Technical Session - Computer Science and Technology & Industrial Information Technology

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A graph theoretic approach to control the traffic congestion on road network

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Introduction

Many relations in real world problems can be represented by graph networks, where each node represents data and links represent the relationship between them. Web graphs, internet graphs, communication networks, biological networks such as food web are some of the examples of the existing social networks. All of those networks are analyzed to identify the communities or to find the importance of certain nodes in the networks. Therefore centrality measure plays an important role in social networks analysis. Since massive financial and man-hour loss due to traffic congestion, it becomes a major issue for all of cites in the world to analyze the traffic networks. In order to control traffic congestion, it is essential to understand the development of traffic flows. Therefore, finding a way to control traffic is needed. Most authors analyze road networks from the viewpoints of shortest path, cost minimization etc. Recently, a model for determining traffic assignment and optimizing signal timings in road networks were presented (Yang,*et al*.,1995) and way of the speed of the dynamics are affected by the underling network structure were studied (Holme,*et al*.,2003).Network representation was used to analyze the patterns in a street (Masucci,*et al*.,2009). An efficient algorithm to find the shortest route between two nodes of a large scale, time-dependent graph were developed on road network (Nannicini,*et al*.,2008). Cut-set of a graph were used to find optimal control of the traffic system (Baruah,*et al*.,2012).In this research, the centrality measures to analyze the congestion in the road network is used.

Methodology

Considering main and alternative paths from Thorana Junction to Kiribathgoda in Colombo-Kandy main road, a road network is constructed as a weighted,undirected,labeled graph, where each node represents an intersection, junction, or a special place and each edge represents a road segment between those intersections. Weights of edges are taken as the distances between nodes. Due to the complexity of the networks, 118 nodes initially have selected to construct this network. All centrality measures(Degree,Closeness,Betweenness, Eigenvector) and network criticality for all nodes in this road network are calculated. Besides that clustering coefficents are also calculated. All simulations are carried out using Mathematica and MATLAB programs.

Result and Discussion

For each node in the road network, all centrality measures are shown in the Figure 1. Figure 1(a) shows that the nodes around the Kiribathgoda Hospital represent traffic. Closeness centrality values are obtained in the analysis carried out range from 0.2985 to 0.62.Figure 1(b) shows that node 71 (Junction of New Hunupitiya road) has the highest closeness centrality and it is the most accessible node from the source node. Looking at Figure 1(c), Furthermore nodes 73,71 and 72(3 nodes from New Hunupitiya junction to Kiribathgoda junction) have the highest betweenness centralities. This shows that the road segments from New Hunupitiya road junction to Kiribathgoda junction is an important part in this network and also nodes belongs to this segment, are crucial to maintain node connections. Figure 1(e) shows that the nodes 100,102,97 (nodes around the hospital) have high eigenvector centralities. The graph implies that these nodes are around Kiribathgoda hospital. That means the intersections around the hospital are well connected.
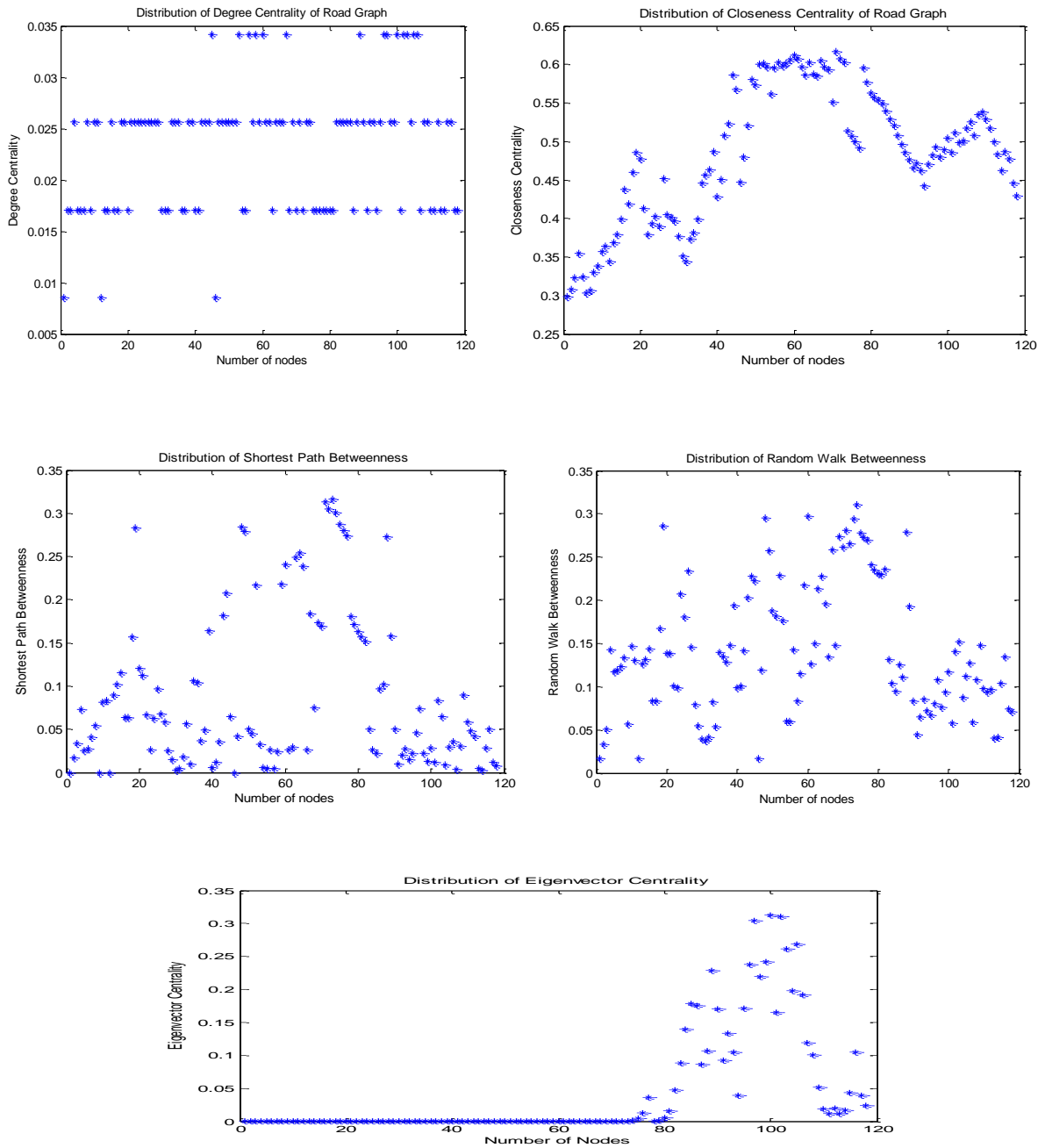
Figure 1: Centrality and Betweenness Measures

Table 1: Correlation coefficients for the centrality positions of the Road Network

	DC	CC	SPB	RWB	EC
DC	1.0000	0.1201	0.0100	0.0825	0.1845
CC	0.1201	1.0000	0.1792	0.2783	0.0086
SPB	0.0100	0.1792	1.0000	0.7891	0.0416
RWB	0.0825	0.2783	0.7891	1.0000	0.0416
EC	0.1845	0.0086	0.0416	0.0416	1.0000

Note: DC-Degree Centrality, CC-Closeness Centrality, SPB-Shortest Path Betweenness, RWB-Random   Walk Betweenness, EC-Eigenvector (p-value 0.05)

Table 1 shows that the shortest path betweenness and random walk betweenness is highly correlated (79%), while other measures are weakly correlated. Thus, in general, vertices with higher shortest path betweenness tend to have higher random walk betweenness. .

