{C_C^N} D_r^{'}(t)\right) \tag{23}$$

The C_O^N is utilized for decision making and the action strategies signal $C_{sig}^N(t)$ is derived for all the routers in $C_R^N(h)$ in the heterogeneous network environment. Based on the position and the link type the action signal is received at varied time instances due to inherit network delays. Let $\rho_r \geq 0$ represent the network delay from the C_S^N to the routers C_R^N. The action signal $C_{sig}^N(t)$, the controlled traffic rate $C_{ca\,r}^N(t)$ and the traffic rates $D_r^{'}(t)$ change with respect to the time t and be considered as a coupled system. Coupled Differential equations can be used to represent such models.

The cognitive server needs to maintain the traffic rate within the limits established by $C_{S_{minld}}^N$, $C_{S_{maxld}}^N$ and yet generate action signals $C_{sig}^N(t)$ defined as

$$C_{sig}^N(t) = \begin{cases} -1 & \text{if } \sum_{r=1}^N D_r^{'}(t) \geq C_{S_{maxld}}^N \\ 0 & \text{if } \sum_{r=1}^N D_r^{'}(t) \leq C_{S_{minld}}^N \\ 1 & \text{otherwise} \end{cases} \tag{24}$$

Let the action signal $C_{sig}^N(t)$ of the cognitive server C_S^N based on the service request rate $C_{ca\,S}^N(t)$ such that $C_{S_{minld}}^N < C_{ca\,S}^N(t) < C_{S_{maxld}}^N$, the additive step $\delta > 0$. The changes in the action signal can be defined as

$$\frac{\Delta C_{ca}^N(t)}{\Delta t} = \left(\delta 1_{\left(C_{sig}^N(t-\rho_r)==1\right)}\right) - \left(\frac{C_{ca}^N(t)}{2} 1_{\left(C_{sig}^N(t-\rho_r)==-1\right)}\right) \tag{25}$$

To maintain quality and service provisioning to normal user clients C_n^N in the presence of malicious users C_m^N the cognitive server C_S^N increases the instantaneous service request rate $C_{ca}^N(t)$ by a factor $\delta > 0$ when the cumulative service request rate is less than $C_{S_{minld}}^N$ or it reduces the rate by half if the instantaneous service request rate is greater than $C_{S_{maxld}}^N$. The dynamic changes in the transmission rates $D_r^{'}(t)$ can be defined as

$$\frac{\Delta D_r^{'}(t)}{\Delta t} = min\left\{C_{ca}^N(t-\rho_r)\,,\, D_r^{'}(t) - D_r^{'}(t)\right\} \tag{26}$$

Where $D_r^{'}(0) = 0$

From the above definition it is clear that request rate $D_r^{'}(t)$ is a function of the offered request rate $D_r(t)$ and the altered rate $C_{ca}^N(t-\rho_r)$ achieved based on cognition.

At a time instance ρ_0, the cognitive server C_S^Nobserves the received traffic is greater than $C_{S_{maxld}}^N$ it is said to be over-loaded. The request rate observed is defined as

$$C_{ca\,S}^N(t) = \Theta_1 e^{-\frac{t}{2}} \tag{27}$$

Where $t \geq \rho_0$

$\Theta_1 = e^{(1/2)\rho_0} C_{ca\,S}^N(\rho_0)$ is a constant

$C_{ca\,S}^N(\rho_0)$Is the request rate at time instance ρ_0

Then the rate at which the over-loaded cognitive server receives request rates id defined as

$$D_r^{'}(t) \approx e^{-t}\left[e^{\rho_0} D_r^{'}(\rho_0) - \frac{2\mu\Theta_r}{D_{r\ (t)}}\sqrt{\Theta_r^2 D_r^2(t) e^{\rho_0}} + \frac{2\mu\Theta_r}{D_{r\ (t)}}\sqrt{\Theta_r^2 D_r^2(t) e^{t}}\right] \tag{28}$$

At a time instance ρ_0, the cognitive server C_S^Nobserves the received traffic is less

than $C^N_{S_{minld}}$ it is said to be under-loaded. The request rate observed is defined as

$$C^N_{ca\,S}(t) = \delta t + \Theta_2 \tag{29}$$

Where $t \geq \rho_0$

$\Theta_2 = -\delta\rho_0$ is a constant

Then the rate at which the under-loaded cognitive server receives request rates id defined as

$$D_r^{'}(t) \approx \left(\left[D_r^{'}(\rho_0) e^{\rho_0} - \mu D_r(t) e^{\rho_0} + \mu D_r(t) \times e^{\left[\frac{1-\delta/D_r(t)\right]\rho_0 e^{-(\Theta_r/D_r(t))}}{\left(1-\frac{\delta}{D_r(t)}\right)}} \right] e^{-t} \right) + \left(\mu D_r(t) \left[1 - \frac{-e^{-(\delta t+\Theta_r)/D_r(t)}}{\left(1-\frac{\delta}{D_r(t)}\right)} \right] \right) \tag{30}$$

The cognition is achieved based on the OODA loop. The service requests received from the malicious users C^N_m are limited and dropped to achieve cognition and maintain the heterogeneous network integrity. The cognition process discussed derives its learning intelligence by using the discrete time dynamic neural networks trained using the back propagation algorithm. The experimental study conducted to prove the discussed cognition process is explained in the next section.

V. Performance Evaluation

This section of the paper discusses the experimental study conducted to evaluate the cognition process based on the OODA Loop. The experimental environment for the heterogeneous environment C_E test bed was developed using C# on the Visual Studio Platform. The heterogeneous environment constitutes of cognitive servers C_S routers C_R and client nodes C_C. Cognitive decision making is incorporated within the cognitive servers. We have evaluated the proposed discrete time dynamic neural network cognitive engine (DNN-DT) against the MFNN cognitive engine. The C_C considered of wired and wireless type. We have considered two mobility models namely, Random Directional Mobility and Random Waypoint Mobility for the user nodes C_C. The user nodes C^N_n introduce regular service rates over the simulation test bed within the limits set by $C^N_{S_{minld}}$ and $C^N_{S_{maxld}}$ and request the cognitive servers for a set of services through the routers deployed. A packet level structure is adopted to model such transactions. A random number of nodes i.e. malicious nodes C^N_m are introduced intro the network whose transactional service rates are irregular by nature i.e. $C^N_{ca\,m} > C^N_{ca\,n}$. The aim of the experimental study can be defined as identifying malicious transactions due to which irregular service rates are observed and negate the malicious client nodes C^N_m introducing such service rates by denying them service provisioning.

The ability of the simulation environment is to handle variations in the number of C_S, C_R , C_C along with the mobility options and channel noise considerations led to an extensive experimental scenarios summarized in Table 1. A total of twenty four scenarios are presented in this paper. The error in identifying the malicious nodes identified by the vibrational service rates is represented in Figure 4. The average detection error for the MFNN Cognitive Engine was found to be around 16.266% when compared to a detection error of about 4.411% of the DNN-DT Cognitive Engine. Network transactional errors are inherit to any networks. Network transactional errors are generally due to packet loss and channel noise. The network transactional errors observed for the simulation scenarios are shown in Figure 5. From the graph it is clear that the network transactional errors are uniform for the MFNN Cognitive Engine and DNN-DT Cognitive Engine scenarios reiterating the fairness of the results are presented in this paper. Network Transactional errors result in misclassification of client nodes increasing the False Positive Rate (FPR). The occurrence of such scenarios is controlled during test bed deployments for all the scenarios presented here.

Table 1 : Considered Simulation Scenarios

No.	Cognition Engine	No. Servers (C_S)	No. Routers (C_R)	Mobility Model	Channel Noise	No. Nodes (C_C)	No. Malicious Nodes(C_m^N)
1	MFNN COGNITIVE ENGINE	3	30	RANDOM DIRECTIONAL	PRESENT	200	13
2	MFNN COGNITIVE ENGINE	3	30	RANDOM DIRECTIONAL	ABSENT	200	9
3	MFNN COGNITIVE ENGINE	3	30	RANDOM WAYPOINT	PRESENT	200	5
4	MFNN COGNITIVE ENGINE	3	30	RANDOM WAYPOINT	ABSENT	200	5
5	MFNN COGNITIVE ENGINE	5	50	RANDOM DIRECTIONAL	PRESENT	200	11
6	MFNN COGNITIVE ENGINE	5	50	RANDOM DIRECTIONAL	ABSENT	200	14
7	MFNN COGNITIVE ENGINE	5	50	RANDOM WAYPOINT	PRESENT	200	10
8	MFNN COGNITIVE ENGINE	5	50	RANDOM WAYPOINT	ABSENT	200	13
9	MFNN COGNITIVE ENGINE	7	70	RANDOM DIRECTIONAL	PRESENT	200	23
10	MFNN COGNITIVE ENGINE	7	70	RANDOM DIRECTIONAL	ABSENT	200	5
11	MFNN COGNITIVE ENGINE	7	70	RANDOM WAYPOINT	PRESENT	200	14
12	MFNN COGNITIVE ENGINE	7	70	RANDOM WAYPOINT	ABSENT	200	7
13	DNN-DT COGNITIVE ENGINE	3	30	RANDOM DIRECTIONAL	PRESENT	200	11
14	DNN-DT COGNITIVE ENGINE	3	30	RANDOM DIRECTIONAL	ABSENT	200	7
15	DNN-DT COGNITIVE ENGINE	3	30	RANDOM WAYPOINT	PRESENT	200	8
16	DNN-DT COGNITIVE ENGINE	3	30	RANDOM WAYPOINT	ABSENT	200	6
17	DNN-DT COGNITIVE ENGINE	5	50	RANDOM DIRECTIONAL	PRESENT	200	9
18	DNN-DT COGNITIVE ENGINE	5	50	RANDOM DIRECTIONAL	ABSENT	200	8
19	DNN-DT COGNITIVE ENGINE	5	50	RANDOM WAYPOINT	PRESENT	200	8
20	DNN-DT COGNITIVE ENGINE	5	50	RANDOM WAYPOINT	ABSENT	200	7
21	DNN-DT COGNITIVE ENGINE	7	70	RANDOM DIRECTIONAL	PRESENT	200	15
22	DNN-DT COGNITIVE ENGINE	7	70	RANDOM DIRECTIONAL	ABSENT	200	5
23	DNN-DT COGNITIVE ENGINE	7	70	RANDOM WAYPOINT	PRESENT	200	11
24	DNN-DT COGNITIVE ENGINE	7	70	RANDOM WAYPOINT	ABSENT	200	7

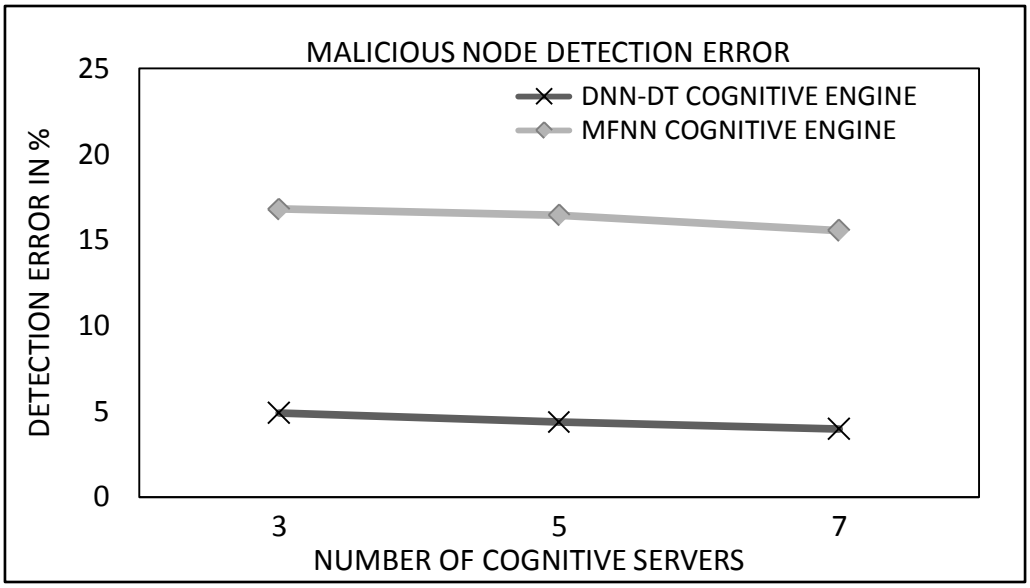

Figure 4 : Malicious Node Detection Error vs. Number of Cognitive Servers

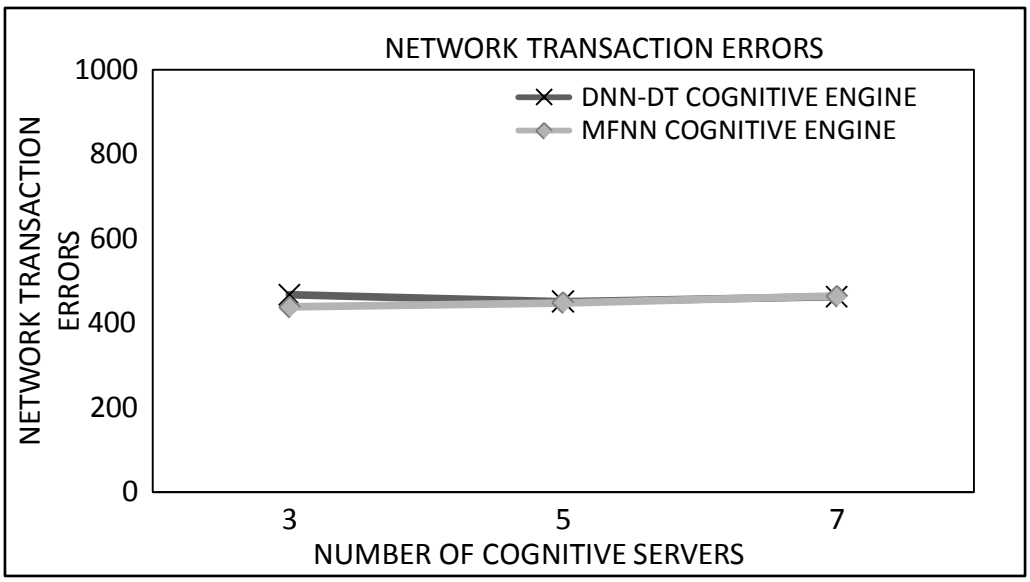

Figure 5 : Network Transaction Errors vs. Number of Cognitive Servers

It is observed that the DNN-DT cognitive engine reduces the malicious node detection error by about 25% when compared to the MFNN cognitive engine. The discrete time dynamic neural networks adapt quickly to the dynamic environments presented here. This ability of the discrete time dynamic neural network results in reduced network overheads in action planning and decision making phase of the OODA Loop. The network overheads observed are shown in Figure 6 and Figure 7 given below. The network overheads are measured in terms of the additional query transactions induced by the cognitive servers for accurate decision making. It was observed that about 12064, 19686 and 28865 transactional packets were reduced when considering the discrete time dynamic neural network to achieve cognition for the 3, 5 and 7 server scenarios. From Figure 7 it can be observed that the average reduction of about 2% was achieved considering an average of all the network transactions considered for the varied scenarios discussed in this section. Though the reduction in the average network overhead appears marginal, its significance increases for larger network scenarios.

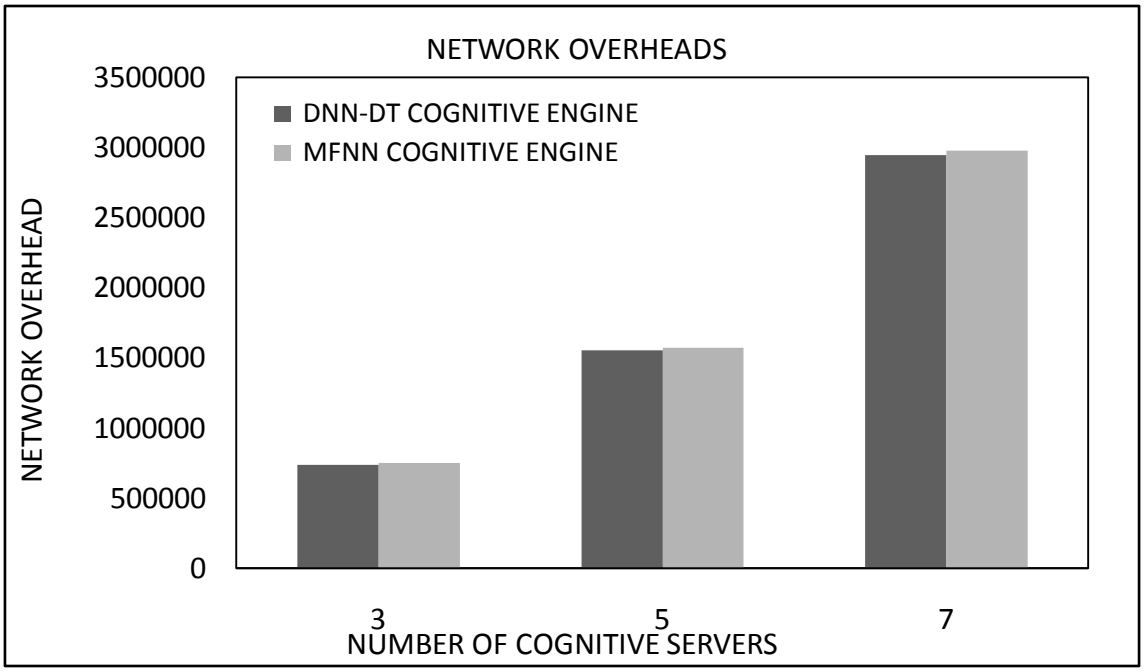

Figure 6 : Network Overheads vs. Number of Cognitive Servers

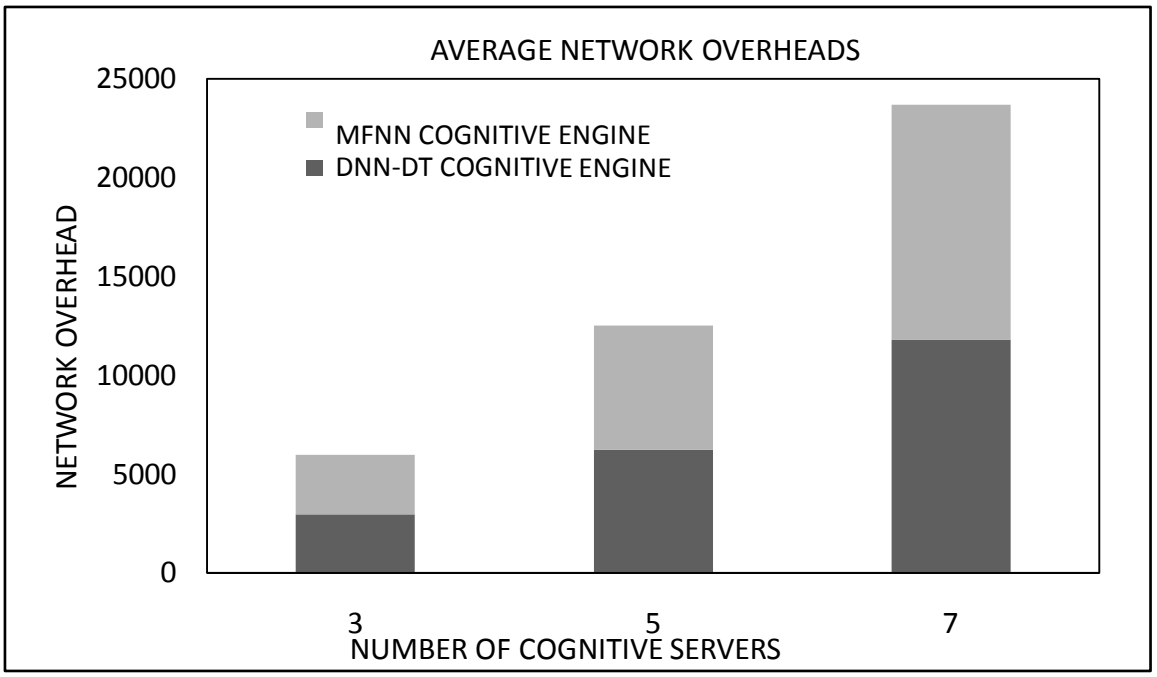

Figure 7 : Average Network Overheads vs. Number of Cognitive Servers

The receiver operating characteristic curve for 3, 5 and 7 server's scenarios have been studied and the efficiency of malicious node detection of the MFNN cognitive engine and the DNN-DT cognitive engine is shown in Figure 8. From the figure the average malicious node detection efficiency of the MFNN cognitive engine is about 0.83 when compared to 0.95 malicious node detection efficiency of the DNN-DT cognitive engine. It can also be observed that, as the number of cognitive servers increases, the detection efficiency of the cognition engine also increases.