Conclusions

In this research, road traffic network from Thorana junction to Kiribathgoda are constructed as an undirected weighted graph. Centrality and betweenness measures are calculated. According to the results, New Hunupitiya road junction is most valuable node in this road network. Besides that the road segment from University of Kelaniya to Kiribathgoda junction is also important road in this network. According to this study can be highlighted that New Hunupitiya road Junction is the most valuable node and there should be a traffic light to control the traffic on road network. By considering centrality measures, we can identify the important nodes and edges can be identified in this network in order to model traffic congestion accurately.

Acknowledgement

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Android mobile driving assistant for highway drivers

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Introduction

Mobile based driving assistant that always communicate with the driver in an interactive way, has not introduced yet. It assists the driver when he is driving on highways and driver can control the assistant through his voice command. Mobile Driving Assistant helps driver to clarify the way that he drives. In addition, the driving assistant carefully examines the facial expressions of the driver and if he is in a drowsy condition, assistant suggests alternatives to overcome from those situations. This is a friendly interactive guide for the highway drivers.

Recalling the history, in 2002 Ji and Yang (2002) has presented a detection drowsiness system based on infrared light illumination and stereo vision. This system localizes the eye position using image differences based on the bright pupil effect. Brandt et al. (2004) has shown a system that monitors the driver fatigue and inattention. For this task, he has used VJ method to detect the driver's face. Using the optical flow algorithm over eyes and head this system is able to compute the driver state. Tian and Qin (2005) have built a system for verifying the driver's eye state. Their system uses Cb and Cr components of the YcbCr color space; with vertical projection function this system localizes the face region and with horizontal projection function it localizes the eye region. Once the eyes are localized the system computes eye state using a complexity function.

Pallavi M, S. Gawali in 2012 their research paper demonstrated the new non-intrusive approach for monitoring driver drowsiness depending on the driver and driving data fusion. They use percentage of eye closure (PERCLOS) model for estimating driver status. The driving information such as lateral position and steering wheel angle also use for drowsiness detection. Multilayer perceptron neural network has been trained for optimal performance score in this research paper.

Yong Du, Peijun Ma in 2008 published a research paper on effective vision based driver fatigue detection method. In this at primary stage, the inter-frame difference approach binding color information is used to detect face. Marco Javier Flores and Jose Maria Armingol in 2008 presented the basic model for drowsiness detection. For this they used Viola & Jones (VJ) method to detect the driver's face. Once face is detected SVM is used to detect eye status from trained data.

Methodology

For implementation of the Mobile Driving Assistant application, Samsung Galaxy Core was used as the mobile device and the android version 4.1(API level 16) was used as the development environment. The internet and GPS services need to be activated in Mobile Device.

The Mobile Driving Assistant is based on android platform supported mobile phones only. Java was used as programming language and common programming language to develop android applications. ADT bundle was handled as IDE for the implementation.

Android voice recognition and android Text-To-Speech facilities were focused in order to maintain the voice discussion between the driver and the mobile driving assistant. Applications that available in Android platform can potentially make use of any speech recognition service on the device that's registered to receive a Recognizer Intent. Google's Voice Search application, which is pre-installed on many Android devices, responds to a Recognizer Intent by displaying the "Speak now" dialog and streaming audio to Google's servers. The Android platform includes a Text-to-Speech (TTS) capability. Also known as "speech synthesis", TTS enables an Android device to "speak" text in various languages. Face and eye blinking detection is the most important module of the mobile driving assistant. Haarcascade_lefteye_2splits.xml files, distributed with OpenCV package were used to detect eyes when eyes are opened. OpenCV 2.4.9.0 was used for the image processing purposes.

Results and Discussion

There are three main modules in this Mobile Driving Assistant application. First module is the identification of eye blinking pattern by using the camera of an android mobile device and give voice suggestions in order to avoid sleepiness, The second one is identification of speed of the vehicle, highway entrance points, exit points, parking locations using Global Positioning System (GPS) and the last one is detection of the call log and informs about the priority calls to the driver.
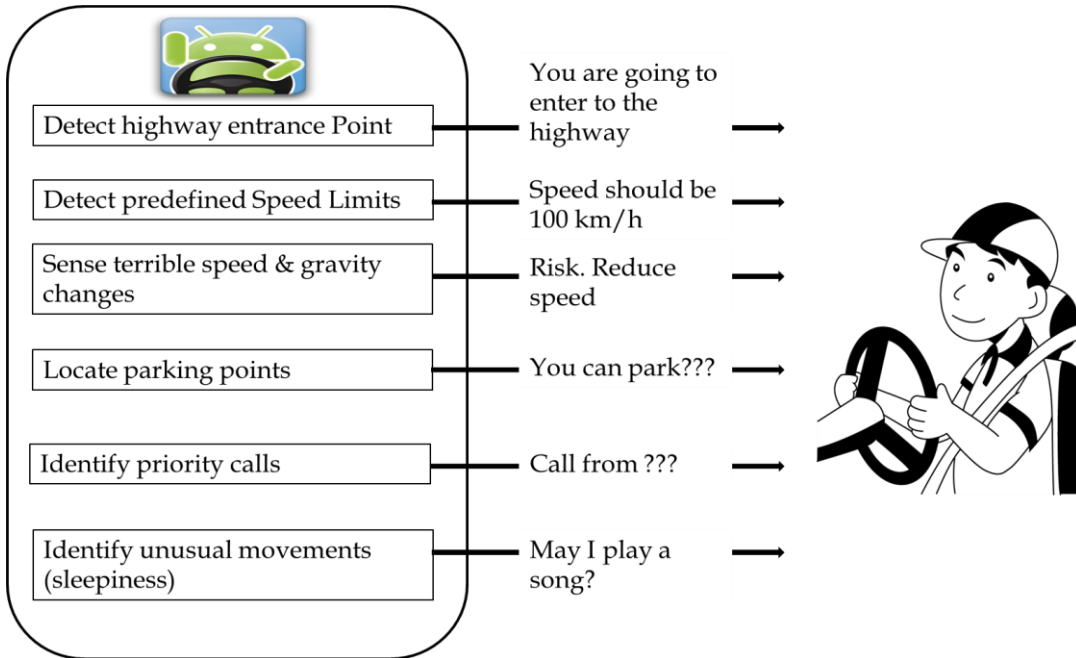

Figure 01 : Mobile Driving Assistant system Architecture

1. Eye blinking pattern is identified by using the camera of the android mobile device and express voice suggestions in order to avoid sleepiness.