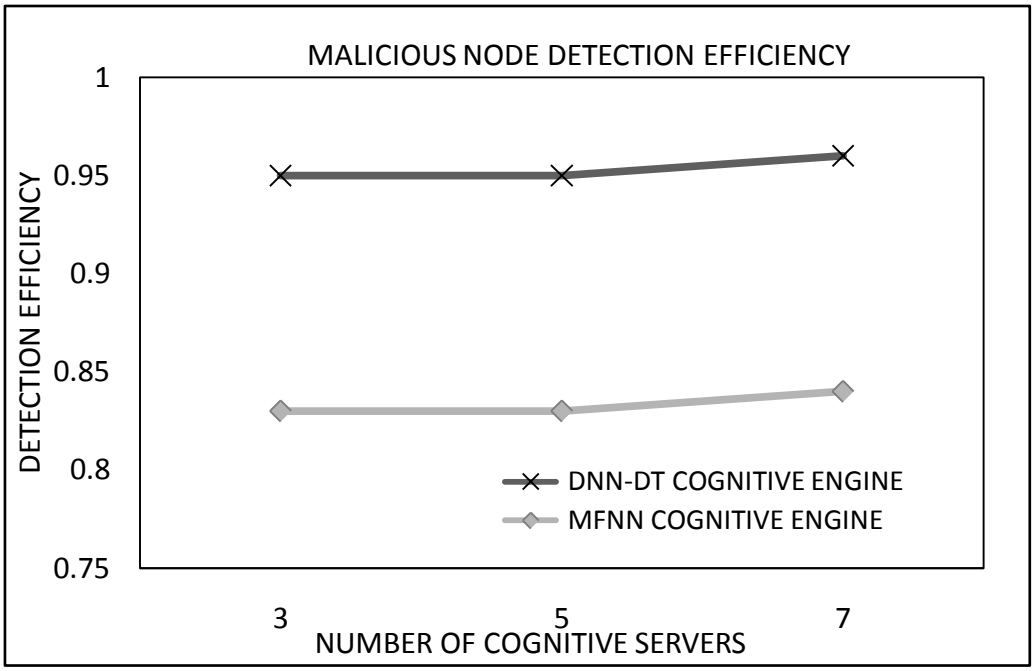

Figure 8 : Malicious Node Detection Efficiency vs. Number of Cognitive Servers

The variations in service rates $C_{ca}^{N}{}_{C_S^N}$ observed at the cognitive server C_S^N based on the network transactions enables to identify the malicious nodes $C_m^N \in C_C$. The classification accuracy of network transaction is critical to achieve higher malicious node identification. The malicious transaction classification accuracy based on the receiver operating characteristic is shown in Figure10 given below. From the figure it is clear that the malicious transaction classification accuracy of the discrete time dynamic neural networks is 12% better than MFNN cognitive engine.

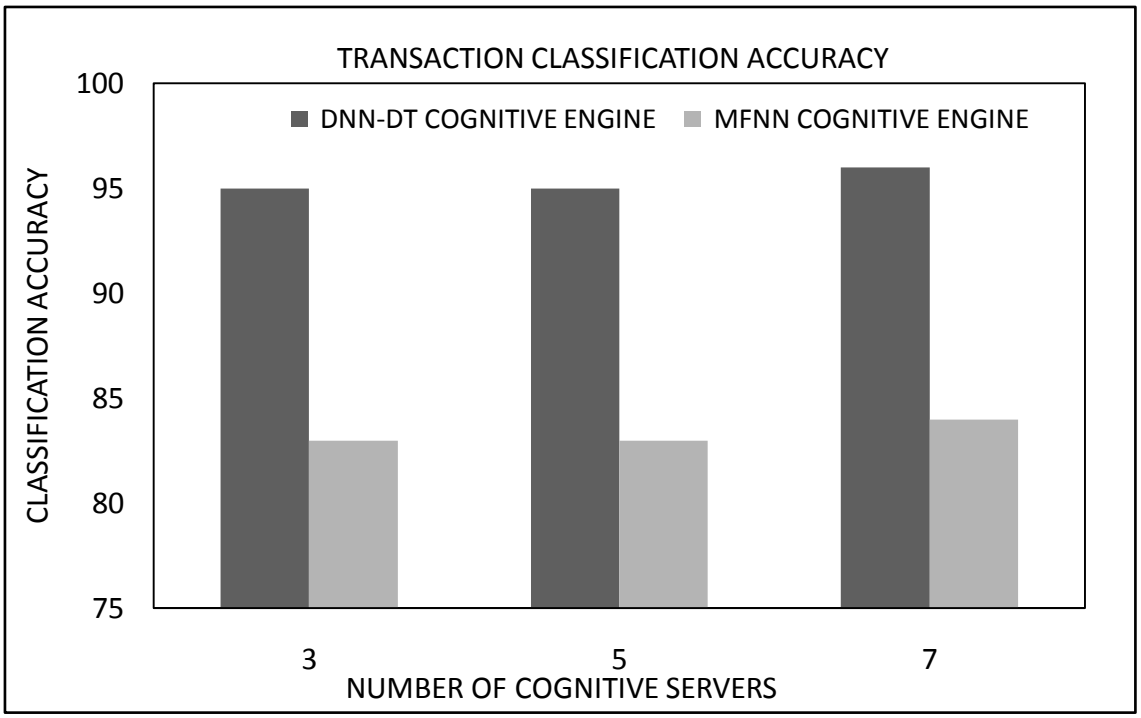

Figure 8 : Transaction Classification Accuracy vs. Number of Cognitive Servers

To study the effect of user node mobility let us consider a cognitive network constituting of seven cognitive servers. The experimental study conducted for this scenario can be summarized from the data tabulated and represented in Table 2. The effect of user mobility and channel noise on malicious user node

detection accuracy for C_S^7 is shown in Figure 10. From the figure it is clear that the channel noise inclusion reduces the malicious node detection accuracy. The DNN-DT cognitive engine achieves an average detection accuracy of about 96.02% when compared to 84.45% detection accuracy achieved by the MFNN Cognitive engine. The accuracy of malicious node detection for random directional mobility is observed to be less than that of the random waypoint mobility model by about 0.297% and 0.375% for MFNN cognitive engine and DNN-DT cognitive engine.

Table 2 : Simulation Scenarios Considering Seven Cognitive Servers (C_S^7).

Cognition Engine	No. Of Nodes	Mobility Model	Channel Noise	No. Of Malicious Nodes	Detection Error (%)
MFNN COGNITIVE ENGINE	200	RANDOM DIRECTIONAL	PRESENT	23	15.85388007
MFNN COGNITIVE ENGINE	200	RANDOM DIRECTIONAL	ABSENT	5	15.54081344
MFNN COGNITIVE ENGINE	200	RANDOM WAYPOINT	PRESENT	14	15.55681133
MFNN COGNITIVE ENGINE	200	RANDOM WAYPOINT	ABSENT	7	15.2442622
DNN-DT COGNITIVE ENGINE	200	RANDOM DIRECTIONAL	PRESENT	15	4.276987201
DNN-DT COGNITIVE ENGINE	200	RANDOM DIRECTIONAL	ABSENT	5	4.042841339
DNN-DT COGNITIVE ENGINE	200	RANDOM WAYPOINT	PRESENT	11	3.93334491
DNN-DT COGNITIVE ENGINE	200	RANDOM WAYPOINT	ABSENT	7	3.636929

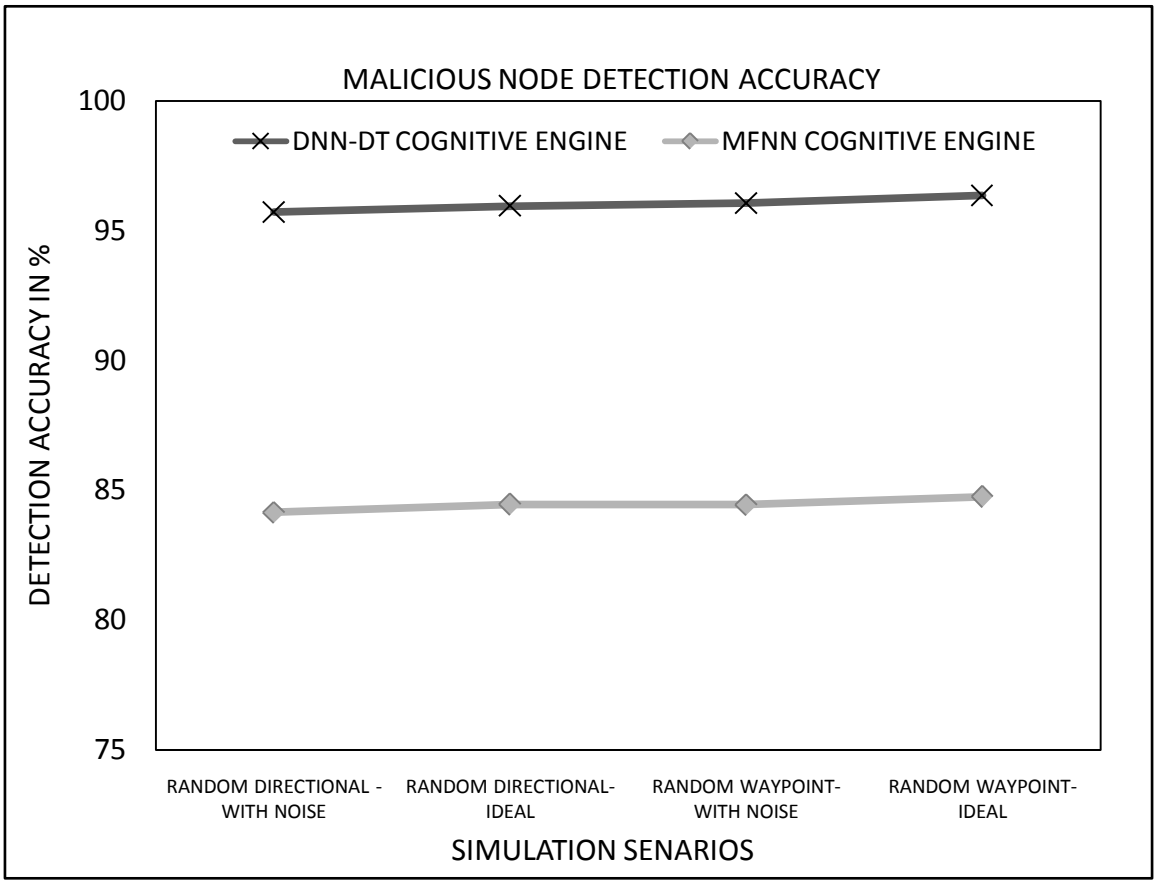

Figure 10 : Malicious Node Detection Accuracy for C_S^7

Mobility inclusion in network simulations induces an additional overhead in the network maintenance transactions. The effects of mobility on the network transactions are shown in Figure 11. The random waypoint mobility model was found to induce additional transactional overheads owing to the random node mobility it exhibits. The random directional mobility model considers the mobility of all the nodes as per a particular mobility rate and are less complicated when compared to random waypoint mobility models where in the mobility of random nodes is induced. The receiver operating characteristics curve for C_S^7 discussed here is shown in Figure 12. The area covered by the DNN-DT curve was found to be 0.9408 when compared to 0.7728 covered by the MFNN curve. The error of the curve for DNN-DT was about 2.5% against the error of about 4.7% exhibited by the MFNN curve.

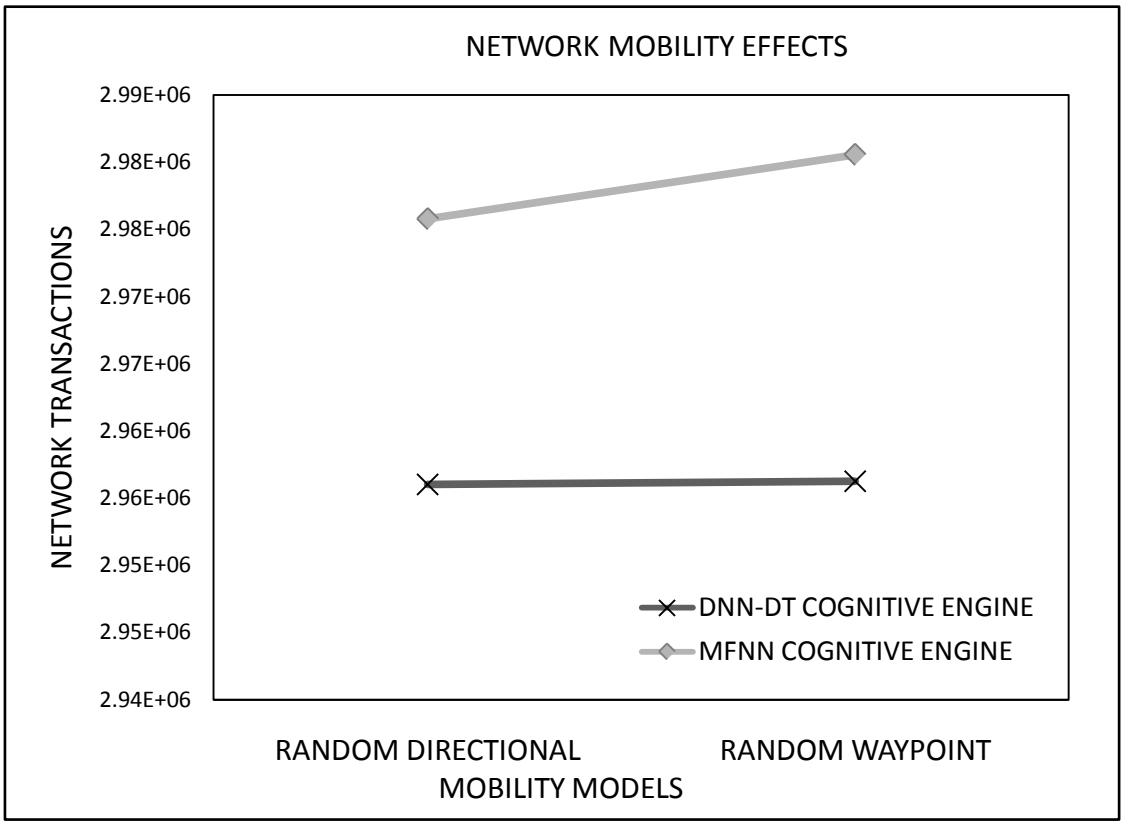

Figure 11 : Network Mobility Effects in Terms of Network Transactions Monitored

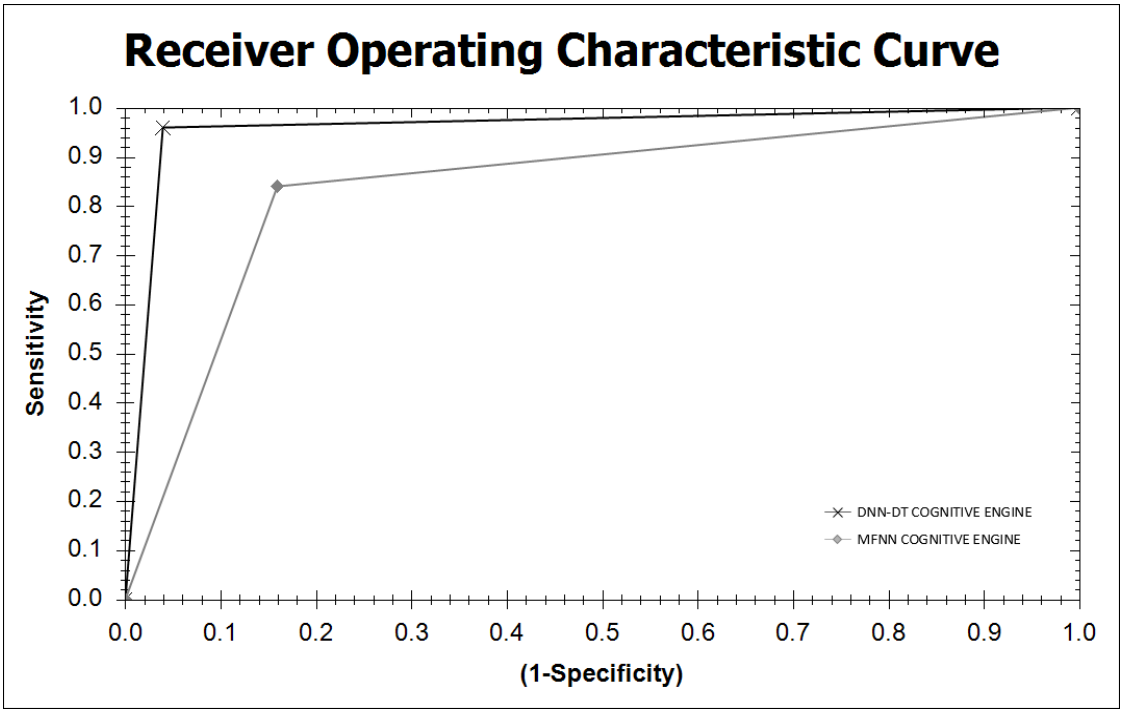

Figure 12 : Receiver Operating Characteristic Curve for C_S^7

Based on the experimental study and the analysis, it can be concluded that the proposed discrete time dynamic neural network cognition model achieves a higher accuracy of about 25% when compared to the MFNN based cognition engine.

VI. Conclusions

The issues in security provisioning to networks can be addressed by cognitive networks. This paper proposes an OODA Loop based cognitive network. The use of discrete time dynamic neural networks to incorporate intelligence in the cognition loop is considered. The purpose of the cognitive network is to identify malicious user nodes in heterogeneous network environments. The malicious node identification is achieved by monitoring the service rates of the client nodes. Service provisioning of the services hosted by the cognitive servers to the malicious nodes is disabled hence improving performance and maintaining network integrity. The proposed system exhibits 25% higher malicious node detection efficiency and 12% higher malicious transaction classification accuracy when compared to the MFNN based cognition engine. The discrete time dynamic neural network based cognitive network proposed in this paper is an effective mechanism to identity malicious nodes and negates their presence in the considered heterogeneous network.

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The Effect of E-Learning Approach on Students' Achievement in Fraction Math Course Level 5 at Yemen's Public Primary School

By Tareq Saeed Ali Thabet & Dr. N. V. Kalyankar
S.R.T.M. University, India

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Keywords: control group, e-learning, experimental group, pre-test, post-test, students' achievement, t-test.

GJCST-E Classification : J.1

Strictly as per the compliance and regulations of:

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I. Introduction

EL is the use of Information and Communication Technology e.g. Internet, Computer, Mobile phone, Learning Management System (LMS), Televisions, Radios and others to enhance teaching and learning activities. E-learning is a unifying term used to describe the fields of online learning, web-based training and technology delivered instructions (Oye, Salleh, & Iahad, 2010). EL has become an increasingly popular learning approach in higher educational institutions due to vast growth of internet technology. Nowadays E-learning has a competitive advantage and many universities have implemented it and this has impacts on students' performance or GPA. However, still there are other universities and academic institutions that use very low interactive E-learning which is not enough to contribute to the performance of the students. In contrary to that, other higher educational institutions use highly interactive E-learning which directly improves students' performance in general (Rodgers, 2008).

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Today technology is a tool used to remove geographical barriers and facilitates everybody to learn anytime and anywhere without the presence of the lecturer. The main purpose of E-Learning is to increase accessibility of education and reducing costs and time as well as improving Students' academic performance. This approach of learning facilitates different students at different continents to attend the same classes almost at the same time. Nowadays, technology is becoming the medium for teaching and learning without being at university campuses. This technology enabled instructional method is aimed to improve quality of education and student academic performance. It has been found that students in higher educational institutions that engaged in E-Learning, generally performed better than those in face-to-face courses. (Holley, 2002) found that students who participate in online/ EL achieve better grades than students who studied traditional approach. As result of this finding EL is growing very fast and become popular and that is why many higher educational institutions are adopting to virtual learning system. E- Learning is widely used in many universities in the world today. In some universities, their EL does not add any value to the teaching and learning activities of the University and perhaps they do not investigate the impact of E-learning on student academic performance. Much research has not been done on the relationship of E-learning use and student academic performance. (EL) is the use of Information and Communication Technology e.g. Internet, Computer, Mobile phone, Learning Management System (LMS), Televisions, Radios and others to enhance teaching and learning activities. E-learning is a unifying term used to describe the fields of online learning, web-based training and technology delivered instructions (Oye, Salleh, & Iahad, 2010). It is widely used in schools and other organizations all over the world, either to support classroom learning or on its own. The Yemen's public primary school (YPPS) is no exception. Usually, a special kind of Computer Aided education (CAE) content management system is used for running e- learning courses. These systems hold the fraction unit content and information of the students and also provide the interactive tools to support learning process. While using such systems makes the e- learning experience much easier, it also

induces some problems like the heterogeneous previous knowledge of the students. In many cases, this can be an obstacle, especially in such courses, where the students are from different faculties, or in adult learning situations. This is also a problem in the regular classroom education, but even more so in e-learning, where the participants can be from all over the world. The attitude of students towards e-learning or learning content management systems is also an important factor in e-learning. There have not been any major surveys in the YPPS in that regard.

According to (Bonk and Reynolds, 1997), to encourage thinking on the e-learning, challenging activities that enable learners to link new information to old, and acquire meaningful knowledge must be created; hence, it is the instructional strategy and not the technology that influences the quality of learning. Kozma (2001) argues that the particular attributes of the computer are needed to bring real-life models and simulations to the learner; thus, the medium does influence learning. However, it is not the computer per se that makes students learn, but the design of the real-life models and simulations, and the students' interaction with those models and simulations. The computer is merely the vehicle that provides the processing capability and delivers the instruction to learners (Clark, 2001). In 1997 and after the yemen authority had been established, There is a need for e-learning with the advent of the Internet, and have seen this technology in recent years, a significant development with the evolution of the network itself, and made sure the world to benefit from the application of e-learning in the development of primary and secondary education alike, and provided different countries experiences distinct in this area deserve to be studied and analyzed to draw conclusions and then build on it in the development of an integrated system of e-learning in the Republic of Yemen, commensurate with the nature of Yemeni society and capabilities available, as there is an urgent need and rationale for the Republic of Yemen, and like other countries to introduce a system of e-learning, most notably :

- *Geographical Justifications:* Is the distances between the learners and educational institutions, and the presence of isolated areas and remote geographically, which leads to the difficulty of access to students of educational institutions of formal and informal to the rugged roads or lack thereof sometimes.
- *Social and Cultural Justifications :* Is the spread of education and increase the ability to absorb the social and cultural changes and technological developments, and the trend towards education and empowerment of women, and traditional literacy and informatics.

- *Geographical Justifications:* Is the distances between the learners and educational institutions, and the presence of isolated areas and remote geographically, which leads to the difficulty of access to students of educational institutions of formal and informal to the rugged roads or lack thereof sometimes.
- *Social And Cultural Justifications:* Is the spread of education and increase the ability to absorb the social and cultural changes and technological developments, and the trend towards education and empowerment of women, and traditional literacy and informatics.
- *Economic Rationales:* Is to provide educational services to the disadvantaged segments of the poor and others in the community, on the grounds that the e-learning system less expensive, and the possibility of teaching large numbers of students at a lower cost. Justifications for psychological and health : is that e-learning offers programs that take into account individual differences among learners, and remove the psychological barrier between the learner and the teacher, as well as met the aspirations of all individuals in the education and development of feelings of delivery capacity and contribute to the growth of self and community and continuous improvement. There is almost a consensus among educators and politicians all over the world that the gap tomorrow will be between rich and poor, but between the actors in the field of e-learning and among the recipients of this act, and like any system it relates to cultural heritage and institutional need of e-learning in our country to the time is short so settles determined constants, the application of e-learning Bmnzawmth integrated in the learning environment has become an urgent requirement dictated by the need for qualitative development required for the science content of the curriculum and the most appropriate method to be presented interactively take into account the many educational standards and technical, and perform my work to learning outcomes and educational - level scientific prepares students to enter into the realm of practical life worthily and effectively. Had turned our eyes to the experiences of countries in the field of e-learning, it can realize that there is an international trend towards e-learning due to its effectiveness in improving the educational process and flexibility of the obvious being that includes multimedia and super- enrichment activities, interactive, and provides the opportunity to achieve a partnership between the teacher and the students, parents, and society as a whole, and that this international trend vary justifications and images from country to country depending on the economic and social conditions and geographic each state,

and e-learning included all phases of basic education, secondary and university and others, and that the role and efforts in the field of e-learning is not shortened to official bodies, but also extended to community-based organizations and the private, but the field of supervision remains the official bodies, in addition to engaging in e-learning needs to infrastructure is the technical aspect associated with equipment, systems, software, networks, etc., and the human side goal of rehabilitation administrators, technicians, designers and specialists, and before that the training of teachers involved in the educational process in the the use of modern techniques, all of which must be in accordance with the successive stages of each phase is based on its predecessor, and according to the plans very carefully thought out. Yemen public primary school (YPPS) in capital sana'a, established to teach by e-learning in 20 school. This course (Normal Fractions). The course includes the following subjects: 1-Review Fraction, 2- Compare and order fractions, 3- Add fractions, 4-Sub fraction, 5- Multiply fraction, 6- Dividing fractions.

Instrumentation course in YPPS many times, and I have noticed the difficulty for students to achieve good scores and to be interactive in the classroom during the lectures. As an example, some students can't imagine how the fractions operation done, because the role of math changing for them like 1/4+1/4 they thinking the result is 2/8, Add numerator to numerator and denominator to denominator, I tried to make imaging of fraction to them and show them how 1/4+1/4 = 2/4 not 2/8 do not Add denominator. For answering, to draw, to show animation. I am phd student in e-learning, I am programmer and teacher in Aden University, I make the program by use VB 6, and comtasia program (Video), I tried to solve the problem by used computer program to make learning is easy and fun, the computer-based learning to overcome these problems. All of them agree that e-learning using computer tools, internet and, interactive multimedia based on instructional computer will enhance the education process and increase the efficiency especially if designed under the control of the Instructional System Design theory.

II. The Research Problem May be Defined in the Following Questionadings

What is the effectiveness and usefulness of using e-learning approach in Fraction math course for students of level 5 in the Yemen's Public Primary school?

a) The Research Importance

This study is an important contribution to the research of understanding how to use e-learning. School is using the computer more and more to deliver instruction, and instructors and courseware designers need to have valid information on what technologies are available and how to use them to improve student learning. Students of the "computer Generation" expect and demand high quality. Decisions to purchase e-learning and multimedia software by ministry of education can be justified through this research. Software companies would gain feedback about the usefulness of their products in an educational setting. The fraction course is one of the essential program requirements for fraction. Using e-learning approach to teach this course is the first attempt to engage the YPPS. The efficiency of the suggested program will be determined. The student's attitudes toward this technology will be studied. Student's feedback will be analyzed to determine future plans concerning this type of learning. YPPS technological facilities and educational development strategies may be changed according to the research results.

b) The Research Hypothesis

i. *There are significant differences at level of α (0.05) between the mean scores of the achievement of experimental group and control in remembering skill .*
ii. There are significant differences at level of α (0.05) between the mean scores of the achievement of experimental group and control in understanding skill .
iii. There are significant differences at level of α (0.05) between the mean scores of the achievement of experimental group and control in application skill.

c) The Research Methodology

The research was carried out using the experimental methodology in which the 30 student were treated as an experimental group and 30 students as control groubs. This experimental group had studied the course of fraction instrumentation being programmed using e-learning, the control group had studied the course of fraction by traditional way.

III. Experimental Design

I have used a pretest for two group to determine if they equal in Achievement - posttest for same group to compare the Achievement. Experimental design. One experimental group and one control group with pretest-posttest. Test questions on pre- and post-tests were identical. Test answers were not revealed on the pre-test. The test questions were derived from a pool of questions bank designed by the researcher. After review of arbitrators teachers.

a) Variables Calculations and Statistical Processing Research Importance

After completing the experiment, I have collected the data to be analyzed used SPSS -18, program, two independent groups. The following relations were used in this research to measure the students' gain in achievement after studying fraction course using the e-learning approach and student studying by traditional way, to compare between them,

1. Effect size : How much change the independent variable will affect the students' achievement and attitudes in studying a new program. In this research I mean how much change the e- learning approach will affect the fraction students' achievement and attitudes in studying the fraction course. Statistically, t-value with degrees of freedom df.
2. Descriptive statistics .
3. t-test: The t-distribution is a bell-shaped, symmetric about the mean distribution, used when the sample size equal or less than 30 and the variance is normally or approximately normally distributed. It is actually a family of curves based on the concept of degrees of freedom, which is related to sample size (df = n-1). As the sample size increases, the t-distribution approaches the standard normal distribution .

IV. Results

Use In order to apply parametric tests, the data was firstly investigated for normality distribution using Kolmogorov-Smirnov statistic. In Kolmogorov- Smirnov statistic, the data is assumed to be normal if the significance level is greater than (.05). As shown in table (1), the data was confirmed to be normally distributed. Therefore the t-test was used since the sample size is small (n=30), all the population) and the data was normally distributed.

a) Two independent samples statistics of pretest 1: Remembering

To check the equivalent between experimental group and control group in achievement (remembering skill) we make pretest exam, we collected the data and make processing of two independent samples t-test was run on the SPSS-18 program to determine the equivalent between experimental group and control group, the result are shown in the table (2). It is clear from this table and table (1) that the mean in the scores is (3.0667)and (3.2333). the computer t value equal (-0.504) at the degree of freedom equal (58) with statistical significant (0.616). this is greater than the claimed level of significance α (0.05), therefore the two groups are equivalent in Achievement (Remembering) i.e. there is no significant differences at level of α (0.05) between the mean score of the Achievement (Remembering) pretest of two samples.

Table 1 : Descriptive Statistics for Achievement (Remembering) , pretest

Test	N	Mean	Std. deviation
Experimental	30	3.0667	1.38796
Control	30	3.2333	1.16511

Table 2 : Achievement (Remembering) independent two samples t-test , pretest

Achievement	T-value	df	P-value
Experimental	-0.504	58	0.616
Control			

b) Two independent samples statistics of pretest 2: Understanding

To check the equivalent between experimental group and control group in achievement (Understanding skill) we make pretest exam, we collected the data and make processing of two independent samples t-test was run on the SPSS-18 program to determine the equivalent between experimental group and control group, the result are shown in the table (4). It is clear from this table and table (3) that the mean in the scores is (3.2667) and (3.8000). the computer t value equal (-1.730) at the degree of freedom equal (58) with statistical significant (0.089). this is greater than the claimed level of significance α (0.05), therefore the two groups are equivalent in Achievement (understanding) i.e. there is no significant differences at level of α (0.05) between the mean score of the Achievement (Understanding) pretest of two samples.

Table 3 : Descriptive Statistics for Achievement (Understanding), pretest

Test	N	Mean	Std. deviation
Experimental	30	3.2667	0.98027
Control	30	3.8000	1.37465

Table 4 : Achievement (Understanding) independent two samples t-test, pretest

Achievement	T-value	df	P-value
Experimental	-1.730	58	0.089
Control			

c) Two independent samples statistics of pretest 3: Application

To check the equivalent between experimental group and control group in achievement (application skill) we make pretest exam, we collected the data and make processing of two independent samples t-test was run on the SPSS-18 program to determine the equivalent between experimental group and control group, the result are shown in the table (6). It is clear from this table and table (5) that the mean in the scores is (3.3667) and (3.3000). The computer t value equal

(0.177) at the degree of freedom equal (58) with statistical significant (0.860). This is greater than the claimed level of significance α (0.05), therefore the two groups are equivalent in Achievement (Application) i.e. there is no significant differences at level of α (0.05) between the mean score of the Achievement (application) pretest of two samples.

Table 5 : Descriptive Statistics for Achievement (Application), pretest

Test	N	Mean	Std. deviation
Experimental	30	3.3667	1.58623
Control	30	3.3000	1.31700

Table 6 : Achievement (Application) independent two samples t-test, pretest

Achievement	T-value	df	P-value
Experimental	0.177	58	0.860
Control			

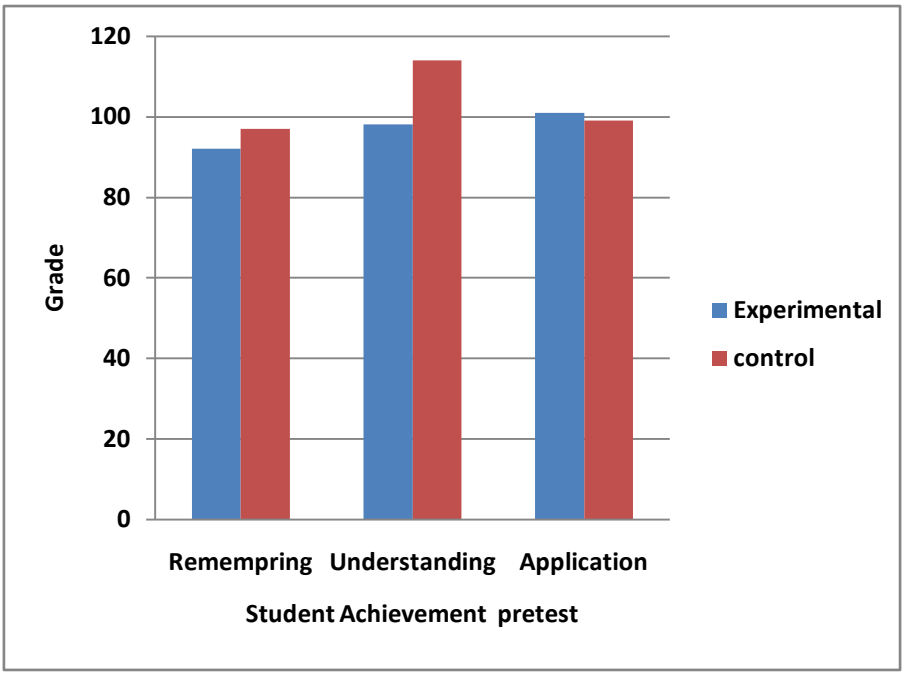

Figure 1 : Student Achievement Pretest

d) Two independent samples statistics of posttest 1: Remembering

To check the validity of the first hypothesis that stated (There are significant differences at level of α (0.05) between the mean scores of the achievement of experimental group and control in remembering skill), the two independent samples t-test was run on the SPSS-18 program to determine any significant differences between experimental group and control, the result are shown in the table (8). It is clear from this table and table (7) that the mean in the scores is (5.2667) and (4.2667). The computer t value equal (3.015) at the degree of freedom equal (57.899) with statistical significant (0.004). this is less than the claimed level of significance α (0.05), therefore the hypothesis is Accepted and the alternative hypothesis is rejected i.e. there is significant differences at level of α (0.05) between the mean score of the Achievement (Remembering) posttest of two samples Favoring the experimental group.

Table 7 : Descriptive Statistics for Achievement (Remembering), posttest.

Test	N	Mean	Std. deviation
Experimental	30	5.2667	1.58623
Control	30	4.2667	1.31700

Table 8 : Achievement (Remembering) independent two samples t-test, posttest.

Achievement	T-value	df	P-value
Experimental	3.015	57.899	0.004
Control			

e) Two independent samples statistics of posttest 2: Understanding

To check the validity of the first hypothesis that stated (There are significant differences at level of α (0.05) between the mean scores of the achievement of experimental group and control in understanding skill),

the two independent samples t-test was run on the SPSS-18 program to determine any significant differences between experimental group and control, the result are shown in the table (10). It is clear from this table and table (9) that the mean in the scores is (6.9000)and (5.3667). The computer t value equal (4.319) at the degree of freedom equal (55.293) with statistical significant (0.000). this is less than the claimed level of significance α (0.05), therefore the hypothesis is Accepted and the alternative hypothesis is rejected i.e. there is significant differences at level of α (0.05) between the mean score of the Achievement (Understanding) posttest of two samples Favoring the experimental group.

Table 9 : Descriptive Statistics for Achievement (Understanding), posttest

Test	N	Mean	Std. deviation
Experimental	30	6.9000	1.21343
Control	30	5.3667	1.51960

Table 10 : Achievement (Understanding) independent two samples t-test, posttest

Achievement	T-value	df	P-value
Experimental	4.319	55.293	0.000
Control			

f) Two independent samples statistics of posttest 3: Application

To check the validity of the first hypothesis that stated (There are significant differences at level of α (0.05) between the mean scores of the achievement of experimental group and control in Application skill), the two independent samples t-test was run on the SPSS-18 program to determine any significant differences between experimental group and control, the result are shown in the table (12). It is clear from this table and table (11) that the mean in the scores is (7.4000) and (5.4667). The computer t value equal (4.709) at the degree of freedom equal (57.295) with statistical significant (0.000). This is less than the claimed level of significance α (0.05), therefore the hypothesis is Accepted and the alternative hypothesis is rejected i.e. there is significant differences at level of α (0.05) between the mean score of the Achievement (Application) posttest of two samples Favoring the experimental group.

Table 11 : Descriptive Statistics for Achievement (Application), posttest

Test	N	Mean	Std. deviation
Experimental	30	7.4000	1.49943
Control	30	5.4667	1.67607

Table 12 : Achievement (Application) independent two samples t-test, posttest

Achievement	T-value	df	P-value
Experimental	4.709	57.295	0.000
Control			

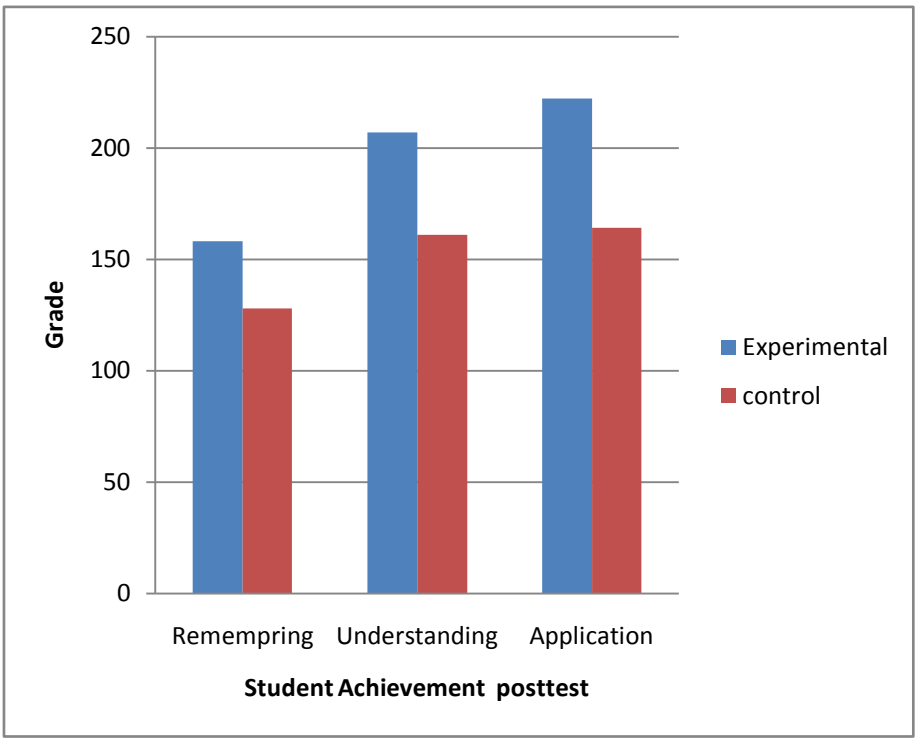

Figure 2 : Student Achievement Posttest

V. Conclusion

The goal of any learning activity is for learning to take place. A common way to measure the effectiveness of instruction is to measure learner achievement. When examining the descriptive data concerning the achievement pretest and posttest scores for experimental and control groups, it was found that there is an increase in the mean of experimental after the application of the EL of the course. Also, the standard deviation in the posttest of experimental group is reduced compared to the standard deviation in the posttest of control group which means less data variations and pointed out that the student's scores are around the mean. Therefore the first hypothesis stated that (There are significant differences at level of α (0.05) between the mean scores of the achievement (Remembering) of posttest for experimental and control groups) was Accepted. The second hypothesis stated that (There are significant differences at level of α (0.05) between the mean scores of the achievement (understanding) of posttest for experimental and control groups) was Accepted. The third hypothesis stated that (There are significant differences at level of α (0.05) between the mean scores of the achievement (Application) of posttest for experimental and control groups) was accepted.

From this discussion, it is clear that EL approach has good efficiency in learning and improves the students' achievement and attitudes toward this new systematic way of learning using the new technology based on computer and multimedia tools.