Haar cascade algorithm introduced by Viola Jones, is used for face and eye detection. In here the face detection class is refreshed in every seven seconds. If it is not detected the pupil of the eye when refreshing it ask some suggestions and Driver can reply to those suggestions by using voice commands.

2. Speed of the vehicle, Highway entrance points, exit points, parking locations can be identified using GPS and longitudes and latitudes help to identify the exact location.

This module is running as service. When the phone is in the Wi-Fi range or driver on mobile data and GPS, it is always running inside the device. This module is detected the initial longitude, latitude and displays them. One of the main features of this module is that detecting the phone state using GPS and measure the speed of the vehicle. It is caught the speed as meters per second. If the car exceeds the maximum speed of the highway boundary, mobile assistant warns about this. When the driver reaches to the entrance point or parking point, it is checked the current longitude and latitude with the defined longitudes and latitudes. If this matches, it conveys the message.

3. Analyze the call log and informs about the priority calls to the driver.

This module is also running as a service. Assume that the phone is in silent mode when the driver is driving on highways. This module can be analyzed the call log. It is got the received numbers from the call log and the occurrence of each number. The missed and outgoing calls are not analyzed. When the call comes, it is checked the number and the occurrence. If the occurrence is less than the defined number of occurrence, it is considered this as a new caller and alerts this. If the occurrence is more than defined number, and when the call comes more times, it is alert this as an emergency call.

Conclusion

The implementation is based on the android mobile device. And the main expectation was to keep a higher user interaction with the system for the drivers who drive on highways. The implementation environment and the techniques used, provided excellent support for the successful development of the system. The approach outlined here was more effective in implementing solution with High-Tech, user friendly Mobile Based driving assistant where a very high precision is expected than the existing criteria.

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Blood bank management system

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Introduction

Requirement of blood for the National Blood Transfusion Service of Sri Lanka has increased in last three years. Hence it is essential to increase the number of blood donors and maintain efficiency and updated service. In the last 10 years, the number of voluntary donors has been increased compared to non-remunerated donors. Though, there is an increased voluntary blood donor, because of the lack of information relating to bold donation, many people become disentitle to donating blood. Because of this reason, National Blood Transfusion Service of Sri Lanka continuously loses a bulk of acquirable blood for a year from people who are willing to donate blood. To organize blood donation campaigns, organizers need to go to the nearest blood bank to inform and get necessary things to organize blood donation campaigns. It is more time consuming and difficult task. Emergency patients, who need blood immediately, request blood through advertising on televisions or social media. To make the matter worse, National Blood Transfusion Service of Sri Lanka gets island wide blood stock update once a month. It causes further difficulty in terms of making decisions. "The Blood Bank Management system" is a web based system that directly addresses above problems by integrating relevant functions. Blood donors can register on the system and continuously they will be notified about the campaigns via SMS (Short Message Service). Campaign organizers can organize campaigns online and get responses from blood donors. Patients can request blood via online or sending a SMS. Daily blood stock can also be handled through the system.

Methodology

Blood Bank Management System is a web based system with integrating SMS alert function that implemented using HTML, PHP, CSS, JavaScript and JQuery for web development and MySQL for database design. Blood donor can register on the system and it will provide with a donor an ID. Blood campaign organizers can organize a campaign through online. The request is sent to the particular blood bank officer and officer can approve or reject the request. Once he/she approves the campaign, donors may get SMS notification to their mobile by informing the campaign. Not only that, organizer informs with the approved status via SMS to the organizer's phone. Patients can request blood via online or just by sending a SMS to the system. Then system will inform to all the relevant donors with the request. Blood stock will be handled day by day through the system. Blood bank officer can add or remove a donor to the system and from the system. Also he can add blood stock to the relevant blood bank. Blood Bank Management system has separate Admin panel. Administrator can view island wide blood stock either as blood group or branch. Furthermore, administrator can add a new bank to the system as well as a user to the system.

Results and Discussions

According to the literature, some online systems are used in some foreign countries. However, there is no proper online system available in Sri Lanka. Blood Bank Management system is an efficient system as it is integrating all the functions with a SMS alert facility. The main goal of the Blood Bank Management system is to gather all the blood donors into one place automatically and inform them constantly about the opportunities to donate blood via a SMS to the donor's mobile phone. Also the system should have functions to organize blood campaigns online. It makes easier to organizers to organize blood donation campaigns. Also the system is capable of handling blood stocks. Through the daily updated blood stocks, management can make decisions effectively. Further system facilitates with the function that emergency patients can request blood online or by sending a SMS to the system. Ultimately the system provides proper communication among the blood donors, campaign organizers and the people who need blood.

Conclusion

This study focused about the development of new Blood Bank Management System. This system is totally web based application integrated with a SMS gateway technology. The system was localized for the local user and users interfaced were developed to attract user intention within the range of professionally. System maintenance is achievable.

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Classification of virtual learning environment

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Introduction

Virtual Learning Environments (VLEs) are more popular in e-learning atmosphere. VLEs are influential learning systems in higher education institutions. It also referred as learning management systems (LMS) and course management systems (CMS). Main function of the VLE is to streamline the course management aimed for various learner groups. VLEs are electronic platforms which can be used to afford and footpath to e-learning and enrich face-to-face education with online components. The functions of the VLEs are computerized the learning administration by helping and recording the learner's bustle. Formal education and corporate training have different needs and these needs have to be satisfied using VLEs. Teachers are responsible to develop the learning contents in VLE. It provides flexible delivering materials, learning activities and support the tools to create and monitoring. Blackboard and Moodle are commonly employed system in current VLE.

Sri Lankan higher education system emphasizes on learner-centric learning. In this concept learner plays a vital role in the learning process and learners are projected to actively involve in the learning process. They have more accountability for their learning process and teachers are accountable for learners' learning and they frolic the protagonist of "facilitator" who directs the learning process instead of information provider. Learner-centric learning will bestow the learners a deeper and better off learning experience, as there is better participation and involvement in the learning process (Brown S., 2008). The learner-centric learning atmosphere uses the web 2.0 technologies such as blogs, wikis, and social software which helps to publishing the content over the internet (Alexander, B., 2006, Yang, S., 2009). This technology can improve the interactive communication and collaboration among teacher and learners who either possess associated learning resources, or help to discover and obtain it, or are willing to exchange and share with others in the online learning environment. Web 2.0 allows the learner to read and write in the web using create, publish, exchange, share and cooperate on information. This makes the learners become the consumers and producers of learning resources and satisfies the learner-centric learning concepts. Thus, web 2.0 offers a learning atmosphere and have the capability to fundamentally change the nature of learning and teaching, through the invention of learner controlled learning.