VI. Acknowledgements

After the results of the research have been lighted, the researcher would like to suggest the following points:

- Expansion in the computerization of mathematics curriculum because of its impact on student achievement.
- Work on the provision of computers in all schools with Data show.
- The need for training and rehabilitation of mathematics teachers in the use of computer.
- The need for a teacher who specializes in computer technician in addition to the computer lab in each school.
- Provide incentives and support for teachers who are doing the role of computers in the educational process.
- Hold contests on the level of the Republic of programming modules in Mathematics
- The e-learning approach should be used in our Schools,
- Execute practical sessions for students of all levels concerning use of LMS.
- Encourage instructors to practice the e-learning approach and use LMS.
- Establish an authoring unit for e-learning of different courses with different experts. acknowledgement section may be presented after the conclusion, if desired.

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Voip End-To-End Security using S/MIME and a Security Toolbox

By Md. Shahidul Islm
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Abstract- Voice Over Internet Protocol (VOIP) is a rapidlygrowing Internet service for telephone communication. However, while it offers a number of cost advantages over traditional telephone service, it can pose a security threat, especially when used over public networks. In the absence of sufficient security, users of public networks are open to threats such as identity theft, man-in-the-middle attack, interception of messages/eavesdropping, DOS attacks, interruption of service and spam. S/MIME adds security to the message itself and can be used to provide end-to-end security to SIP. S/MIME can also offer confidentiality or integrity, or both, but it does not provide any anti-replay protection. However, we propose to use a unified architecture for the implementation of security protocols in the form of a security toolbox system. It will prevent an attack against anti-replay.

Keywords: S/MIME, SIP, IPSEC, replay attack, SDP.

GJCST-E Classification : C.2.0

Strictly as per the compliance and regulations of:

Voip End-To-End Security using S/MIME and a Security Toolbox

Md. Shahidul Islm

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Keywords: S/MIME, SIP, IPSEC, replay attack, SDP.

I. Introduction

How can a client be sure that his message will not be intercepted by someone? This is the most important and urgent question that security professionals have to answer when dealing with VoIP systems.

Voice over Internet Protocol is a rapidly growing Internet service. Voice over IP (VoIP) has been developed in order to provide access to voice communication anywhere in the world. VoIP is simply the transmission of voice conversations over IP-based networks. Although IP was originally planned for data networking, now it is also commonly used for voice networking. While VoIP (Voice over Internet Protocol) offers a number of cost advantages over traditional telephoning, it can also pose a security threat. So watertight security is needed when using VoIP, end-to-end, especially when used on a public network. There is, however, no standard for VoIP and no general solution for VoIP security. The security of VoIP systems today is often non-existent or, in the best case, weak. As a result, hackers can easily hack.

II. Review

Several writers have taken on this or similar problems. Gupta and Shmatikov [1] investigated the security of the VoIP protocol stack, as well as SIP, SDP, ZRTP, MIKEY, SDES, and SRTP. Their investigation found a number of flaws and opportunity for replay attacks in SDES that could completely smash content protection. They showed that a man-in-the-middle attack was possible using ZRTP. They also found a weakness in the key derivation process used in MIKEY.

Niccolini et al. [2] designed an intrusion prevention system architecture for use with SIP. They evaluated the effectiveness of legitimate SIP traffic in the presence of increasing volumes of malformed SIP INVITE messages in an attack scenario.

Fessi et al. [3] proposed extensions to P2P SIP and developed a signaling protocol for P2P SIP that uses two different Kademlia-based overlay networks for storing information and forwarding traffic. Their system requires a centralised authentication server, which provides verifiable identities at the application/SIP layer.

Palmieri and Fiore [4] describe an adaptation of SIP to provide end-to-end security using digital signatures and efficient encryption mechanisms. The authors developed a prototype implementation and conducted a performance analysis of their scheme. However, one weakness of this system is that it is open to man-in-the-middle attacks.

Syed Abdul and Mueed Mohd Salman [5] developed Android driven security in SIP based VoIP systems using ZRTP on GPRS network. It communicated securely, using the GPRS data channel encrypted by using ZRTP technique. As it relies on ZRTP, it is probably vulnerable to man-in-the-middle attacks too.

Chirag Thaker, Nirali Soni and Pratik Patel [6] developed a new Performance Analysis and Security Provisions for VoIP Servers. This paper provided a performance analysis of VoIP-based servers providing services like IPPBX, IVR, Voice-Mail, MOH, Video Call and also considered the security provisions for securing VoIP servers.

III. Related Work

This paper considers a different solution, presenting a structure to assure end-to-end security by using the key management protocol S/MIME with the security toolbox system. S/MIME (Secure/Multipurpose Internet Mail Extensions) is a standard for public key encryption and signing of MIME data. S/MIME provides end-to-end integrity, confidentiality protection and does not require the intermediate proxies to be trusted. However, S/MIME does not provide any anti-replay protection. To protect against a replay attack, we use

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the security toolbox system. Toolbox system is a protocol as a single package comprised of two layers: control and a library of algorithms.

IV. Parameters' of a Solution

SIP is an application-layer protocol standardized by the Internet Engineering Task Force (IETF), and is designed to support the setup of bidirectional communication sessions for VoIP calls. The main SIP entities are endpoints (softphones or physical devices), a proxy server, a registrar, a redirect server, and a location server.

However, TLS (Transport Layer Security) can be used to introduce integrity and confidentiality to SIP between two points. Although it uses SIP signaling to secure, it has some limitations. Each proxy needs the SIP header in clear text to be able to route the message properly. All proxies in use in a connection must be trusted, as messages are decrypted and encrypted in each node. There will be no assurance that an SIP message cannot be intercepted by someone in the network.

IPSec can also be used to provide confidentiality, integrity, data origin authentication and even replay protection to SIP. It cannot be used in end-to end security. Proxy servers need to read from SIP headers and sometimes write to them. It can be used in protecting data flows between a pair of hosts (host-to-host), between a pair of security gateways (network-to-network), or between a security gateway and a host (network-to-host). IPSec assumes, however, that a pre-established trust relationship has been introduced between the communicating parties, making it most suited for SIP hosts in a VPN scenario. Further, the SIP specification does not describe how IPSec should be used; neither does it describe how key management should be operated.

S/MIME is a set of specifications for securing electronic mail and can also be used to secure other applications such as SIP. S/MIME provides security services such as authentication, non-repudiation of origin, message integrity, and message privacy. Other security services include signed receipts, security labels, secure mailing lists, and an extended method of identifying the signer's certificate(s) etc.

S/MIME provides open, interoperable protocols that allow compliant software to exchange messages that are protected with digital signatures and encryption. S/MIME requires that each sender and recipient have an X.509-format digital certificate, so public-key infrastructure (PKI) design and deployment is a major part of S/MIME deployment.

The same mechanisms can be applied for SIP. The MIME security mechanism is referred to as S/MIME and is specified in RFC 2633. S/MIME adds security to the message itself and can be used to provide end-to-end security to SIP.

Suppose two clients are trying to communicate each other. One client wants to send a message to the other client.

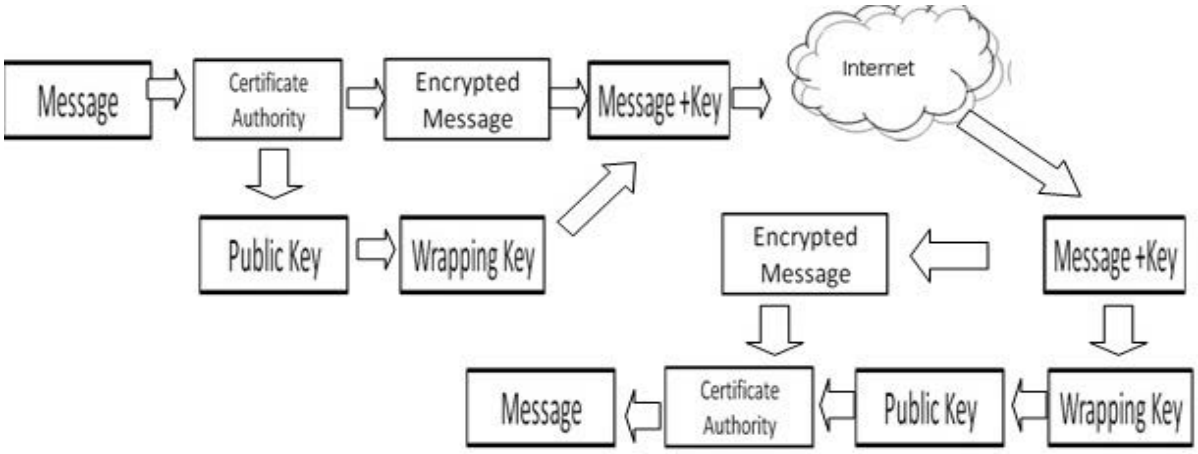

Figure 2 : End-to-end security

Figure 1 shows how to send the message in secure way. Before S/MIME can be used to encrypt the message, one needs to obtain a key/certificate, either from one's in-house certificate authority (CA) or from a public CA.

The client uses S/MIME to sign and/or encrypt a SIP message. S/MIME combines public-key and secret-key cryptography. To encrypt the message, the sender obtains certificates from the certificate authority (CA) and generates a strong, random secret key. The message is then signed with the private key of the sender.

The encryption of the message is a bit trickier. It requires that the public key of the recipient is known to the sender. This key must be fetched in advance or be fetched from some kind of central repository. The secret key is used to encrypt the message, and then the public key of the recipient is used to encrypt the key for the

recipient. When the recipient gets the message, he uses the private key to decrypt his copy of the secret key, and the secret key is used to decrypt the original message.

V. The Security Risk

S/MIME does not provide any anti-replay protection. The most serious attack is a replay attack on SDES, which causes SRTP to repeat the key stream used for media encryption, thus completely breaking transport-layer security. To protect against a replay attack, we use the security toolbox. How to use it to prevent an attack on SRTP, when used in combination with an SDES key exchange, is described below.

Suppose two users, Alice and Bob are trying to communicate with each other. Bob is the initiator in this session, and SDES is used to transport SRTP key material. To provide confidentiality for the SDES message, S/MIME is used to encrypt the payload.

S/MIME does not provide any anti-replay protection. Suppose an attacker, Charles, is trying to attack the call. Charles sends the copy of Bob's original INVITE message to Alice, containing an S/MIME-encrypted SDP attachment, with the SDES key transfer message. Since Alice does not maintain any state for SDP, she will not be able to detect the replay. Charles will effectively, for Alice, become Bob!

This is why it is proposed to use security toolbox: to prevent such a personation attack. Since anti-replay tools will be maintained all states for SDP, at all times, all messages will be filtered through anti-replay tools. Anti-replay tools will be able to detect the replay. S/MIME provides the security at the document level and IPSec performs the same function at the packet level. This configuration should become common whenever an application uses S/MIME as a document-level protection.

VI. A Security Toolbox

Ibrahim S. Abdullah and Daniel A. Menasce [9] designed a security toolbox. In the toolbox, every tool carries out a specific function such as: encryption, decryption, random number generation, integrity protection, anti-replay, and header processing.

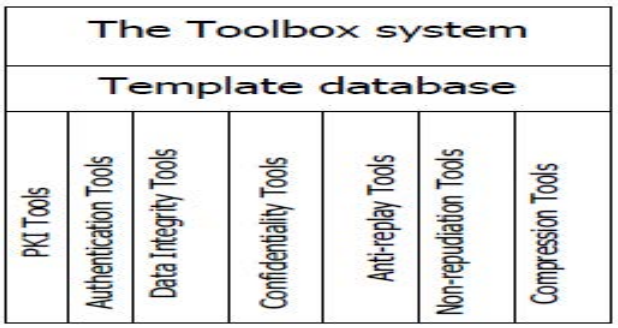

Figure 2 : Components of A Toolbox System

Figure 2 shows the major components of such a toolbox. The template is a set of specifications that define the required security services. The template database takes the necessary steps from the database for overall protection.

The toolbox architecture consists of two parts: one that must be secured as part of the trusted domain of the operating system (CBT) and another that may be part of the user domain.

The secure part consists of the following components:

1. Databases: store information about different operations of the toolbox, such as: private and secret keys, templates, registry for the tools and template names, alert messages, authorization information, policies, and the toolbox configuration information.
2. Interpretation engine: interprets protocol templates.
3. Security tools: the set of tools that implement the security algorithms.
4. Cache: stores temporary keys and associated information.
5. Inter-communication manager: handles control messages between toolboxes running at different hosts (e.g., during handshake).

The second part of the toolbox consists of:

a) Template developer and analyser: analyses template creation, verification, and maintenance.
b) Certificate repository: contains copies of the certificates that the toolbox consults for authentication. These certificates may be placed in public storage, because they are protected by their creator's digital signature. This repository could part of a directory service application.
c) Directory services are standard applications used to provide user's authentication and authorization services.

Now let us revisit our friends Alice and Bob with a security toolbox. Recall that Bob accepts Alice's INVITE message. They communicate but then Charles sends replay messages to Alice, pretending to be Bob. Now the security toolbox takes action. First, the toolbox, working with IPSec, has full identification of Bob: especially including his IP Packets. When Charles starts to copy Bob's messages and send them as if he were Bob, the toolbox sees that Charles' IP Packet is not the same as Bob's. Therefore, Charles is recognized as a personator and his packets are denied access to Alice. Charles' scheme fails and he goes away with nothing. Alice and Bob continue to communicate happily without any interference from hackers like Charles.

VII. Conclusion

S/MIME is being increasingly used as at security system for VoIP messages. However, S/MIME has an Achilles heel. The Achilles heel is the replay

attack. This happens because S/MIME does not identify the source of the messages coming into the system. This article suggests a solution to this problem by combining the S/MIME with a security toolbox, using IPSec to monitor IP packet. The toolbox monitors the IP packet of message originators and, where a new IP address enters from the same source, denies access to the message. Such a solution guarantees complete end-to-end user security for VoIP messages at minimal cost. Thus S/MIME, with this solution, maximizes effectiveness, given the technology of the moment, in protecting the user.

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Survey on Techniques for Ontology Interoperability in Semantic Web

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Abstract- Ontology is a shared conceptualization of knowledge representation of particular domain. These are used for the enhancement of semantic information explicitly. It is considered as a key element in semantic web development. Creation of global web data sources is impossible because of the dynamic nature of the web. Ontology Interoperability provides the reusability of ontologies. Different domain experts and ontology engineers create different ontologies for the same or similar domain depending on their data modeling requirements. These cause ontology heterogeneity and inconsistency problems. For more better and precise results ontology mapping is the solution. As their use has increased, providing means of resolving semantic differences has also become very important. Papers on ontology interoperability report the results on different frameworks and this makes their comparison almost impossible. Therefore, the main focus of this paper will be on providing some basics of ontology interoperability and briefly introducing its different approaches. In this paper we survey the approaches that have been proposed for providing interoperability among domain ontologies and its related techniques and tools.

Keywords: ontology mapping; ontology alignment; ontology merging; semantic heterogeneity; semantic web.

GJCST-E Classification : I.2.4

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Survey on Techniques for Ontology Interoperability in Semantic Web

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Abstract- Ontology is a shared conceptualization of knowledge representation of particular domain. These are used for the enhancement of semantic information explicitly. It is considered as a key element in semantic web development. Creation of global web data sources is impossible because of the dynamic nature of the web. Ontology Interoperability provides the reusability of ontologies. Different domain experts and ontology engineers create different ontologies for the same or similar domain depending on their data modeling requirements. These cause ontology heterogeneity and inconsistency problems. For more better and precise results ontology mapping is the solution. As their use has increased, providing means of resolving semantic differences has also become very important. Papers on ontology interoperability report the results on different frameworks and this makes their comparison almost impossible. Therefore, the main focus of this paper will be on providing some basics of ontology interoperability and briefly introducing its different approaches. In this paper we survey the approaches that have been proposed for providing interoperability among domain ontologies and its related techniques and tools.

Keyterms: ontology mapping; ontology alignment; ontology merging; semantic heterogeneity; semantic web.

I. Introduction

The WWW has become a vast resource of information. It is growing rapidly from last few decades. The problem is that finding the information, and the individual desires are often quite difficult, because of complexity in organization and quantity of the information stored. In traditional search engines, Information Retrieval (IR) is keyword based or with a natural language. Query entered by the users is not understandable, so it retrieves the large number of documents in the ranked order which have poor semantic relationships among the documents. This keyword based approach results poor precision - List of retrieved documents contain a high percentage of irrelevant documents, and poor recall- List of relevant retrieved among possible relevant. To avoid the above problems semantic search engines are required.

Ontology is used to model knowledge representation of a particular domain (E-learning, sports, medical, etc). Ontologies are explicit specifications of the conceptualization and corresponding vocabulary and (Gruber 1993). Ontology is the fundamental factor for semantic web. We can perform different techniques for ontology reusability called ontology interoperability techniques. Different interoperability techniques like Transformation & translation, merging, Integration, Alignment, mapping have their own significance.

Translation and transformation are the basic operations on ontology. Ontology alignment process takes two or more input ontologies and produces a set of relationships between concepts that match semantically with each other. These matches are also called mappings. Ontology merging, as its name implies merges two ontologies of same or similar domain in to one based on semantic similarity of concepts and produces unique ontology. Ontology integration is the one which creates new ontology by merging two different domains.

Ontology mapping is one of the interoperability techniques to avoid heterogeneity and inconsistency problems caused by ontology engineers of similar or same domain. Ontology mapping operation interprets the sets of correspondences between similar concepts and among two or more ontologies of same or similar domains. This is prominent research area in the field of AI (Artificial Intelligence). These mappings support two other related operations ontology alignment and ontology merging.

Three important mismatches may exist between ontologies syntactic, semantic and lexical mismatches. Our recent researchers developed several methods and techniques to identify these mismatches.

The rest of the paper organized as follows. Section II discusses about different types of ontology interoperability, Section III discusses about types of ontology mapping. Section IV discusses about challenges in ontology mapping. Section V discusses about types of mismatches. Section VI discusses about tools and techniques used for ontology interoperability.

II. Ontology Interoperability

This section describes several operations on ontologies like Transformation and translation, merging, mapping, Integration. These can be considered as an ontology reuse process. [16, 21]

a) Ontology Transformation and Translation

Ontology Transformation [2, 4] is the process used to develop a new ontology to cope with new

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requirements made by an existing one for a new purpose, by using a transformation function't'. Many changes are possible in this operation, including changes in the semantics of the ontology and changes in the representation formalism. Ontology Translation is the function of translating the representation formalism of ontology while keeping the same semantic. In other words, it is the process of change or modification of the structure of ontology in order to make it suitable for purposes other than the original one. There are two types of translation. The first is translation from one formal language to another, for example from RDFS to OWL, called syntactic translation. The second is translation of vocabularies, called semantic translation [2]. The translation problem arises when two Web-based agents attempt to exchange information, describing it using different ontologies.

b) Ontology Merging

Ontology merging [17, 6, 4] is the process of creating a new single coherent ontology from two or more existing source ontologies related to the same domain. The new ontology will replace the source ontologies.

c) Ontology Integration

Integration [17, 6] is the process of creating a new ontology from two or more source ontologies from different domains.

d) Ontology Alignment

Ontology alignment [20,7, 15,30] is the process or method of creating a consistent and coherent link between two or more ontologies by bringing them into mutual agreement. This method is near to artificial intelligence methods: being a logical relation, ontology alignments are used to clearly describe how the concepts in the different ontologies are logically related. This means that additional axioms describe the relationship between the concepts in different ontologies without changing the meaning in the original ontologies. In fact the ontology alignment uses as a pre process for ontology merging and ontology integration. There are many different definitions for ontology alignment depending upon its applications and its intended outcome.

Sample definitions include the following :-

- Ontology alignment is used to establish correspondences among the source ontologies, and to determine the set of overlapping concepts, concepts that are similar in meaning but have different names or structure, and concepts that are unique to each of the sources [4].
- Ontology alignment is the process of bringing two or more ontologies into mutual agreement, making them consistent and coherent.
- Given two ontologies O1 and O2, mapping of one ontology in to another means that each entity (concept c, relation R, Instance I) in ontology is trying to find a corresponding entity which has the same intended meaning in ontology O2.

Formally, an ontology alignment function is defined as follows:

- An ontology alignment function, align based on the set E of all entities e € E and based on the set of possible ontologies O, is a partial function.