Methodology

VLEs are motivated as the platform for learner-centric learning in the present learning environment, because it helps the learners to control and manage their own learning activities. This comprises the support for learners to fixed their learning objectives, manage their material and communicate with others via learning groups and provides a suitable environment to practice social skills in the learning and accomplish their learning goals. To succeed learner-centric learning, institution have to employ the suitable VLEs according to their learning needs. VLEs are classified according to the architecture of the system. The first classified approach is web-based with loosely joined or tightly joined web services. ELGG and PLEX systems are located udder this category. Second classified approach is based on the platform that supports a rich facility for extension points. Moodle and Blackboard are located in this family. Final classification, highlighted the Social Software concept based system.

Result and Discussion

The classification of the VLE's helps the educational institute to properly identify the system within the budget, existing resources, target groups and the needs. This classification helps to maximize utilization of the employed VLE. It motivates the learner-centric learning atmosphere especially in Sri Lankan higher education scenario.

Conclusion

VLE supports the lifelong learning that is mainly informal and occurs over the life of the learner. To achieve this goal, institutions have to concentrate on adopting the proper VLE system. This classification technique guide the VLE implementers and learners to properly identify the suitable learning system with the minimal cost and utilize the whole features maximize the usage. This could motivate the learner-centric learning atmosphere in the web-based environment.

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Expert food analysis system

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Introduction

Diet is a main factor which directly affects the health condition of a living being. Most of the times, unsuitable diet practices are the main reasons for long term diseases in the human body. For examples, unsuitable diet practice is the reason for occurring and increasing the diseases like diabetes, high blood pressure, heart diseases, cancers, allergies, etc. By choosing the correct diet can not only save the body from numerous diseases but also cure existing diseases.

Suitability or unsuitability of a diet depend on numerous factors like existing diseases of the body, age, gender, special body events like pregnancy, season of the year etc. Apart from the human health it may be required to select a suitable diet based on the religion and cultural facts of each person.

To identify a suitable diet (food products), it is required to analyze each and every food component which is used to produce a complete food product. But, due to the complexity of the formation of the food products in the current market and the less knowledge in the food analyzing domain makes it difficult to select the suitable food product base on the above mentioned facts.

With the help of Information Technology and knowledge of Ayurvedic Medicine, it is possible to identify a path to reduce the difficulty in analyzing food products (Alwis, R. 2012; Hemachandra, D. and Karunaratne, H. 2007). Ayurvedic medicine is rich in knowledge to analyse a food product but it is difficult to use that knowledge by the general public due to less understanding of the Ayurvedic food analyzing knowledge and less availability of the information from the food producers regarding the food product (Nagodawithana, P. 2007).

With the help of the Information Technology, it is possible to identify a pathway to provide a solution for above mentioned problems by creating an efficient and simple way for the proper flow of information among human experts in food analyzing domain, food producers and customers.

By using this solution, it is possible to keep the people away from the diseases which could be occurred due to unsuitable diet selections. It will improve the life quality of the human society. Additionally it will provide a high value to the economy.

"Expert Food Analysis System" will help people by minimizing the complexity when they are going to select a suitable diet based on their physical body and social status. Selection of a suitable diet will result a healthier society which is free from most of highly spread diseases like diabetes, high blood pressure, heart diseases etc.

"Expert Food Analysis System" creates new business opportunities in the market. It will create a competition among food products in terms of their healthiness. That competition will keep the healthy food products in the market and will create new opportunities for healthy new food products in the food market. And also will remove the food products which are obvious reasons for diseases.

The final outcome of this solution or the final goal of this product is improving the quality of life in the society by combining medicine and business with information technology.

Methodology

The whole project consists of three main parts as Expert System, Web Application and Mobile application. Expert System is implemented with CLIPS (C Language Integrated Production System) and is integrated into Web application using Mommosoft library (CLIPSNet; CLIPS). Web application is implemented with HTML, Javascript, CSS and C# in the Visual Studio 2010 environment. Databases were created with Ms SQL (MSDN Library; Newest Questions). Considering the whole system, Expert System can be considered as the back-end. Mobile application is the front-end and web application acts as the intermediate component between mobile and expert applications. Web application is hosted in an

IIS testing server. Mobile application is developed with Java on Android platform in the Eclipse environment. Mobile application and Web application is linked together with the internet.

Human food analysis experts should store their knowledge related to food analysis domain as raw data in the knowledge base of the Expert System. Raw data about various food products including ingredients should be stored in a SQL database. Web interfaces have been provided for ease of data insertion. System generates a QR code which is included an identification number which can uniquely identifies each registered food product. Generated QR code should be attached with the package of the food product or racks etc. Food consumers have to maintain a personal profile including the information related to personal health and culture.

Food consumers can scan the QR code with the mobile application and validate the food product by comparing the information already printed on the package of the food product and received information by the mobile application. When a QR code is scanned, mobile application send an identification number to the web server and refer the SQL database for food ingredients and personal profile. Then those data will be analysed and send the report to the consumer which indicates how the particular food product personally will be effected.
SQL database also stores the consumer feedbacks and raw data which are statistically valuable. Data transferring between the mobile application and remote server will be handled by http requests and responses.

Results and Discussions

Currently there are various systems which are related to Diet and Health domain combination. Most of them are developed by integrating the Mobile and Web Technology. Another obvious fact which is common to most of those system is they are based only on western medicine. Most of current systems are seemingly based on static information and direct information flow among food consumers, food producers and food analysis experts is poor or not exist.

"Expert Food Analysis System" introduces an open system architecture which connects not only the food consumer and food analyser but also the food producer. Possible problems which can be occurred by combining the food producer into the system have been handled in the system. Information domain for the knowledge base is not only the western medicine but a combination of Western and Ayurvedic medicine. Due to the design of this system it can be used regardless of a particular region and system's knowledge base can be rapidly grown unlike other existing Hygiene and Diet related systems.

Conclusion

Expert Food Analysis System help the consumers to easily achieve the expectation of having a more healthy diet in the current market system. Businesses will be pushed to produce new products and competition among food product for healthiness will be increased. This system can be contrasted from other few existing systems by its open system architecture. This system combines Food Producers other than the Food Consumer and Food Analysers unlike other systems. The main success factor of this system depends on the richness of the knowledge base of this system. It is required to make new rules which cover many parameters and add new facts by the experts in the food analysis field. Results given by the system always depends on the completeness of the rules and accuracy of the facts. Generating new rules and facts is a non-IT function and it should be done through experiments in the food analysis field.

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Modification of information gain measure to select the best group of attributes in a data set for a binary decision tree inducer

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Introduction

Classification is one of the frequently used techniques in data mining processes which can be applied to accurately predict the target class for each case in a data set. The Decision tree (*DT*) algorithms are one of the powerful classification and prediction methods which facilitate decision making in sequential decision making for a given dataset (Han & Kamber, 2006; Bramer, 2007). The major strengths of the *DT* algorithms are their ability to generate understandable rules, to handle both numerical and categorical attributes and also provide a clear indication of which attributes are most salient for prediction or classification (Kangaiammal, 2013). ID3 and C4.5 are multi splitting algorithms and developed by J. Ross Quinlan in1986 and 1993 respectively. That can be used to Entropy, information gain (*IG*) and Gain ratio as attribute selection measures. These measurements can be utilized to make the binary decision tree to reduce the complexity of the decision tree. If the algorithm identifies more than one attributes with equal *IG* in the data set, then it will select the initial attribute as a splitting node of a tree. This attribute may not be the best attribute for decision making when it is compared with the other attributes of equal *IG*. Therefore, the aim of this study is to improve the *IG* measure to select the best attribute in a dataset and plot a binary decision tree.