Align: O1 ^ O2

Align (eO1) = fO2
if Sim (eO1, fO2) > threshold. Where Oi: ontology, eOi, fOj: entities of (Oi, Oj,)
Sim (eO1, fO2): Similarities function between two entities eO1 and fO2.

The ontology alignment function is based on different similarity measures.
A similarity measure is a real valued function Sim(ei, fj): OxO ^ [0, 1] measuring the degree of similarity between x and y.

Ontology heterogeneity is shown in Fig 1.

e) Ontology Mapping

Ontology mapping [30, 12, 2, 14, 28] is a formal expression or process that defines the semantic relationships between entities from different ontologies. In other words, it is an important operator in many ontology application domains, such as the Semantic Web and e-commerce, which are used to describe how to connect and from correspondences between entities across different ontologies. Ontology matching is the process of discovering similarities between two ontologies. An entity 'e' is understood in an ontology O denoted by elO is concept C, relation R, or instance I, i.e. elO € C U R U I. Mapping the two ontologies, O1 onto O2, means that each entity in ontology O1 is trying to find a corresponding entity which has the same intended meaning in ontology O2.

The Ontology mapping function "map" is defined based on the vocabulary, E, of all terms e € E and based on the set of possible ontologies, O as a partial function: map: E x O x O ^E, with e € O1(3 f €O2 : map(e,O1,O2) = f v map(e,O1,O2) = ^).
An entity is mapped to another entity or none.

III. Types of Ontology Mapping

Based on the method of ontology mapping and how ontologies are created and maintained, it is divided in to three categories.

a) Ontology mapping between an integrated global ontology and local ontologies.[5,23]

In this case, ontology mapping is used to map a concept of one ontology into a view, or a query over other ontologies.

b) Ontology mapping between local ontologies [19]

In this case, ontology mapping is the process that transforms the source ontology entities into the target ontology entities based on semantic relation. The source and target are semantically related at a conceptual level.

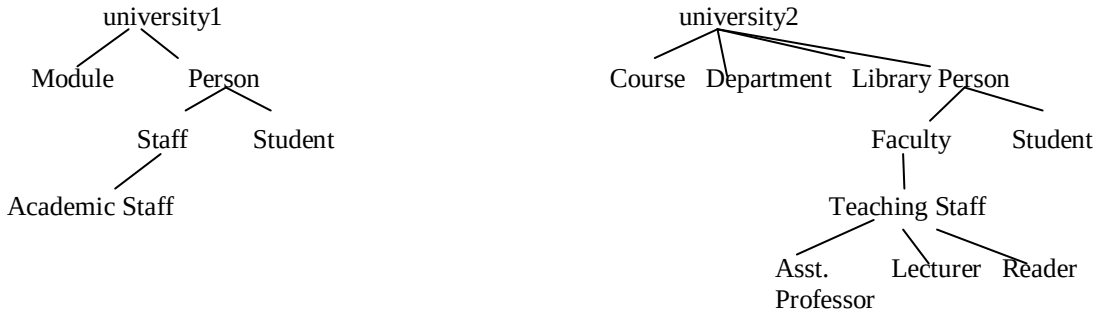

Figure 1 : Ontology heterogeneity among ontologies of same domain

c) Ontology mapping in ontology merge and alignment[4]

In this case, ontology mapping establishes correspondence among source (local) ontologies to be merged or aligned, and determines the set of overlapping concepts, synonyms, or unique concepts to that sources [4]. This mapping identifies similarities and conflicts between the various source (local) ontologies to be merged or aligned.

IV. Challenges of Ontology Mapping

In this section, we discuss challenges of ontology mapping

1. Large-scale evaluation
2. Performance of ontology-matching techniques
3. Discovering missing background knowledge
4. Uncertainty in ontology matching
5. Matcher selection and self-configuration
6. User involvement
7. Explanation of matching results
8. Social and collaborative ontology matching
9. Alignment management: infrastructure and support
10. Reasoning with alignments

V. Types of Mismatches

Different types of mismatches may occur between different ontologies. Indeed different ontology designers opt for different representation languages and use different ontology editors to represent knowledge at different levels of granularity (detail). This explains the emergence of different forms of ontology mismatches. The identification of these types of mismatches is essential in order to solve them during the mapping, alignment or merging process.

a) Syntactic mismatches

Two ontologies are syntactically heterogeneous if they are represented by different representation languages, such as OWL, KIF etc. To resolve this type of mismatches, simply transform the representation language of one ontology to the representation language of the other ontology. Herein, we state that sometimes the translation is difficult and even impossible.

b) Lexical mismatches

Describe the heterogeneities among the names of entities, instances, properties, or relations. In this type of mismatches, we may find four forms of heterogeneities: Synonyms, Homonyms, Same name in different languages, and same entities with the same name but with different syntactic variations.

c) Semantic mismatches

These kind of mismatches describe words belong to same synonym set. For example, ontology A has price and ontology B has cost. Then both are said to be semantically equivalent or match, otherwise it is a mismatched pair.

VI. Tools and Techniques for Ontology Mapping

LSD [15] (Learning Source Description): LSD semi automatically creates semantic mappings with a multi strategy learning approach. This approach employs multiple learner modules with base learners and the meta-learner where each module exploits a different type of information in the source schemas or data. LSD uses the following base learners: 1) The Name Learner: it matches an XML element using its tag name, 2) The Content Learner: it matches an XML element using its data value and works well on textual elements, 3) Naive Bayes Learner: it examines the data value of the instance, and doesn't work for short or numeric fields, and 4) The XML Learner: it handles the hierarchical structure of input instances. Multi-strategy learning has two phases: training and matching. In the training phase, a small set of data sources has been manually mapped to the mediated schema and is

utilized to train the base learners and the Meta learner. In the matching phase, the trained learners predict mappings for new sources and match the schema of the new input source to the mediated schema. MOMIS [23] (Mediator Environment for Multiple Information Sources): MOMIS creates a global virtual view (GVV) of information sources, independent of their location or their data's heterogeneity. MOMIS builds an ontology through five phases as follows:

1. Extraction of local schema
2. Local source annotation using Word Net (online dictionary)
3. Common thesaurus generation: relationships of inter schema and intra-schema knowledge about classes and attributes of the source schemas
4. Generation of GVV: A global schema and mappings between the global attributes of the global schema and source schema are generated.
5. GVV annotation is generated by exploiting annotated local schemas and mappings between local schemas and a global schema.

A Framework for OIS [24] (Ontology Integration System): Mappings between an integrated global ontology and local ontologies are expressed as queries and ontology as Description Logic. Two approaches for mappings are proposed as follows: 1) concepts of the global ontology are mapped into queries over the local ontologies (global-centric approach), and 2) concepts of the local ontologies are mapped to queries over the global ontology (local centric approach).

GLUE [18]:

It semi-automatically creates ontology mapping using machine learning techniques. It consists of Distribution Estimator, Similarity Estimator, and Relaxation Labeler. It finds the most similar concepts between two ontologies and by using a multi-strategy learning approach calculates the joint probability distribution of the concept for similarity measurement. It has Content Learner, Name Learner, and Meta Learner. Content and Name Learners are two base learners, while Meta Learner combines the two base learners' prediction. The Content Learner exploits the frequencies of words in content of an instance and uses the Naive Bayes' theorem. The Name Learner uses the full name of the input instance. The Meta-Learner combines the predictions of base learners and assigns weights to base learners based on how much it trusts that learner's predictions.

ONION [25] (ONtology compositION system):

It resolves terminological heterogeneity in ontologies and produces articulation rules for mappings. The linguistic matcher identifies all possible pairs of terms in ontologies and assigns a similarity score to each pair. If the similarity score is above the threshold, then the match is accepted and an articulation rule is generated. After the matches generated by a linguistic matcher are available, a structure-based matcher looks for further matches. An inference-based matcher generates matches based on rules available with ontologies or any seed rules provided by experts. Multiple iterations are required for generating semantic matches between ontologies. A human expert chooses, deletes, or modifies suggested matches using a GUI tool.

LOM [22] (Lexicon-based Ontology Mapping):

LOM finds the morphism between vocabularies in order to reduce human labor in ontology mapping using four methods: whole term, word constituent, synset, and type matching. LOM does not guarantee accuracy or correctness in mappings and has limitations in dealing with abstract symbols or codes in chemistry, mathematics, or medicine.

QOM [11] (Quick Ontology Mapping):

QOM is an efficient method for identifying mappings between two ontologies because it has lower run-time complexity. In order to lower run-time complexity, light weight ontologies QOM uses a dynamic programming approach. A dynamic programming approach has data structures which investigate the candidate mappings, classify the candidate mappings into promising and less promising pairs, and discard some of them entirely to gain efficiency. It allows for the ad-hoc mapping of large size, light-weight ontologies.

PROMPT [25]:

PROMPT is a semi-automatic ontology merging and alignment tool. It begins with the linguistic- similarity matches for the initial comparison, but generates a list of suggestions for the user based on linguistic and structural knowledge and then points the user to possible effects of these changes.

Onto Morph [13]:

Onto Morph provides a powerful rule language for specifying mappings, and facilitates ontology merging and the rapid generation of knowledge-base translators. It combines two powerful mechanisms for knowledge-base transformations such as syntactic rewriting and semantic rewriting. Syntactic rewriting is done through pattern-directed rewrite rules for sentence-level transformation based on pattern matching. Semantic rewriting is done through semantic models and logical inference.

Anchor-PROMPT [19]:

Anchor-PROMPT takes a set of anchors (pairs of related terms) from the source ontologies and traverses the paths between the anchors in the source ontologies. It compares the terms along these paths to identify similar terms and generates a set of new pairs of semantically similar terms.

CMS [8] (CROSI Mapping System):

CMS is an ontology alignment system. It is a structure matching system on the rich semantics of the OWL constructs. Its modular architecture allows the system to consult external linguistic resources and consists of feature generation, feature selection, multi-strategy similarity aggregator, and similarity evaluator.

FCA-Merge [9]:

FCA-Merge is a method for ontology merging based on Ganter and Wille's formal concept analysis [28], lattice exploration, and instances of ontologies to be merged. The overall process of ontology merging consists of three steps: 1) instance extraction and generation of the formal context for each ontology, 2) the computation of the pruned concept lattice by algorithm TITANIC29, and 3) the nonautomatic generation of the merged ontology with human interaction based on the concept lattice.

CHIMAERA [26]:

CHIMAERA is an interactive ontology merging tool based on the Ontolingual ontology editor. It makes users affect merging process at any point during merge process, analyzes ontologies to be merged, and if linguistic matches are found, the merge is processed automatically, otherwise, further action can be made by the user. It uses subclass and super class relationship.

ConcepTool [1]:

This is an interactive and analysis tool that aims to facilitate knowledge sharing. It supports ontology alignment process where the ontologies are represented in Entity Relationship model resulting from reasoning based on description logic. ConcepTool is based on heuristic and linguistic inferences to compare attributes of two entities belonging to the input ontologies. The analyst is then charged of identifying relevant information to resolve conflicts between overlapping entities. Overlapping entities are related to each other through semantic bridges. Each bridge provides a semantic transformation rule to solve the semantic mismatches between these entities. Summarizing, ConcepTool begins by analyzing the input models to derive taxonomic links and overlapping entities. Then, the analyst matches the common entities. The articulation ontology entities are automatically generated and the analyst defines mappings between the attributes of the matched entities. Finally, the articulation ontology is analyzed.

VII. Conclusion

The ontology Interoperability is a prominent issue in many application domains such as semantic query processing, data integration, data-warehousing, E-Commerce and E-Business. Issues of heterogeneity and inconsistency among the ontologies of same or similar domains will be resolved using ontology mapping. Definitions of ontology matching, ontology merging, ontology Integration are given. We have presented a general framework situating ontology Mapping. Kinds of ontology mapping are proposed. Ten challenges which we face while mapping ontologies are presented. We have located three forms of mismatches that are usually studied in these processes, namely, lexical, syntactic and semantic mismatches.

Because of the wide usage of ontology Interoperability techniques there is a need to consolidate different techniques and tools have been proposed to handle ontology Alignment, ontology Mapping and Merging processes. In this paper, we have surveyed the literature of these techniques and described the different criteria and approaches adopted by algorithms.

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An Efficient QOS based Routing Protocols for Next Generation Network (NGN)

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GJCST-E Classification : *C.2.0*

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I. Introduction

NGN is envisioned to be an answer to network operators and service providers to replace existing telephone networks as well as to introduce a new converged service platform between fixed and mobile telecommunication businesses [1]. It is generally agreed that the main difference between traditional telecommunication networks and NGN is the shift from separate and vertically integrated application-specific networks to a single network capable of carrying any services. NGN is essentially about delivering new services that are available to any place, at any time, on any device, through any customer-chosen access mechanism. NGN is expected to co-exist and inter-work among wired networks (e.g., xDSL, Metro Ethernet, FTTH, leased lines, ISDN), wireless networks (e.g., 2G, 3G, WLAN, WiMAX/WiBro) as well as satellites and broadcasting networks, all interconnected through the service provider's IP backbone networks and the Internet.

In this heterogeneous networking environment, in addition to the traditional challenges such as security, QoS, and charging, new challenges such as generalized mobility, and network discovery and selection exist.

Providing effective, secure and efficient operations and management of the envisioned NGN environment is a huge challenge. In order to provide the creation, deployment, and management of all kinds of services, NGN operations are highly dependent on flexible and efficient management systems and processes [2]. When the networks are evolving towards NGN, the scenario to support various services would become more complex.

The carrying of diverse traffic such as voice, data, video or signaling would be possibly integrated onto one common platform, which would call for the corresponding network management systems.

The ITU-T Recommendation Y.2401 [5] presents the management requirements, general principles and architectural requirements for managing NGN to support business processes to plan, provision, install, maintain, operate and administer NGN resources and services [4].

Thus, we examine the challenges facing the management of NGN. The standards and research activities of NGN management are also presented.

a) NGN Overview

NGN is a packet-based network to support the transfer of mixed traffic types such as voice, video, and data [1]. It will integrate services offered by traditional networks and new innovative IP services into a single service platform. The key operation of the NGN is the separation of services and transport networks, which provides QoS-enabled transport technologies and service-related functions independent from underlying transport technologies [7]. The transport functions provide transfer of information between peer entities; the services functions are concerned with the applications and services to be operated between peer entities [8].

Fig. 1 shows typical NGN components: service network, core network, access network, and user equipment [8]. The service network is composed of various servers such as Web Server, Authentication, Authorization and Accounting (AAA), SIP Proxy Server and LDAP Server, etc. The service network is only responsible for providing services and applications for NGN users. The connection between the service network and the core network can be implemented via gateways.

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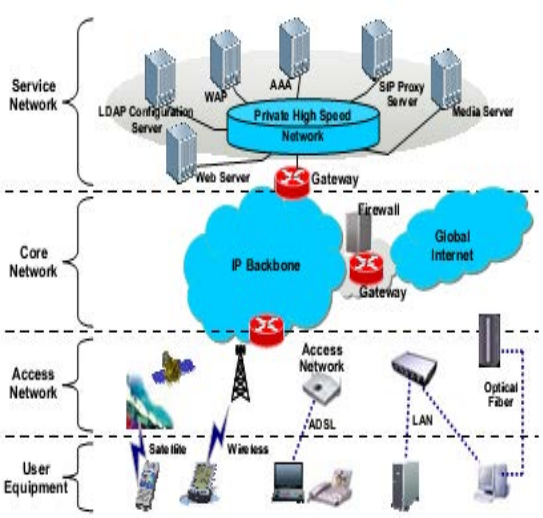

Figure 1 : NGN Network components

b) Integrated Network Platform

The core network in NGN represents the transportation backbone in traditional networks, which is concerned with the transfer of information between peer entities. Besides the transfer of packets, control and management functions are also implemented in the core network. The access network in NGN is derived from the existing access technologies. To accommodate various access media, the access network is separated from the core network of NGN, which serves as an intermediate between user equipment's and core network.

Integrated Network Platform refers to the integration of all IP capable wireless and wire line systems for the seamless delivery of Internet data services.

The goal is to allow mobile users to move transparently from wired to wireless networks or vice-versa without breaking their connection to the Internet. An office worker, connected to an Ethernet LAN, could transparently switch to a high-speed WLAN connection in order to maintain connectivity and provision of services. While moving around within the building, the node could switch transparently from one wireless subnet to another, and when leaving the building, could again switch transparently to a wide-area wireless data service such as GPRS or UMTS.

The increasing availability of wireless and wire line technologies with different properties will make the creation of an integrated network platform possible. Such integration should address following requirements:

- Enabling global mobility for users across different bearer types (integration of wireless & wire line technologies).
- Integration of Ad-hoc networks ñ Coverage extension in environments without networking infrastructure.
- Intelligent multiple interface handling ñ Filtering data streams to utilize the best interface which are based on different bearer technologies.

c) Ad-Hoc Networks

An ad-hoc network consists of a collection of mobile nodes without the required intervention of a centralized access point or existing infrastructure. The links of the network are dynamic and are based on the proximity of one node to another node. These links are likely to break and change as the nodes move across the network. Because of the temporary nature of the network links, and because of the additional constraints on mobile nodes (limited bandwidth and power), conventional routing protocols are not appropriate for ad-hoc mobile networks.

Protocols in Ad-hoc Networks

Unlike the cellular networks where base stations are essential, ad-hoc networks is backed up by communications directly between mobiles, thus the routing protocols are central and deserve our focus on their mechanisms. And in ad-hoc networks, there exists several routing protocols as listed below, which will be demonstrated in this report:

1. DSDV: Destination Sequenced Distance Vector
2. AODV: Ad-hoc On Demand Distance Vector

II. Backgrounds

AD HOC networks are networks of autonomous nodes that have wireless connections between each other. These connections can created and destroyed, changing the network topology as nodes change location, move out of range of other nodes or fail completely. Ad hoc networks pose an additional set of problems to those encountered in traditional fixed networks or wireless cellular networks. Dynamically forming the communications infrastructure from mobile devices is the source of these complications. One way of thinking about this is to imagine the problems caused by continually moving and changing the router you use to get from your local subnet to the rest of the world. How would packets get to or from you? This type of question has to be addressed along with requirements that affect traditional routing protocols such as loop free routing, completeness and stability.

As we have already seen, classical encryption techniques use scrambling of bits in order to encipher the message. In this section, we discuss three important classical cryptographic techniques namely,

1. Playfair Cipher
2. Vigenere Cipher
3. Caesar Cipher

The Playfair cipher uses a 5 by 5 table containing a key word or phrase. To generate the key table, one would first fill in the spaces in the table with the letters of the keyword (dropping any duplicate

letters), then fill the remaining spaces with the rest of the letters of the alphabet in order (put both "I" and "J" in the same space). The key can be written in the top rows of the table, from left to right, or in some other pattern, such as a spiral beginning in the upper-left-hand corner and ending in the center.

The Vigenere Cipher is the process of encrypting alphabetic text by using a series of different Caesar ciphers based on the letters of a keyword. To encrypt, a Vigenere square is used. It consists of the alphabet written out 26 times in different rows, each alphabet shifted cyclically to the left compared to the previous alphabet, corresponding to the 26 possible Caesar ciphers. At different points in the encryption process, the cipher uses a different alphabet from one of the rows. The alphabet used at each point depends on a repeating keyword.

III. Proposed Method

NGN Functional Architecture

Fig. 2 shows an overview of the NGN functional architecture [2]. The NGN architecture needs to offer the configuration flexibility to support multiple access technologies. It also needs to support a distributed and open control mechanism, which provides a separated service provisioning from transport network operation and speeds up the provision of diversified NGN services.

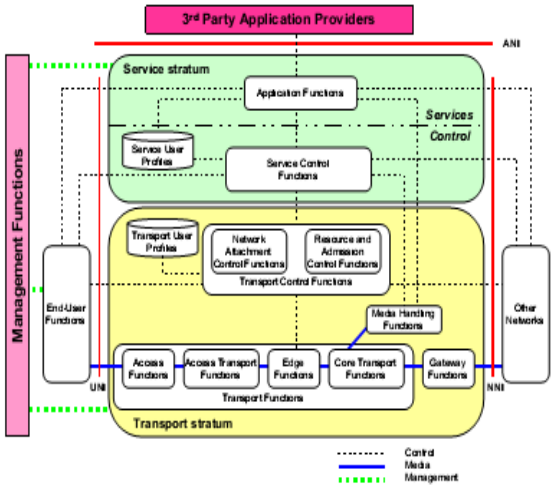

Figure 2 : NGN functional architecture

The NGN functions are divided into service and transport strata. The transport stratum functions provide connectivity for all components and physically separated functions within the NGN. The service stratum functions provide session-based and non-session-based services, including subscribe/notify for presence information and a messaging method for instant message exchange [7]. End-user functions are connected to the NGN by user-to-network interface (UNI), while other networks are interconnected through the network-to-network interface (NNI). The application-to-network interface (ANI) provides a channel for interactions and exchanges between applications and NGN elements.

a) Network Discovery And Selection

Since NGN consists of interconnected heterogeneous networks using heterogeneous user terminals, NGN should provide a seamless capability, independent of access method and network, and NGN also should address the identifying mechanisms [1]. That is, each terminal can use more than one type of network and possibly access multiple networks simultaneously for different applications (e.g., one for voice and another for receiving streaming media).

In such an environment, a terminal must be able to discover what networks are available for use. One of the proposed solutions for network discovery is to use software-defined radio devices that can scan the available networks. After scanning, they will load the required software and reconfigure themselves for the selected network. The software can be downloaded from the media such as a server, smart card, memory card or over the air.

b) Generalized Mobility

At present, mobility is used in a limited sense such as movement of user and terminal and with or without service continuity to similar public accessed networks (such as WLAN, GSM, UMTS, etc.) [6]. this means the horizontal handoff, which involves a terminal device to change cells within the same type of network to maintain service continuity. In the future, mobility will be offered in a broader sense where users may have the ability to use more access technologies, allowing movements between public wired access points and public wireless access points of various technologies. That is, in NGN environment, in addition to the horizontal handoff, the vertical handoff must also be supported. The vertical handoff mechanism allows a terminal device to change networks between different types of networks (e.g., between 3G and 4G networks) in a way that is completely transparent to end user applications. Thus, the challenge is to allow vertical handoffs between pairs of different types of networks in the presence of 2G, 3G, WLAN, WMAN, satellite, and 4G networks. The greater challenge lies when the vertical handoffs must take place with a certain set of QoS requirements still satisfied. Roaming allows a customer to automatically make and receive voice calls, send and receive data, or access other services when traveling outside the geographical coverage area of the home network. Roaming is technically supported by mobility management, authentication and billing procedures. Establishing roaming between service providers is based on roaming agreements. If the visited network is in the same country as the home network, then it is known as national roaming. If the visited network is

outside the home country, then it is known as global roaming. If the visited network operates on a different technical standard than the home network, then it is known as inter-standard roaming.

In NGN, all three types of roaming should be supported to roam through different network types, operating in different cities and countries. For true global roaming, roaming agreements must be set up among service providers among countries. Today, only a few service providers in different countries provide global roaming. The challenge is to provide more roaming agreements among the service providers in different countries. The greater challenge would be to provide inter-standard roaming in different countries.

c) Qos Support

Over the past decade, much research has been conducted in the area of QoS, and many protocols and methods have been proposed. However, the predominant method to support QoS by the Internet service providers (ISPs) today is over-provisioning. That is, instead of implementing complex QoS algorithms and methods, ISPs typically provide enough bandwidth in their backbone trunks so that their networks are hardly overloaded and thus there exists very little delay and few packets are lost in transit. This is quite feasible since a lot of fiber trunks have been installed over the past decade and the bandwidth cost of wired Internet trunks is very cheap. In the ISP's views, it is much simpler and cheaper to provide over-provisioned networks than implementing and managing complex QoS mechanisms. Although NGN is supposed to provide higher bandwidth and more cost-effective channels than its predecessor networks, the bandwidth cost in NGN wireless networks will remain higher than wired networks. Thus, over-provisioning in NGN will not be feasible and QoS support mechanisms will definitely be needed. Providing QoS support in NGN will be a major challenge thus much work is needed.

Congestion is an important issue which researchers focus on in the Transmission Control Protocol(TCP) network environment. To keep the stability of the whole network, congestion control algorithms have been extensively studied. Queue management method employed by the routers is one of the important issues in the congestion control study. Active queue management (AQM) has been proposed as a router-based mechanism for early detection of congestion inside the network. In this paper we analyzed several active queue management algorithms with respect to their abilities of maintaining high resource utilization, identifying and restricting disproportionate bandwidth usage, and their deployment complexity.

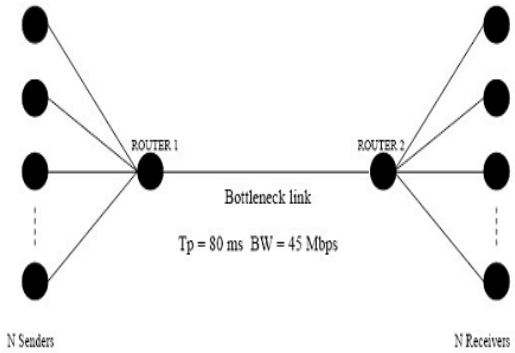

Figure 3 : Simulation topology

We compare the performance of RED, Drop tail based on simulation results, using RED and Drop Tail as the evaluation baseline. The characteristics of different algorithms are also discussed and compared. Simulation is done by using Network Simulator (NS2) and the graphs are drawn using X- graph.

Throughput: This is the main performance measure characteristic, and most widely used. In communication networks, such as Ethernet or packet radio, throughput or network throughput is the average rate of successful message delivery over a communication channel. The throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second or data packets per time slot.

This measure how soon the receiver is able to get a certain amount of data send by the sender. It is determined as the ratio of the total data received to the end to end delay. Throughput is an important factor which directly impacts the network performance.

Delay: Delay is the time elapsed while a packet travels from one point e.g., source premise or network ingress to destination premise or network degrees. The larger the value of delay, the more difficult it is for transport layer protocols to maintain high bandwidths. We will calculate end to end delay.

d) Routing Protocols

Efficient routing protocols can provide significant benefits to mobile ad hoc networks in terms of both performance and reliability. Mobile Ad-hoc Network (MANET) is an infrastructure less and decentralized network which need a robust dynamic routing protocol. Many routing protocols for such networks have been proposed so far. Amongst the most popular ones are Dynamic Source Routing (DSR), Ad-hoc On-demand Distance Vector (AODV), and Destination-Sequenced Distance Vector (DSDV) routing protocol. To compare the performance of AODV and DSDV routing protocol, the simulation results were analyzed by graphical manner and trace file based on Quality of Service (QoS) metrics.

We will simulate an ad-hoc network using different routing protocols with the help of NS and then make a comparison based on the result.

Fig 4 shows basic topology of 3 node network in which initial location of nodes 0, 1 and 2 are respectively (5, 5), (490,285) and (150,240) (the z coordinate is assumed throughout to be 0).

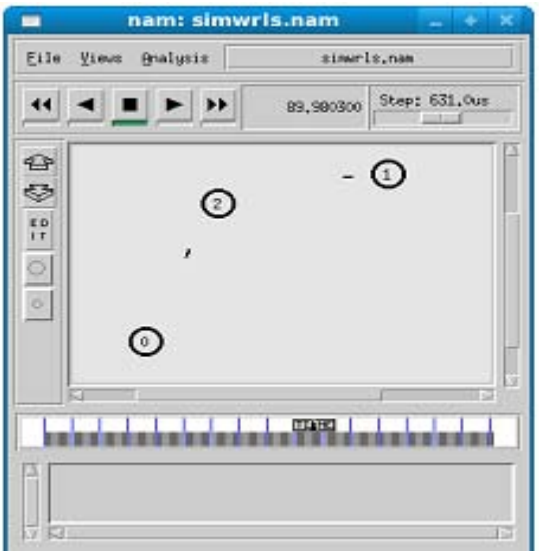

Figure 4 : Basic topology of 3-nodes network

At time 10, node 0 starts moving towards point (250,250) at a speed of 3m/sec. At time 15, node 1 starts moving towards point (45, 258) at a speed of 5m/sec. At time 110, node 0 starts moving towards point (480,300) at a speed of 5m/sec.

The simulation lasts 150 sec. At time 10, TCP connection using the DSDV ad-hoc routing protocol and the IEEE802.11 MAC protocol is initiated between node 0 and node 1.

e) Security

Over the past few years, the Internet and enterprise networks have been plagued by denial of service attacks (DoS), worms and viruses, which have caused millions of computer systems to be shutdown or infected and the stored data to be lost, ultimately causing billions of dollars in loss. The introduction of wireless LANs (e.g., IEEE 802.11) into enterprises has made network security more vulnerable since rogue base stations (i.e., unauthorized private base stations) can be easily connected to existing wired networks, potentially becoming the source of security attacks inside firewalls and intrusion detection systems. Moreover, connecting malicious PC via a base station that is not well managed is also critical.

In cryptography, a Caesar cipher, also known as the shift cipher, is one of the simplest and most widely known encryption techniques. It is a type of substitution cipher in which each letter in the plaintext is replaced by a letter some fixed number of positions down the alphabet. For example, with a shift of 3, A would be replaced by D, B would become E, and so on.

To pass an encrypted message from one person to another, it is first necessary that both parties have the 'key' for the cipher, so that the sender may encrypt it and the receiver may decrypt it. For the Caesar cipher, the key is the number of characters to shift the cipher alphabet. Here is a quick example of the encryption and decryption steps involved with the Caesar cipher. The text we will encrypt is 'defend the east wall of the castle', with a shift (key) of 1.

Plaintext: defend the east wall of the castle
Cipher text: efgfoe uif fbtu xbmm pg uif dbtumf

It is easy to see how each character in the plaintext is shifted up the alphabet. Decryption is just as easy, by using an offset of -1.

Plain: abcdefghijklmnopqrstuvwxyz
Cipher: bcdefghijklmnopqrstuvwxyza

Obviously, if a different key is used, the cipher alphabet will be shifted a different amount.

Mathematical Description

First we translate all of our characters to numbers, 'a'=0, 'b'=1, 'c'=2... 'z'=25. We can now represent the Caesar cipher encryption function, e(x), where x is the character we are encrypting, as:

$$e(x) = (x + k) \pmod{26}$$

Where k is the key (the shift) applied to each letter. After applying this function the result is a number which must then be translated back into a letter. The decryption function is:

$$e(x) = (x - k) \pmod{26}$$

Figure 5 : Encryption process

Figure 6 : Decryption process

IV. Results

a) Simulation Model

The objective of this paper is the performance evaluation of two routing protocol for mobile ad hoc networks by using an open-source network simulation tool called NS-2. Two routing protocols: DSDV and AODV have been considered for performance evaluation in this work. The simulation environment has been conducted with the LINUX operating system, because NS-2 works with Linux platform only.

Whole simulation study is divided into two part one is create the node (that may be cell phone, internet or any other devices) i.e. NS-2 output. It's called NAM (Network Animator) file, which shows the nodes movement and communication occurs between various nodes in various conditions or to allow the users to visually appreciate the movement as well as the interactions of the mobile nodes. And another one is graphical analysis of trace file (.tr).Trace files contains the traces of event that can be further processed to understand the performance of the network.

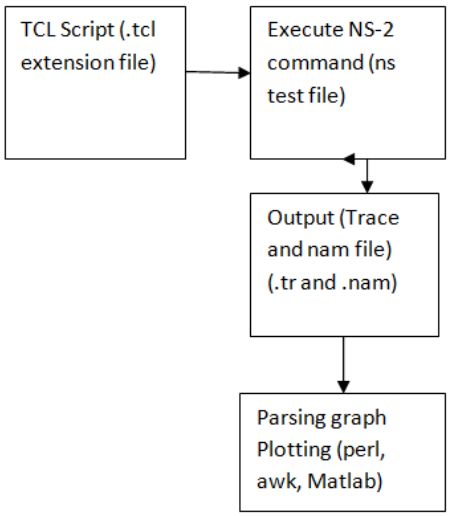

Figure 7 : Simulation overview

Figure 7 depicts the overall process of how a network simulation is conducted under NS-2. Output files such as trace files have to be parsed to extract useful information. The parsing can be done using the awk command (in UNIX and LINUX, it is necessary to use gawk for the windows environment) or Perl script. The results have been analyzed using Excel or Matlab.
A software program which can shorten the process of parsing trace files (Xgraph and Trace Graph) has also been used in this paper. However, it doesn't work well when the trace file is too large.

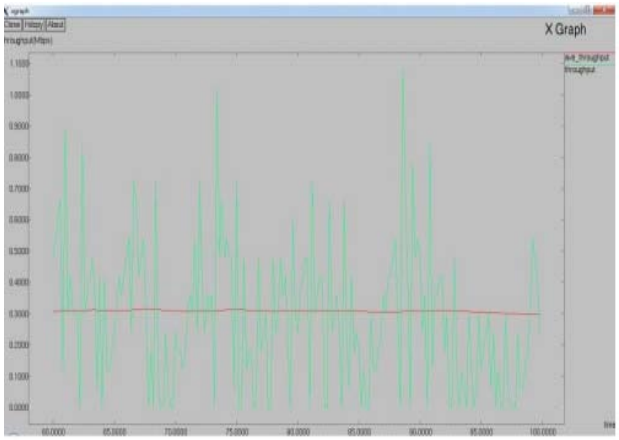

Figure 8 : Drop tail

Figure 8 shows how throughput varies w.r.t simulation time had been depicted shows unfair.

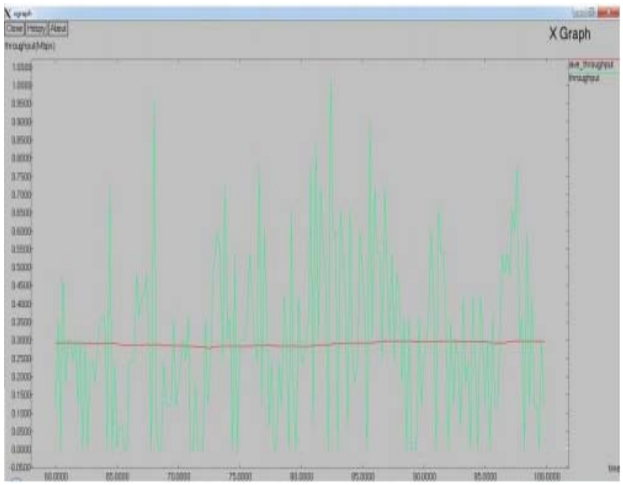

Figure 9 : RED

To generate trace file and nam file, we call tcl script in CYGWIN command shell. By varying the simulation parameter shown in table 1, we can see the graphical variation between various performance metrics like throughput, drop, delay, jitter etc.

Figure 9 shows how throughput varies w.r.t simulation time been depicted.

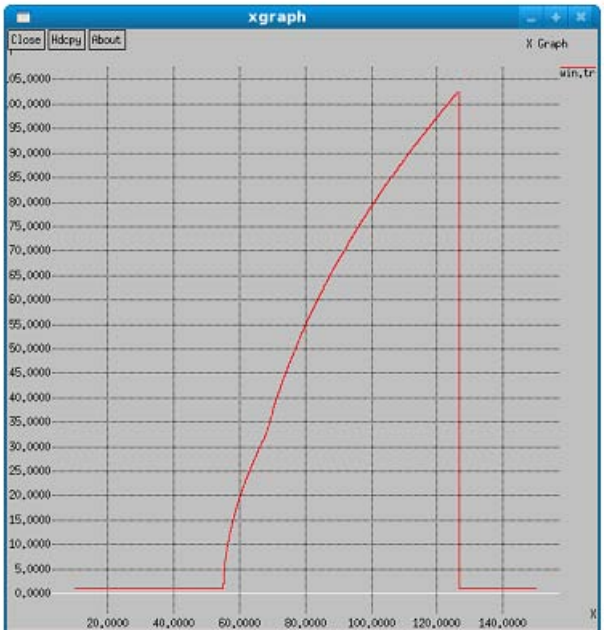

Figure 10 : window evolution before DSDV changes

At the beginning the nodes are too far away and a connection cannot be set. The first TCP signaling packet is transmitted at time 10 sec but the connection cannot be opened.

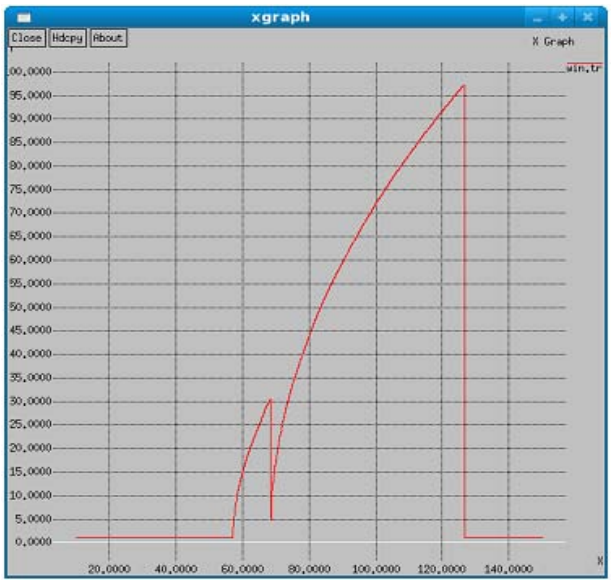

Figure 11 : window evolution after DSDV changes

Meanwhile nodes 0 and nodes 1 start moving towards node2. After 6 second (timeout) a second reatempt occurs but still the connection cannot be established and the timeout valure is doubled to 12sec.

At time 28 another transmission attempt occurs.While the connection still could not be established.Then at around 55 sec, both nodes 0 as well as node 1 to be within the radio of node 2 so that when tcp connection is reattempted at that time a two hop path is established between node 0 a direct connection is established.

At the moment of the path change there is a single TCP packet loss that cause the window to decrease slightly.At time 125.5 nodes 0 and 1 are too far apart for the connection to be maintained and the conncetion breaks.

From fig 12 it is seen that at 40sec connection is established and window size increases smoothly without any path change also no packet loss up to 144sec then window size decreases due to connection break.

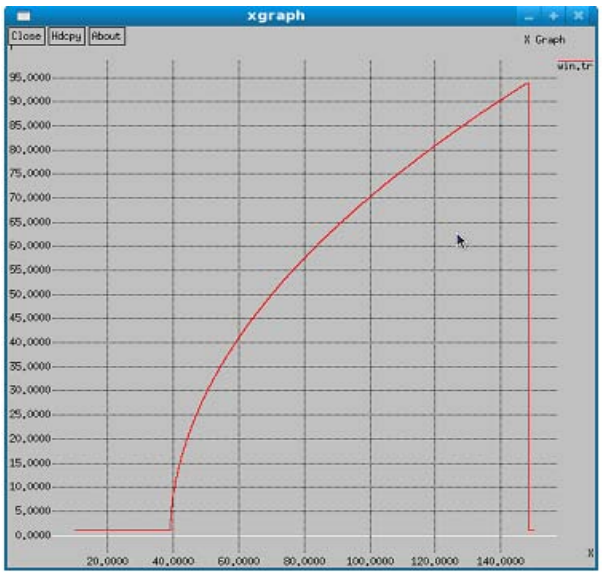

Figure 12 : window evolution over AODV changes

V. Conclusions

Simulation results show that DSDV compared with AODV, DSDV routing protocol consumes more bandwidth, because of the frequent broadcasting of routing updates. While the AODV is better than DSDV as it doesn't maintain any routing tables at nodes which results in less overhead and more bandwidth. AODV perform better under high mobility simulations than DSDV. High mobility results in frequent link failures and the overhead involved in updating all the nodes with the new routing information as in DSDV is much more than that involved AODV, where the routes are created as and when required. AODV use on -demand route discovery, but with different routing mechanics. AODV uses routing tables, one route per destination, and destination sequence numbers, a mechanism to prevent loops and to determine freshness of routes.

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Generation of any PDF from a Set of Equally Likely Random Variables

By Dr. Ziad Sobih & Prof. Martin Schetzen
Northeastern University, Jordan

Quantization- Computer quantization is important to consider in digital signal processing because it limits the accuracy of signals to be processed. In this paper we will talk about the quantization effect on system performance and use the result to make an improvement in the signal and systems field.

Computers communicate with ones and zeros back and forth. The ones and zeros make a word that a computer sends to another. Each character of the word is a bit and the word has eight bits. The word can be called a byte. One byte can have 256 different words. In general if we have eight bits register in a computer the dynamic range of numbers are quantized to 256 levels. This may result in error because the number we want to process may not fall exactly in its level. The accuracy depends on the computer and the number of bits on a register. In this paper we want to use A/D quantization error.