Materials and Methods

To overcome the above problem, the relation degree function $AF(A_k)$ was introduced between A_k and C_j ($j=1,2$, represent two kinds of class values) (C.Jin, L.De-Lin, & M.Fen-xiang, 2009) and the normalization value $V(A_k)$ of the relation degree function was calculated.

$$AF(A_k) = \frac{\sum_{i=1}^{n}(a_{i1}-a_{i2})^2}{n}, \qquad \rightarrow (01) \qquad \text{and} \qquad V(A_k) = \frac{AF(A_k)}{\sum_{k=1}^{l}AF(A_k)}, \qquad \rightarrow (02)$$

Where a_{ij} indicates the ith value of attribute A_k in dataset *D* and j^{th} value of categorical attribute *C* and $0 < k \le l$, and *l* is the number of attributes of the dataset *D.*

Then, calculate the values of modified version of *IG*, *MGain(A)* which is defined as:

$$MGain(D, A_k) = (Info(D) - Info_{A_k}(D)) \times V(A_k), \qquad \rightarrow (03)$$

where $Info(D)$ is entropy of *D* and $Info_{A_k}(D)$ (Han & Kamber, 2006) is relative entropy of attribute A_k.

The A_k attribute with highest $MGain(D,A_k)$, is considered as the first splitting attribute of the binary decision tree algorithm. **Algorithm for Binary Decision Tree**

Input: Training Example, *D;* Target Attribute, *C* in; List of Attributes, *l.*
Output: A decision tree.
Handle a case where single attribute is selected

I.   Create a root node for the tree
II. **If** tuples in *D* is all of the same class, *C*, then return the single-node tree Root, label with the class *C*.

III. **If** number of predicting attributes is empty, then return the single node tree Root, label with most common value of the target attribute in the examples

   Handle the case where multiple attributes have same *IG*

IV. Otherwise
- Find all the possible subsets of each attribute in *D*
- Find the normalization values of relation degree function of each attributes
- Apply Attribute selection method (i.e *IG*) for each subset of each attributes in *D* and then find the subset with maximum impurity value to find the best splitting attribute (*A*).

   If there are only one attribute (*A*) with highest impurity value, then
        o Label node with the name of attribute *A* and split '*A*' corresponding to two subsets (*D1* and *D2*)
        If there is more than one attributes with highest impurity values, then
        o Multiply the impurity values by the corresponding *V* values of each attribute and find the corresponding attribute '*A*' with largest value, then
        o Label node and split attribute '*A*' into two subsets (*D1* and *D2*)

   Stopping Criteria
   If tuples in *D1* or *D2* are all of the same class, then
        o below this new branch add a leaf node label with class *C* in *D1* or *D2* (step 2)
   If *D1* or *D2* is empty, then
        o below this new branch add the leaf node with most common value of the target attribute in the examples else below this new branch add the sub tree (attach the node returned by Generate **Binary decision tree**) , End
   Return root

Results and Discussion

Table 01: Values of conditional entropy, information Gain and modification of IG for possible splitting subsets of each attributes.

Attributes	Possible sets	Conditional	$Gain(D,A_k)$	V_k	$Gain(D,A_k) \times V_k$
Age	{4} &{2,3}	0.6490	0.3219	0.3810	0.1226
	{3} &{2,4}	0.9245	0.0464		
	{2}&{3,4}	0.9245	0.0464		
Color Cloth	{8}&{5,6,7}	0.8000	0.1709		
	{7}&{5,6,8}	0.6490	0.3219	0.2381	0.0766
	{6}&{5,7,8}	0.9651	0.0058		
	{5}&{6,7,8}	0.9651	0.0058		
	{8,7}&{6,5}	0.9510	0.0200		
	{8,6}&{7,5}	0.8464	0.1245		
	{7,6}&{8,5}	0.8464	0.1245		
Income	{11}&{10,9}	0.9245	0.0464		
	{10}&{11,9}	0.8797	0.0913	0.1906	0.0174
	{9}&{11,10}	0.9651	0.0058		
student	{13}&{12}	0.9245	0.0464	0.1905	0.0088

The Figure 01 and Figure 03 represent the binary decision tree for the initial data set which is used the *IG* and *MIG* attribute selection measure respectively. The Figure 02 and Figure 04 represent the decision tree for the data set which was changed the order of the attributes and applied the same attribute selection measures respectively.
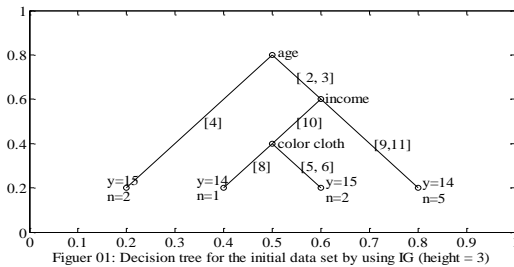
Figuer 01: Decision tree for the initial data set by using IG (height = 3)
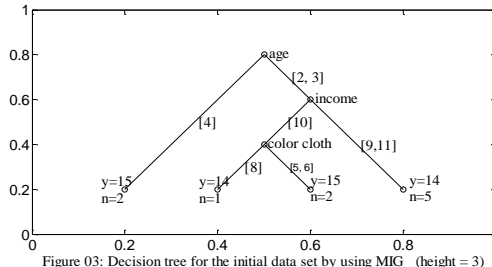

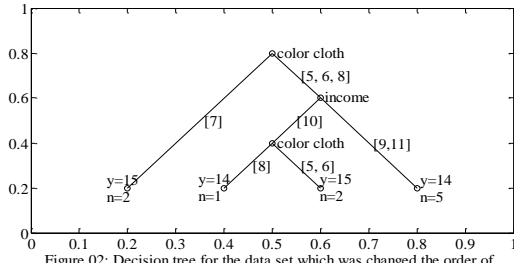Figure 03: Decision tree for the initial data set by using MIG (height = 3)

Figure 02: Decision tree for the data set which was changed the order of attributes and used the IG (height = 3)
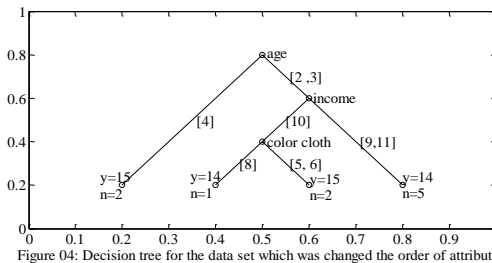

Figure 04: Decision tree for the data set which was changed the order of attributes and used the MIG (height = 3)

Conclusions

The *IG* measure selects the least important attribute to make the decision of the dataset. But, *MIG* measure selects a better attribute than the *IG* measures in decision tree inducer algorithm. When the algorithm classifies categorical data into a binary tree by using *MIG*, it has to find all possible subsets of each attribute, and then the computational efficiency of the algorithm will be deteriorated. Therefore, this algorithm will be more efficient for a data set with a lower number of values of each attribute in a dataset.

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Security door open system based on password, fingerprint and GSM

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Introduction

Fingerprint verification is one of the most reliable personal identification methods in biometrics. Most doors are controlled by the biometric technique. The idea of this technique is to enable automatic verification of identity of one or more behavioral and/or physiological characteristics of a person. Recently, biometric methods used for personal authentication utilize features as the face, the voice, the hand shape, the finger print, and the iris patterns of an individual. Each method has its own advantages based on their usability and security. This biometric access control system provides authorized individuals for safe and secure access in and out of organizations. This system is mainly focus on the security purpose of organizations.

The uses of biometric based systems have seen an exponential growth in recent years. This is because of tremendous progress in this field making it possible to bring down their prices, easiness of use and its diversified use in everyday life. Biometrics is becoming new state of art method of security systems. Biometrics is used to prevent unauthorized access to bank locker, jewelry shop and many other security concerned things. The applications of SMS/GSM Based security systems are quite diverse. There are many real life situations that require control of different devices remotely and to provide security.

And also system has to send message through SMS using GSM to other authorized people who away from the restricted areas. This combination of task improves the security of the system.

Methodology

It mainly consists of four sections.

- Password, Fingerprint identification and verification section.
- Micro controller section.
- Message passing and storing data into database.
- Door section.

In this proposed work keypad is used to input the password by the user. If the password is valid LCD display the success message and allow giving a finger print reader to the user. If not valid password LCD display the error message. Then finger print module is used to identify the individuals. If the password and finger print match the request message pass to other authorized persons. If not match LCD display the error message. Based on the other authorized person's reply then door will unlock. If not send the correct message the door will not unlock.
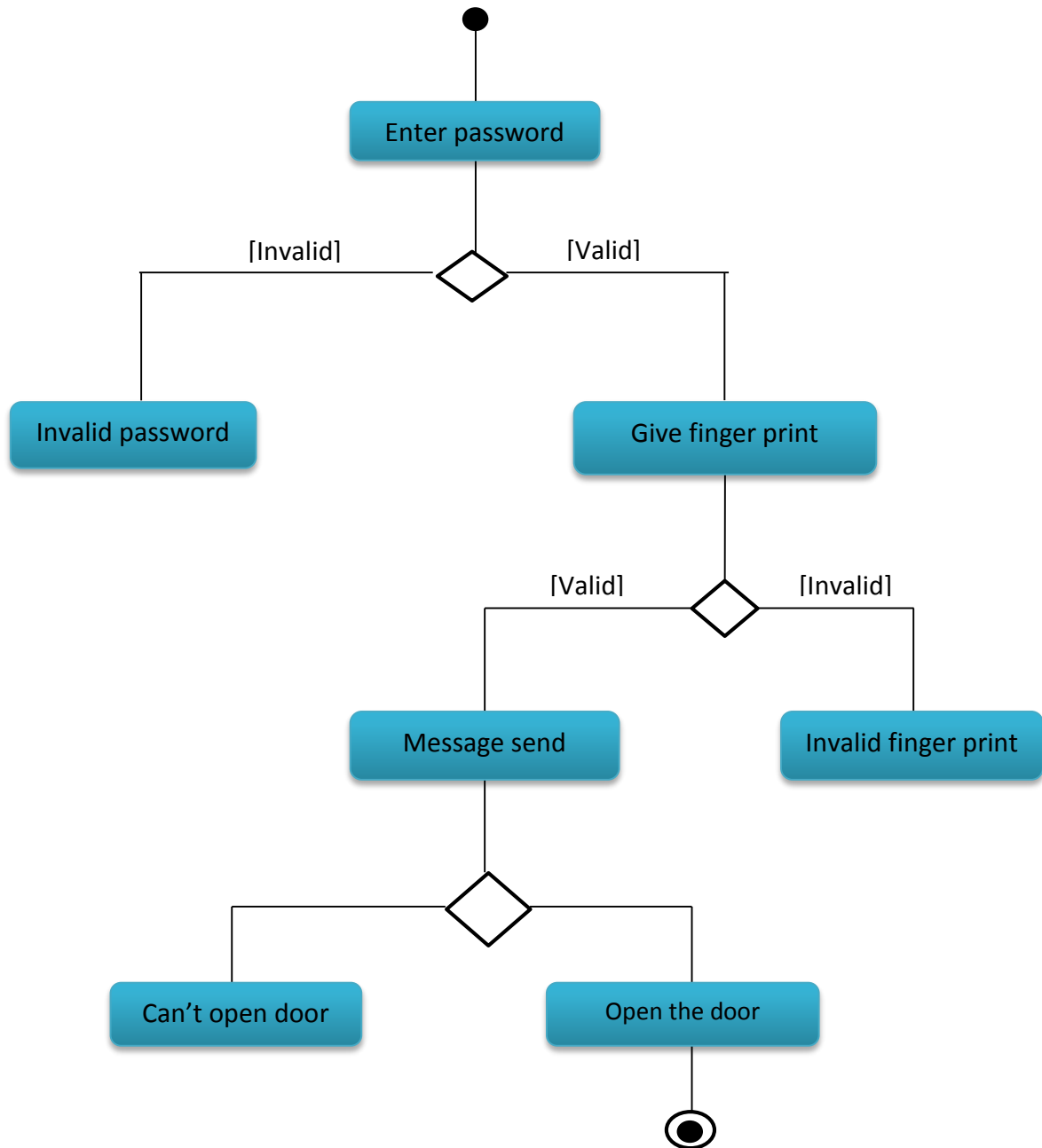
Figure 01: Flow chart of the system

Results

This project aims at developing a higher security provides to the system by using combination of password, finger print and GSM.

- Identify the individuals based on password and fingerprint.
- The request message for opening the door that sends to other authorized persons when the system is identified the authorized person.
- Save the all data in the database that who is open the door and who is accept that request.

Conclusion

After reviewing the possible solutions, I decided to use finger print, GSM module and ARDUINO to make this project. According to the advantage of ARDUINO over other Microcontrollers, I made this decision.

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Cloud computing in business scenario

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Introduction

Cloud Computing has been recognized as a promising model to exploit the power of computer network and communications into business in cost effective way. It provides elastic capacity to all the sectors such as businesses, government and education with flexible price. Present multifarious business environment require organizations to respond quickly to the changes of the market to take advantage of opportunities. It can be achieved through contemporary information and communication technologies. Nowadays cloud computing considered as a resource that is readily available to organizations to attain their business goals promptly.