GJCST-E Classification : C.2.0

Strictly as per the compliance and regulations of:

Generation of any PDF from a Set of Equally Likely Random Variables

Dr. Ziad Sobih [α] & Prof. Martin Schetzen [σ]

I. Quantization

Computer quantization is important to consider in digital signal processing because it limits the accuracy of signals to be processed. In this paper we will talk about the quantization effect on system performance and use the result to make an improvement in the signal and systems field.

Computers communicate with ones and zeros back and forth. The ones and zeros make a word that a computer sends to another. Each character of the word is a bit and the word has eight bits. The word can be called a byte. One byte can have 256 different words. In general if we have eight bits register in a computer the dynamic range of numbers are quantized to 256 levels. This may result in error because the number we want to process may not fall exactly in its level. The accuracy depends on the computer and the number of bits on a register. In this paper we want to use A/D quantization error.

A given digital processing system is realized by computers by relating input and output by deference equation. Coefficient error is due to quantizing of each coefficient of the deference equation to the number of levels available by the registers of the computer. Then there is an error due to the exact value of the coefficient in the deference equation and the quantized value of the implemented system. The implemented system characteristics can be found easily and compared to the original system to determine the error.

A/D quantization error is due to putting each sampled value of the signal to one of the levels. The result is a signal that has error that vary from sample to sample. We will establish a model for this error.

The reason for the model is to avoid nonlinear analysis which is difficult. It is good to know some statistical properties of the error. This is a statistically equivalent model. We defined two sequences to be statistically equivalent if they have the same statistical properties. For example the values of random sequence generated by one computer may be different than the values by another computer but the statistical properties of the two are the same.

Let y1(n) be the response of LTI system to x1(n) and y2(n) be the response of the same system to x2(n). y1 (n) and y2 (n) are statistically equivalent if x1(n) and x2(n) are statistically equivalent.

This result will enable us to find statistics of the system response by making a model for the input statistics. With this statistically equivalent concept we can avoid the nonlinear analysis of the error of quantization.

II. A/D Quantization Error

A general model for A/D converter is the tandem connection between a sampler and a quantizer . Figure 1 show the block diagram. In this paper the effect of finite length word will be examined.

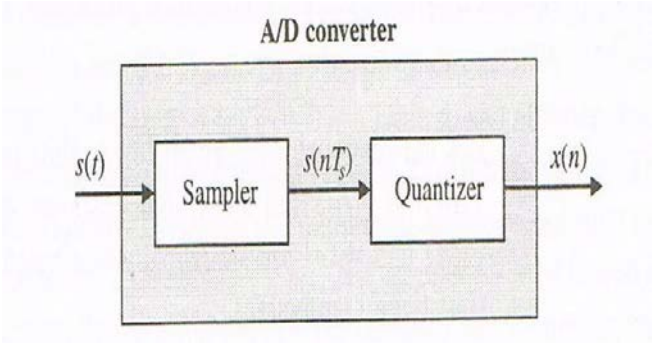

Figure 1 : The block diagram

We have b bits so the register ca have 2^b values and each sample is quantized to one of the values. The A/D quantization error is q(n) = x(n) – s(n Ts) and this is the difference between the quantized value and the sample value. The output of A/D converter is the sequence x(n) then is processed by the DSP system and the output is given to D/A converter. The DSP system is LTI so we can use superposition to express the response z(n) were y(n) is the response for s(nTs) and e(n) is the response for q(n).

To find e(n) we have to know q(n). to know q(n) we have to know s(t). But s(t) is ia signal that has information and the information might change. It is not important to know the sequence q(n) but the statistical properties can help. In the case that we will study the statistical properties of q(n) do not depend on s(t). it is independent of the input signal. And a mean square error can be achieved without specific s(t).

The approach we use in this paper is statistical equivalence. Two independent sequences which have the same statistics are said to be statistically equivalent. We find that two different LSI system responses are

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statistically equivalent if the corresponding inputs are statistically equivalent. Thus the desired properties of e(n) can be found by examining sequences that are statistically equivalent to q(n). we will study the statistical properties of the input q(n) and then draw conclusions about the output e(n). we will show this experimentally.

In A/D converter the amplitude rang is divided to intervals

$$-\frac{1}{2}\tilde{q} \le s(nT_s) < \frac{1}{2}\tilde{q} \qquad (1)$$

Figure 1 is a graph of x(n) versus s(nT) which is the transfer characteristic. This is a uniform quantizer.

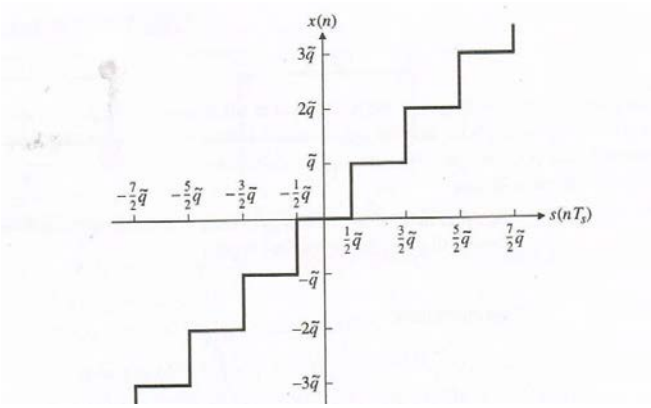

Figure 2 : The transfer characteristics for the input and output

Observe that the normalized quantization error is between -.5 and .5 . if the error sequence is equally likely distributed we will have a PDF as in figure 2. If the input is constant we will have a constant error which we can model as an impulse PDF at this value.

For equally likely distributed sequence the probability of the error to be between zero and .1 is just the area under the PDF curve

$$\int_{0}^{0.01\tilde{q}} P_1(q)dq = \int_{0}^{0.01\tilde{q}} \frac{1}{\tilde{q}}\,dq = 0.01 \qquad (2)$$

The total area under the PDF is 100% meaning that the event will happen

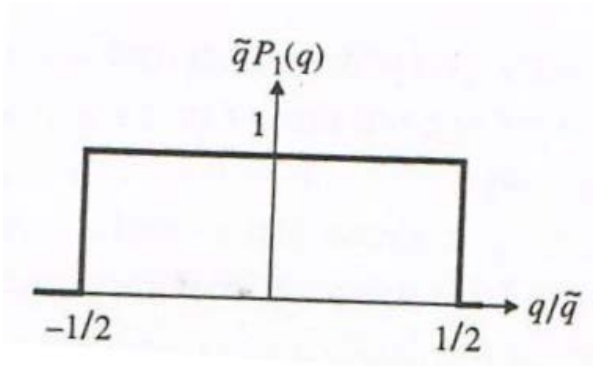

Figure 3 : The equally likely PDF

$$\int_{-0.5\tilde{q}}^{0.5\tilde{q}} P_1(q)dq = 1 \qquad (3)$$

I mean it is certain to have a value between -,5 and .5

The model that we will develop is based on this:

The values of the sequence q(n) has equally PDF and for n1 and n2 so that q(n1) is independent of q(n2) if:

1. The sampled sequence s(nT) is not periodic
2. The probability of s(nT)=s(mT)is zero
3. The width of the quantization error is small

Note that with this result we can study the quantization error no matter what s(t) is? That is because the error is independent of it. The random sequence for the given PDF can be easily generated with MATLAB.

The width of the equally likely PDF is a function of the quantization level. I mean we can generate equally likely sequence with PDF width T1 and T2 and T3. The amplitude of the PDFs is 1/T1 and 1/T2 and 1/T3. For each PDF e(n1) is independent of error e(n2) were n1 not equal to n2.

First we have to find the PDF of e2(n)= q(n)+q(n-1). The probability of q(n) is equally likely and the probability of q(n-1) is also equally likely and they are statistically independent. The probability of the sum is the convolution of the two PDFs

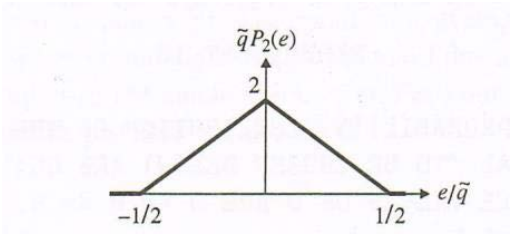

Figure 4 : The PDF of q(n)+q(n-1)

$$P_2(e) = 2\int_{-\frac{1}{2}\tilde{q}}^{\frac{1}{2}\tilde{q}} P_1(q)P_2(2e-q)dq \qquad (4)$$

This result depend on the fact that q(n) and q(n-1) are statistically independent. We can generate q(n) + q(n-1) experimentally using a computer and if we got the shape of the expected graph we can draw conclusions about independence.

The PDF for q (n)or P1 is as in figure 3. The PDF For q(n-1) is also as in figure 3. As we say the PDF of the sum P2 is the convolution of the two equally likely PDFs which is figure 4 keeping in mind that q(n) and q(n-1) are statistically independent.

In this paper I will use the fact that the time constant of an exponential is a measure of the width of the equally likely PDF. I make this assumption to make calculations easier. This is only an estimate to keep things simple.

We begin by analyzing the geometric view of the transfer function in the frequency domain

$$H_a(s) = \frac{a}{s+b}, \tag{5}$$

This system has one pole and the time constant = b . The gain at w0 is

$$|H_a(j\omega_0)| = \frac{|a|}{|j\omega_0 + b|} \tag{6}$$

The gain can be expressed as

$$|H_a(j\omega_0)| = \frac{|a|}{\sqrt{\omega_0^2 + b^2}} = \frac{|a|}{l_p} \tag{7}$$

That is the system gain at frequency w0 is equal to a constant divided by the distance from the pole to the point w0 at the jw axis. This system is a low pass filter.

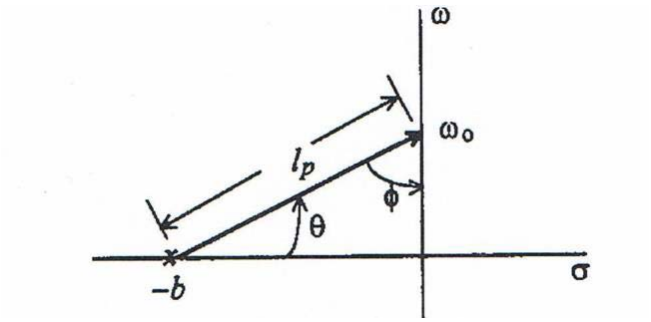

Figure 5 : Distance From The Pole To W0 On The Jw Axis

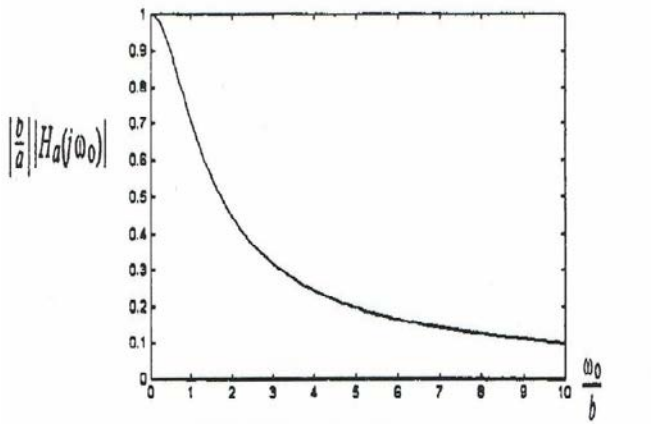

Figure 6 : A low pass filter

III. Convolution

As you can see we have three time constants 4,6 and 8. We will use them as a base to generate the wanted PDF. When we add the three random sequences with these statistics the result sequence has a PDF that is equal to the convolution of the first and the second and the third PDF.

I mean the first sequence has a PDF1 with time constant 4 and the second sequence has PDF2 with time constant 6 and the third sequence has PDF3 with time constant 8.

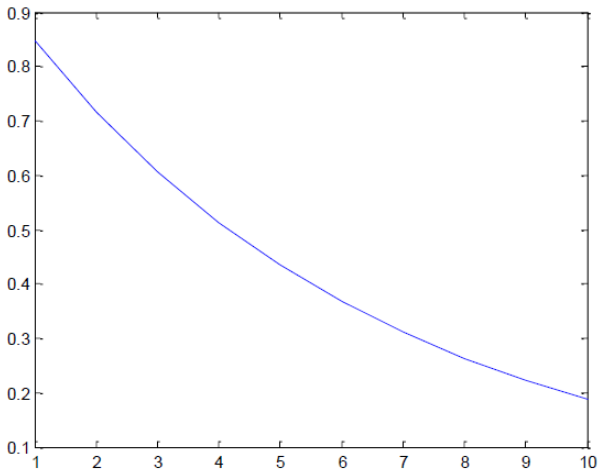

Figure 7 : Exponential with time constant 8

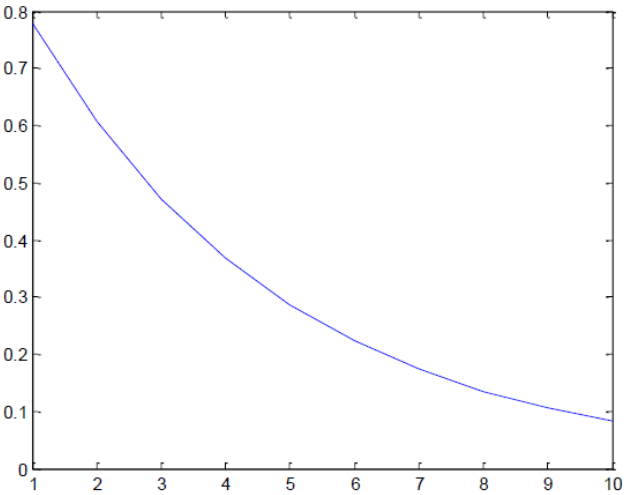

Figure 8 : Exponential with time constant 6

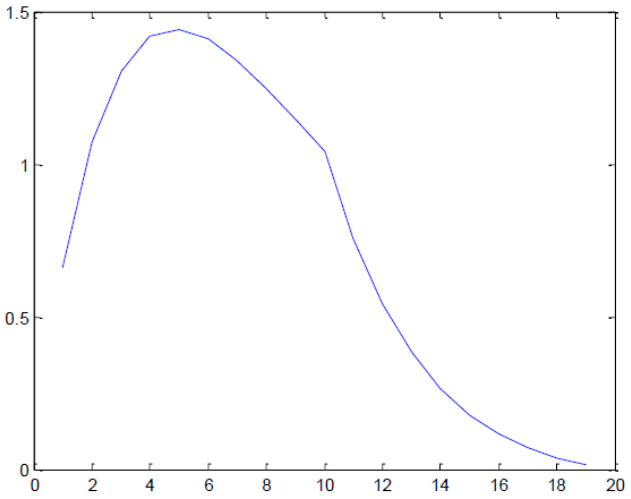

Figure 9 : Convolution of the two exponentials with time constant 6 and 8

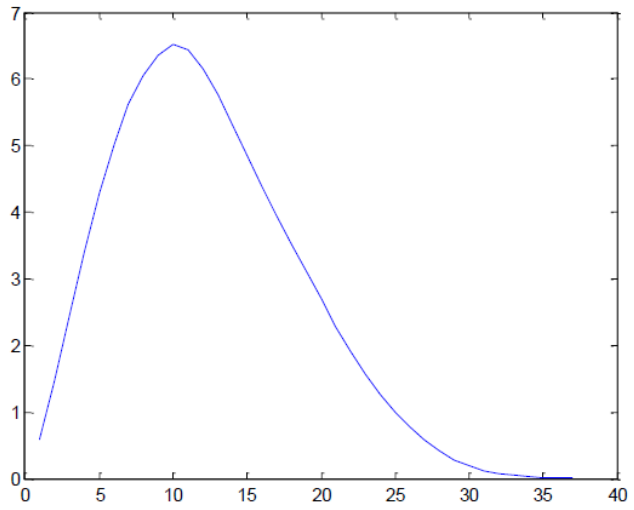

Figure 10 : Convolution of the three exponentials with time constant 4, 6 and 8

IV. Geometric View of Gain

Some uses of Laplace transform was illustrated in the last part. The importance of this technique is that it shows a physical relation between the poles and the gain. One of the bases for PDF design.

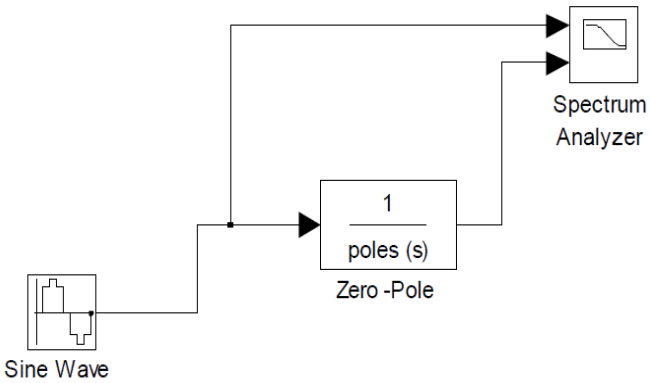

Figure 11 : The frequency response of the system of three poles

We can say that the system gain at frequency w0 is equal to a constant divided by the product of the distances from the system function poles to the point w0 on the w axis.

As you can see the three time constants translate to three poles in the s plan. Adjusting the locations of the poles can give us an estimate of the frequency response of the wanted PDF.

If we have a wanted PDF that we want to design. First we take the Laplace transform. Second we place the three poles in the s plan to give the best estimate for this transform. This way we can design for any PDF using our base of three exponentials with three time constants.

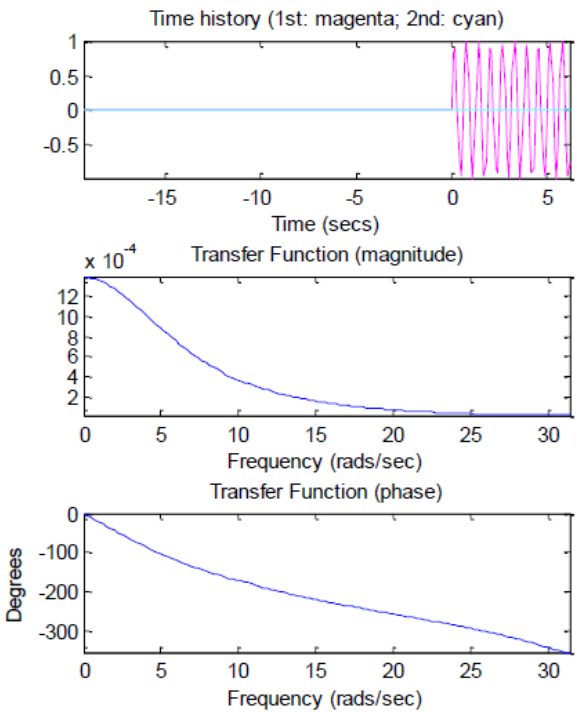

Figure 12 : The frequency response of the system of three poles

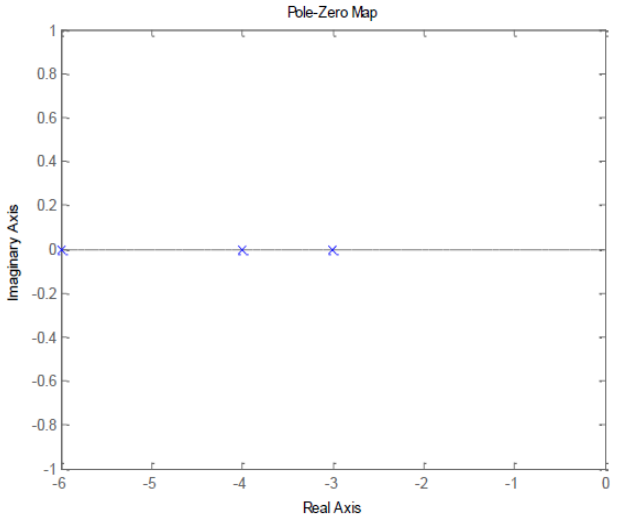

Figure 13 : The location of the three poles on the s plan

V. Conclusion

In this paper we generated equally likely PDF sequence using quantization. An input let us say sin wave sampled at a rate more than ten times its frequency and the sampling rate not periodic with the sin wave frequency. The output samples is given to a ten level quantize in the dynamic rang of the sin wave. We found that the output is an equally likely PDF sequence. Then we use this sequence to generate a wanted sequence with any wanted PDF.