Cloud computing offers a platform to use the collective computing resources. It assembles large number of computing servers and other resources and provides their combined capacity on an on- demand, pay per cycle basis. As per the definition of National Institute of Standards and Technology (NIST) Cloud Computing refers to "pay-per-use" model which enable convenient, on demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell and Grance, 2009). This definition divulge that in cloud the end users can access the service anytime from anywhere, share data and pool resources more easily, and keep their data safely in the infrastructure. This model promotes accessibility and consists of five key characteristics: they are on-demand self-service, broad network access, resource pooling, rapid elasticity and measured service (David S. Linthicum, 2010).

In cloud, organizations do not need to invest a huge amount on hardware and software even though the organizations may have geographically separated location. Organization can select the cloud depend on their budget and needs. If the organization prefer public cloud, can get the resources from the cloud service providers such as Amazon, Google, IBM, Yahoo, eBay, Microsoft, etc. or they may have their own cloud. Cloud would be most advantageous not only to the business but also in management of government, health care and education sectors.

Business Implications of Cloud Computing

One of the most obvious business implication of cloud computing is saves money. Adoption of cloud within the business eco system has the ability to decrease costs in several ways as hardware, software, maintenance, space, equipment, and energy needed to run the business. Hence the cloud enables businesses, the ability to provide regular product or services with lower cost.

Cloud in business environment not only reduce the capital investment but also reduce the investment in human resource. Organizations can easily share data across their divisions with the cloud computing technology in the fastest and easiest way which helps the businesses especially in saves the time of the information acquisition.

Another implication of cloud is that the organizations do not need to be in one specific location. The organization can be anywhere in the world and they can access the service whenever they need. Even the employees of the organization also do not need to be in their office all the time to complete their work assignment, they can complete the task in efficient manner at any time.

Challenges of Cloud

However the cloud helps to increase profit, and business value within short time frame while reduce cost, it still in its infancy. It associated with numerous challenges. Based on a survey conducted by IDC in 2008/09, the major challenges that associated with adoption of cloud computing within organizations are recognized as shown in Figure 1.

Rate the Challenges of "Clouds"

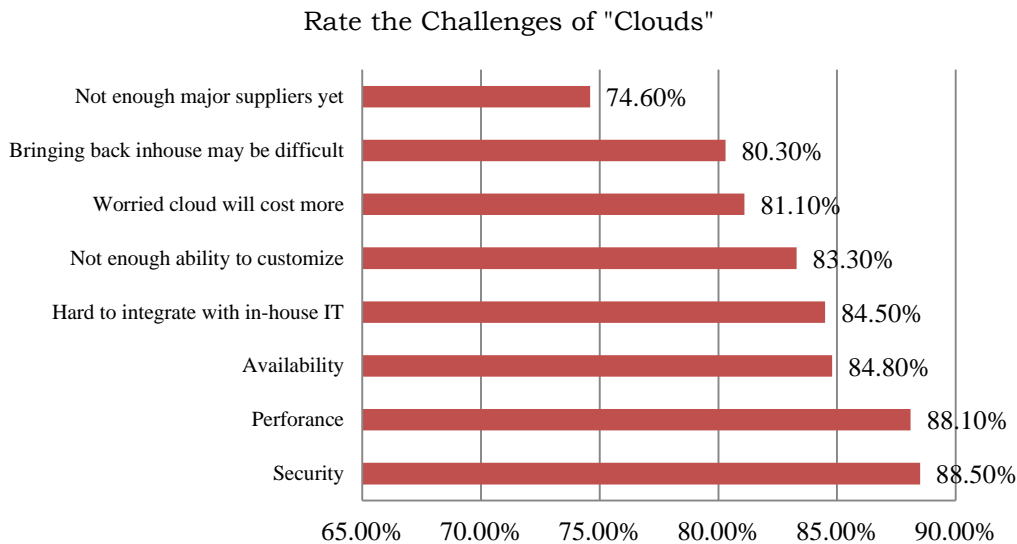| Challenge	Percentage
Not enough major suppliers yet	74.60%
Bringing back inhouse may be difficult	80.30%
Worried cloud will cost more	81.10%
Not enough ability to customize	83.30%
Hard to integrate with in-house IT	84.50%
Availability	84.80%
Perforance	88.10%
Security	88.50%

Figure 01: Challenges in Cloud (Source: IDC Enterprisse Panel Survey)

Security is the most serious issue in adoption of cloud computing, because in cloud computing the data center holds information, rather than the organization. Enterprises do not have power over of their data in cloud, they must trust the provider. This atmosphere increases the fear concerning user security and privacy of the data. Especially, business fear to store high-value customer data, trade secrets, classified information, or proprietary information data because the same underlying hardware may be used by other companies (Chen. Y et al, 2010).

Another limitation in using the cloud is performance instability and availability. Researchers revealed that Amazon, Google, and Microsoft undergo on issues related to performance and availability due to loads. Specifically, the researchers measured how the cloud providers scaled up and responded to the sudden demand of 2,000 concurrent users. In some cases, response times at different points of the day varied by a factor of 20 (Marios D. Dikaiakos et al, 2009). Another challenge associates with cloud is interoperability. Cloud interoperability refers to customers' ability to use the same artifacts, such as management tools, virtual server images, and so on, with a variety of cloud computing providers and platforms (Marios D. Dikaiakos et al, 2009). This rigorously impedes the development of cloud ecosystems by forcing vendor lock-in to specific providers, which hinders the ability of users to choose from alternative vendors simultaneously in order to optimize resources at different levels within an organization.

Conclusion

Cloud computing is an emerging paradigm for the business leaders. Companies worldwide are beginning to recognize cloud's capabilities to generate new business models and promote sustainable competitive advantage. To promote the cloud in business environment, these issues could be overcome and internet access providers have to provide the high band-width internet access facility with reasonable price to metro, urban, and rural areas.

Hybrid cloud approaches could be implemented to increase the security thread–Cryptographic approaches can consider in managing security and privacy issues. In the cryptographic approach the data will be encrypted and stored in the cloud. If someone wants to access data, the system should check its policy rules then decrypt it only if the policies are satisfied.

Make use of standard applications in cloud–To enable interoperability organizations have to build new standards and interfaces with a unique language that will enable enhanced portability and flexibility of virtualized applications. Security Assertion Markup Language (SAML), Extensible Access Control Markup Language (XACML), and Web services standards are viable solutions toward this. This unique language development will enable organizations to work with a variety of cloud computing providers and platforms to satisfy their need.

Making use of cloud computing correctly and efficiently in a business not only increase profits for the company but also the productivity and business value of a company.

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Version controlling for operating system configurations

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Introduction

When developing software, the use of a version controlling system is considered a good practice among software developers. Advantages of using a distributed version controlling system include automatic backups, ability to verify content authenticity, the ability to control versions and branching. It also benefits the programmer by encouraging them to focus on one task at a time. When used properly, a version controlled system provides a very detailed history of when and why something changed. This can be extremely useful when a new user tries to understand an existing system.