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Defensive Approaches on SQL Injection and Cross-Site Scripting Attacks

By Venkatramulu Sunkari & Dr. C. V. Guru Rao
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Abstract- SQL Injection attacks are the most common attacks on the web applications. Statistical analysis says that so many web sites which interact with the database are prone to SQL Injection/XSS attacks. Different kinds of vulnerability detection system and attack detection systems exist, there is no efficient system for detecting these kinds of attacks. SQL Injection attacks are possible due to the design drawbacks of the websites which interact with back-end databases. Successful attacks may damage more. The state-of-art web application input validation echniques fails to identify the proper SQL/XSS Vulnerabilities accurately because of the systems correctness of sanity checking capability, proper placement of valuators on the applications. The systems fail while processing HTTP Parameter pollution attacks. An extensive survey on the SQL Injection attacks is conducted to present various detection and prevension mechanisms.

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Defensive Approaches on SQL Injection and Cross-Site Scripting Attacks

Venkatramulu Sunkari [α] & Dr. C. V. Guru Rao [σ]

Abstract - SQL Injection attacks are the most common attacks on the web applications. Statistical analysis says that so many web sites which interact with the database are prone to SQL Injection/XSS attacks. Different kinds of vulnerability detection system and attack detection systems exist, there is no efficient system for detecting these kinds of attacks. SQL Injection attacks are possible due to the design drawbacks of the websites which interact with back-end databases. Successful attacks may damage more. The state-of-art web application input validation echniques fails to identify the proper SQL/XSS Vulnerabilities accurately because of the systems correctness of sanity checking capability, proper placement of valuators on the applications. The systems fail while processing HTTP Parameter pollution attacks. An extensive survey on the SQL Injection attacks is conducted to present various detection and prevension mechanisms.

I. Introduction

SQL Injection attack is a web application vulnerability that occurs because of improper validations at the server side. National Vulnerability Database (NVD) is an International security organization and is organized by the U.S Government. In this, most of the security threats and the vulnerability (flaws) will be published. Each Vulnerability (Software Flaws) is identified with CVE-ID. When we see the vulnerabilities (CVE-IDs) published to till date there are total of 60598. Among all these vulnerabilities 5922 are sql injection flaws and 8074 are cross site scripting flaws. Exploit-db is a security community. The site publishes vulnerability details possibly with Proof Of Concept(POC). Vulnerability research or response teams and most of the hackers or crackers participate for their fame and name. This site provides a separate category called web apps. In this category we can see the website hacked details. Currently this site is publishing 100 to 200 POC for every month. Famous and Open Source Intrusion Detection System SNORT is providing detection logics not more than twenty. By these logics we can detect upto 20-40 sql injection attacks. So many commercial IDS/IPS Systems are also providing very few logics. By this analysis we can conclude that, SQL Injection attacks are more and there is no efficient detection system for detecting and for protecting web applications from SQL Injection attacks. In the most of the website home pages we see as the Fig. 1 text and password boxes to enter into the website. For example if we have login and password to use the web services, and login as admin and password as admin0123. We enter login, password and then we click on submit. Our browser sends the http GET request and these values(login, password) will be submitted to the appropriate program file, in the above example validate.jsp as an input parameters. In the middle of the transmission we can observe this request as

"GET http://www.example.com/validate.jsp?
username=admin&password=admin0123 HTTP/1.1 ".

Here the validatation process on the server is validate.jsp and it accepts the parameters username and the password. If the above request is received by the www.example.com webserver, then that server sends the requested values to the validate.jsp with the argument values. Validate.jsp validates the username and password with its back-end database (Say ORACLE Server). Before interacting with the database validate. Jsp script creates a dynamic SQL Query for validating the user inputs. Let us assume that the code for the validate,.jsp is designed as Fig. reffunction. If this validate.jsp takes admin as username and admin0123 as password, then the dynamic query will be created at the runtime is var sql = "select * from users where username = '" + username + "' and password = '" + password + "'". Dynamic query will be sql=select * from users where username=admin and password=admin0123. If the user or attacker enters the values for username, and password as "Username : or 1=1 –" and "Password : xyz" In the scenario, the dynamic query will be created below sql=select * from users where username= or 1=1– and password=xyz. In the sql statement username= will become one condition which returns false and the condition 1=1 which is tautology condition and returns always true. These two conditions here are joined with or. so that total result will be true for always. And the Statement (–) is used as comment statement in the most of the sql supported database management systems. If this comment statement statement appears in the middle of the SQL Query, then the rest of the query will be ignored. So that when we execute the above SQL Query, The result of execute query(sql) will be non-zero and returns all the records of the users table. And then attacker may gain the admin access,.(Because of the

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entered user will be treated as the result of the first record and most of the SQL users Tables first record may be the admin). Because of no validations are done at the server-side for the user inputs, an attacker execute his own queries, instead of the developer expected query. And it is possible to insert another SQL Querries by

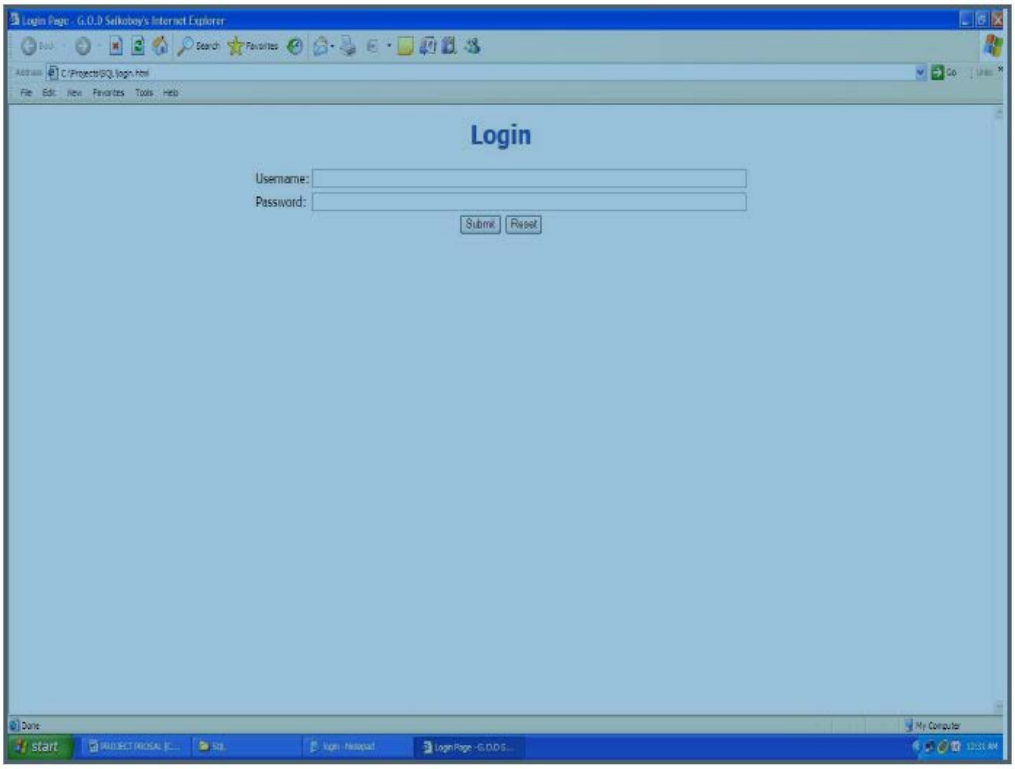

Figure 1 : Sample Login Screen In the Web Applications

```
<HTML>
<HEAD>
<TITLE>Login Page</TITLE>
</HEAD>
<BODY>
<FONT Face='tahoma' color='cccccc'>
<CENTER><H1>Login</H1>
<FORM action='validate.jsp' method=post>
<TABLE>
<TR><TD>Username:</TD><TD><INPUT type=text name=username size=100% width=100></INPUT></TD></TR>
<TR><TD>Password:</TD><TD><INPUT type=password name=password size=100% width=100></INPUT></TD></TR>
</TABLE>
<INPUT type=submit value='Submit'> <INPUT type=reset value='Reset'>
</FORM>
</FONT>
</BODY>
</HTML>
```

Figure 2 : Sample HTML Code To Send Login Data

```
function Login( cn )
{
var username;
var password;
username = Request.form("username");
password = Request.form("password");
var rso = Server.CreateObject("ADODB.Recordset");
var sql = "select * from users where username = '" + username + "' and password = '" + password + "'";
if( execute_query(sql) !=0)
{
Return("Welcome Page"); /* Here allows the user as authenticated and returns welcome page */
}
Else
{
Return(" Error Message");
}
```

Figure 3 : Sample Validation Function

combining with UNION Statement. Example: If the attacker enters below values username: or 1=1 union insert into users values(sreedevi,sreedevi0123,admin) password: xyz Like this if any vulnerability found on the website parameter, an attacker can inject his own queries for insert,update,etc.

The result of the SQL Injection will be very severe. Like this we can find more number of attack or hacked details in the security websites.

II. SQL Injection Attacks

In the most of the website home pages we see the text and password boxes as shown in Fig. 1 to enter into the website. In general this page is used to allow the authorized persons from the remote to use the web application services. For this kind of pages, most of the developers develop the code as Fig. 2. For example if we have login and password to use the web services, and login as admin and password as admin0123. We enter login, password and then we click on submit. Our browser sends the http GET request and these values(login, password) will be submitted to the appropriate program file, in the above example validate.jsp as an input parameters. In the middle of the transmission we can observe this request as GET/validate.jsp?username = admin&password = admin0123 HTTP/1.1 Here the validatation process on the server is validate.jsp and it accepts the parameters username and the password. If the above request is received by the www.example.com webserver, then that server sends the requested values to the validate.jsp with the argument values. Validate.jsp validates the username and password with its back-end database (Say ORACLE Server). Before interacting with the database validate. Jsp script creates a dynamic SQL Query for validating the user inputs. Let us assume that the code for the validate,.jsp is designed as Fig. reffunction.

a) Validate.jsp

If this validate.jsp takes admin as username and admin0123 as password, then the dynamic query will be created at the runtime is

varsql = "select _ fromuserswhereusername =0 " + username+"0andpassword =0 "+password+"0"; Dynamic query will be *sql = select _ fromuserswhereusername = adminandpassword = admin*0123; If the user or attacker enters the values for username, and password as below

Username : or 1=1 - -

Password : xyz

In the above scenario, the dynamic query will be created below

sql = select _ fromuserswhereusername = or1 = 1 – –andpassword = xyz; in the above sql statement username= will become one condition which returns false and the condition 1=1 which is tautology condition and returns always true. These two conditions here are joined with or. so that total result will be true for always. And the Statement (–) is used as comment statement in the most of the sql supported database management systems. If this comment statement statement appears in the middle of the SQL Query, then the rest of the query will be ignored. So that when we execute the above SQL Query, The result of execute query(sql)will be non-zero and returns all the records of the users table. And then attacker may gain the admin access,.(Because of the entered user will be treated as the result of the first record and most of the SQL users Tables first record may be the admin). Because of no validations are done at the server-side for the user inputs, an attacker execute his own queries, instead of the developer expected query. And it is possible to insert another SQL Querries by combining with UNION Statement. Example: If the attacker enters below values username: ' or 1=1 union insert into users values(venkat,venkat0123,admin) - -

password: xyz

Like this if any vulnerability found on the website parameter, an attacker can inject his own queries for insert,update,etc,.

The result of the SQL Injection will be very severe. Like this we can find more number of attack or hacked details in the security websites.

III. SQL Injection Defence Schemes

a) PaulE et al Scheme

In [1] the authors developed a white-box tool to verify software security. In general software requirement specifications, source code, designs and executable code to be analysed by tools. In this work, the authors developed a security scanner tool. It can analyse the functional bevaior. Due to the widespread use of the World Wide Web and proliferation of web application

World Wide Web and proliferation of web application vulnerabilities, application level web security and assurance requires major attention. This specification defines a minimum capability to help software professionals understand how a tool will meet their software assurance needs. The tool can be used as software assurance tool and it can scan the software for security vulnerability for some extent.

b) Muthuprasanna et.at Method

In [2] the authors developed a model of hybrid approach, which combines static code verification and runtime analysis. Webservice protection became necessary because of the use of webapplications is increasing in the internet. Deployments of Webapplication firewalls, next generation firewalls, application detection systems and intrusion detection and prevention systems are increasing to protect web servers.

c) Hossain et.at Method

In [3] the authors developed a mutation based testing tool to verify the web application resistance against SQL Injection vulnerabilities. The authors stated that the current scenario of testing web application cannot eliminate web application vulnerabilities. The proposed that injecting attack pattern into the source code of the web application, by that mutations based test cases can be generated. The generated test cases can potentially find the SQL Injection vulnerabilities. The authors named the tool as MUSIC. The tool is evaluated on open source web applications written in JSP. The tool is further impleted for PHP and other known languages.

d) Russell et.at Method

In [4] the authors developed a low-level approach to find the runtime applicability of sql statement which are prepared at runtime. The authors achieved this using call level interface (CLI) by interacting ODBC or JDBC. Using this approach, the authors evaluated the runtime SQL statement with SQL DOM approach. CLI can be used for to verify the correctness, but SQL DOM is can be used to identify the SQL statement applicability such as user permissions. SQL DOM can be prepared automatically by interacting with the database schema. The authors evaoluated the system for performance. The approach is a offline approach. The posed SQL statements should be given as an input the tool. So, it cannot be directly applied for dynamic query evoluation. The authors are extending the work with XPATH query language for dynamic queries verification.

e) Tania et.at Method

Software systems are complex for verification and validation. Software faults causes security vulnerabilities and causes for security breaches. Several methods such as SQL attack tree models and fault injection models are best comparable to this work [5]. The tool injects the critical attack patterns onto the system and verifies the result for vulnerability existence. The validation methods provided with this tool avoids false positives. The tool reports accurate report, each vulnerability reported by the tool will be based on the behavior of the application at the time of attack injection. As a future work, the authors targeted to generate injection methods based on attack tree models.

f) Huajun et.al Method

Phishing attack is an identity theft attack, mostly on banking, online-transactions etc,. The attackers uses socail sites to steal the user's sensitive information such as credit-card details, account details etc,. Phishing also includes social engineering schemes. Social engineering schemes can be using emails, phone calls claiming that the callers are from valid authorities. Phishing attacks are typically cross-site scripting attacks. The authors [6] proposed few strategies to avoid phishing attacks.

Anti-phishing are classified into three categories by the authors. Server-side anti-phishing strategies, browser-side antiphishing strategies, and online training anti-phishing strategies.

1. Server-side anti-phishing strategies: This approach will be applied the server side. It works similar to anti-spam systems. It verifies the content delivered to the server. If anything which is very closely related to phishing, the detection system prevents it at the server and not to reached to the victim.
2. Browser-side anti-phishing strategies: This approach is brower based approach with plug-in. The plug-in monitors the application behavior at the user-side. If it behaves as cheating or phishing it avoids the attack. The browser based approaches can be categorised as Blacklist approach, visual-clue-based approaches or capta based approach, webpage-feature-based approaches and information flow approaches.
3. Online training anti-phishing strategies: The last strategy suggests that the internet users should have proper training on phishing attacks, how to avoid them. This approaches clears the anti-phishing philosophies. The strategy is to create awareness on phishing attacks. The authors suggest to have a technology called webpage watermarking to fight against phishing attacks.

g) Anderson Morais et al Method

Attack Injection model [7] for security protocol testing suggests to have attack injection to find the web application vulnerabilities. The approaches includes attack tree model to generate testcases. The attack tree model prepares all possible cases. fault injector injects attack patterns onto the server system. The fault injects prepares executes scripts that are collected from the internet. The approach can be used as blackbox model.

The authors created a framework which executes the given scripts. The authors are focusing on UML based representation to generate attack scenarios in future.

h) Sushila Madan et al Method

Web applications are most vulnerable to popular attacks and risks. SQL Injections and cross-site scripting attacks are more popular attacks on web applications. Threat modeling provides a complete assessment on the web application. With techniques such as attack possible entry point, attack trees, privilise escalation chances the tester or security assessment team can indentify the threats on the system. In [8] the authors aimed to create attack risk model called ADMIRE. The system is consise, structured. The approach is step wise approach. The steps includes : (i)Analyze the security objectives (ii) Divide the application (iii) Mark the vulnerabilities (iv) Identify the threats (v) Rank the threat (vi) Eliminate the threat. The model is white-box model. It verifies the application code.

It is specific to a programming language.

i) Parvaiz et al Method

In [9], the authors suggests that the attack tree model is not possible in all cases and is difficult to build the security model. Applications operates in different modes, capturing every aspect becomes difficult to design the security model with attack tree models. Hence the authors proposed a new approach which provides syntax and graphical security models. The new model includes nodes such as PAND node, k/n node, SEQ node, CSUB node, and Housing node. The system provides syntax and graphical represntation for every node. The model allows the developer to understand the system affectively. The system is fault resistant and avoid vulnerabilities during development phase. In most of the cases the tree includes AND/OR models to represent the system structure. As a future plan, the authors are working on to define calculation rules for the new nodes to distingush the node values for different security attributes up to the root node of the tree.

j) Nenad et al Method

[10] Along with web applications even vulnerabilities have grown. Since reviews of manual code are costly, timeconsuming and even error-prone, the need for solutions has become evident. This addresses the problem of web applications which is vulnerable by means of static source code analysis. Many analysis like flow-sensitive, interprocedural, context-sensitive data flow and even literal analysis are used to discover vulnerable points in a program and also to improve the correctness and precision of the results. Pixy, the open source prototype implementation of our concepts, is targeted at detecting cross-site scripting vulnerabilities in PHP scripts.

The system is capable to cover huge number of vulnerabilities. The system can scan the application code dynamically.

k) Kaarina Karppinen et al Method

These days the big problem is Hidden functionality whereas we cannot be sure that the software does not contain malicious code. Due to architecture violations many security vulnerabilities arises and architecture analysis tools will assist in detecting these vulnerabilities.Such visual images can be used to detect vulnerabilities and ultimately help to design software architectures that meet their security requirements.SAVE [11] is one approach used to detect the violation and what effects the violation had on the system. This kind of analysis with SAVE is new and proving to be advantageous as it adds more details to the evaluation. The SAVE downside is that it is more complex compared to static analysis. The future plans will include developing the SAVE tool further by adding more features, such as automatic comparison of dynamic views and encoding of correct visual images that visual images that together could be used to identify malicious behaviour.

IV. Cross-Site Scripting Attacks

This attack can be done on the vulnerable web application to inject the attacker code. Using this attack, an attacker can inject his own code such as javascript into the web application. Some of the results of the Cross Site Scripting attacks are website hacking or web site defacement,. Whenever user requests the hacked website, then the attacker page will be returned. For example NOKIA website is hacked using cross site scripting, In the Hacked time if any user access the NOKIA website, users will get the hackers page,. By this attack an attacker can gain the sensitive information of the website,. And he can disrupt the webservices.

a) Example 1

In most of the websites, we can see the login and password information. If there are no validations for the user inputs, then the attacker can inject his HTML or SCRIPT code as inputs to the vulnerable pages. By this attacker executes his own script on the server side or the client side.

b) Example 2

If the web page is like FIGURE 1.0, and the user has username and the password like

username:venkat

Password :venkat0123

And The Result of the submission of the user inputs is like Here Web Server is returning a dynamic web page with the user inputs. Attacker can send an attack below

Username : venkat < script > alert(SiteisHacked);< /script >

Password : venkat0123

The above script tag is executed in the web server and the result will be submitted to the validate.jsp. if the above script is written for attackers purpose then that will be very dangerous.

V. Conclusion

The state-of-art web application input validation techniques fails to identify the proper SQL/XSS Vulnerabilities accurately because of the systems correctness of sanity checking capability, proper placement of valuators on the applications. The systems fail while processing HTTP Parameter pollution attacks. Hence the paper proposes a novel technique called Input PArameter Analysis System (IPAAS). The proposed system works in three phases as Input Parameter Extraction, Parameter Type Learning, and Runtime detection with the learned Parameter Types. Because the system operates on self learning approach, and applies on the HTTP traffic, it reduces the developers or security analysts efforts and increases the chances of attack detection accuracy.

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Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

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All manuscripts submitted to Global Journals Inc. (US), ought to include:

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Abstract, used in Original Papers and Reviews:

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Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

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Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

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Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

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11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

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21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

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33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

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Key points to remember:

- Submit all work in its final form.
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- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

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- Separating a table/chart or figure - impound each figure/table to a single page
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· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

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The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

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- Significant conclusions or questions that track from the research(es)

Approach:

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- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
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Approach:

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- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

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- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
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- Leave out information that is immaterial to a third party.

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The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
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- Present a background, such as by describing the question that was addressed by creation an exacting study.
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Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
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- Give details all of your remarks as much as possible, focus on mechanisms.
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- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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