Meanwhile, operating system configurations are mostly managed by a single user according to requirements and their own preferences. This goal of this study is to apply distributed version controlling technology to manage changes made to server configurations in order to make them more maintainable.

Methodology

In order to test whether software versioning software can be used as is for versioning system states, a distributed version controlling system is used to perform all basic version controlling operations on system configurations. Version controlling operations tests by this study includes:

1. Store system state by creating commit points
2. Restore system to a previous state by reverting to any commit point
3. Creating branches to store different system states
4. Applying changes by merging branches

In order to prove compatibility, no changes are made to the version controlling software when used. Therefore, it must be possible to perform all system versioning operations without using any third party software other than a version controlling software. The system repository is also tested for compatibility with services built around version controlling systems such as repository hosting services such as Github and Continuous Integration services.

The following information are expected to be stored and changed successfully by the system when performing versioning operations:

1. Software installed on a system and their versions
2. System wide configurations for installed services

When implementing, Ubuntu Server 14.04 is used as the target operating system for this study. Git is used as the distributed version controlling system. It is assured that no Git incompatible changes are made to the repository and the system is kept stable at all stages. Therefore it can be used with repository hosting services such as Github A Git repository which can be placed anywhere on the system is used to track files inside the /etc directory. Git is configured to use these paths using environment variables. Therefore, the repository can be used with any Git client with proper settings. For this test, a repository is made at the root directory and properly configured to make sure it does not disturb other operating system functions.

Git-hooks play a major role for integration because it allows commands to be run when performing version controlling tasks. This allows for performing necessary tasks on the system when a change is made by Git commands.

A command line application is made to use the system. An interactive shell and a web interface were also made for developers who are not familiar with Git. The system is also abstracted so new user interfaces or support for new operating systems can be added easily.
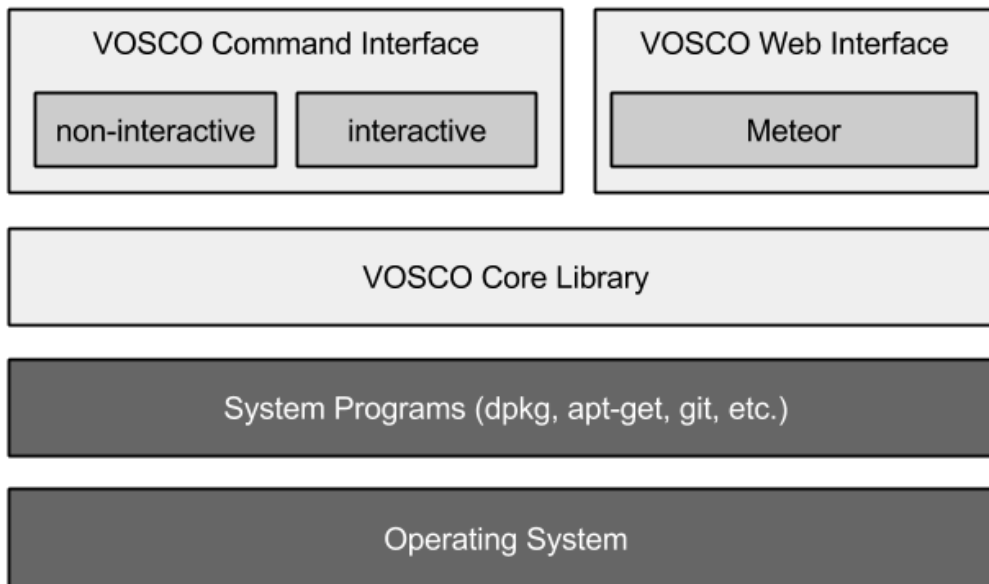

Figure 01: Architecture of the System

Result and Discussion

Git commit, checkout and branch commands can be used on a live system. Git merge, rebase and cherry-pick commands can be used on a live system only if there are no merge conflicts. When a merge conflict occurs, the system can be unstable until they are resolved. This is caused by lines added by the versioning system to indicate conflicts. It is observed when these lines are added, configuration files get corrupt which causes services using such files to malfunction.

Conclusions

Version controlling can be applied to system configurations on Linux using Git without making any changes to Git code.

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RIA-Bus: A conceptual technique to facilitate the AJAX-based rich Internet application development

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Introduction

Rich Internet Applications (RIAs) have become quite popular in this era of Web2 (Lawton, 2008). Compared to the traditional Web Applications, RIAs are faster, responsive and they have rich Graphical User Interfaces (GUIs) (Paulson, 2005). Among plugin-based approach and script-based approach, Asynchronous Javascript And Xml (AJAX) – which is a script-based technique to develop RIAs – grabbed the demand of the engineers due to many good features of AJAX. AJAX uses stable languages HTML, CSS, JavaScript; it is free; and do not need third party plugins (Farrell & Nezlek, 2007).

However the complexity of the AJAX based RIAs are considered high due to various reasons (Li & Peng, 2012) (Mesbah & Deursen, 2007). Hence, the application of Rapid Application Development (RAD) practices are not supported adequate in AJAX based RIAs engineering (Dissanayake & Dias, The Significance of Importance of an Architectural Pattern for AJAX Based Rich Internet Applications, 2014). To maintain the sustainability of both the developed RIA and the engineering project – not only in the initial development life cycle, but also in post deployment stages – it is important to identify the main cause of these complexities and address it.

Methodology

We conducted a literature survey to gain the background knowledge of the RIAs, AJAX, RAD, architectural patterns and the relationship between these areas. The main intention was to identify and understand the complexities and difficulties of enabling RAD in AJAX based RIA engineering.

As we gain the knowledge and identify some facts related to the complexities in AJAX based RIA engineering, we conducted a cross-sectional survey to verify the facts identified in literature survey. Also understanding of the up to date nature of the AJAX based RIA development was gained by analyzing the data gathered in the cross-sectional survey. The targeted crowed was the individuals engaged in AJAX based RIA engineering; specifically in the design and development phases. Data were gathered using a structured questionnaire with closed end questions and analyzed using statistical methods.

Parallel to the surveys, a series of experiments were conducted to understand and get the experience of AJAX based RIA designing and development techniques, tools, and complexities. This series of experiments was conducted as a prototype based incremental development. In each and every incremental complexities were identified, and some techniques to address the identified complexities were tested. The knowledge gained in the early iterations was applied to the later iterations. We used HTML5 and CSS3 for GUI development, JavaScript for client-side development along with jQuery library, and PHP as the server-side development language. Apache server was used to host the web application and for databases MySQL serer was used.

Results and Discussion

The key finding of the literature survey is, that the main reason for the complexities engaged in AJAX based RIAs engineering is, the lack of availability of architectural formalism for AJAX based RIAs engineering (Dissanayake, Dias, & Jayawardena, 2013).

In the analysis of the cross-sectional survey, we derived and highlighted the following results. The understanding of the general AJAX architecture is not difficult, and there is a good usage of Computer Aided Software Engineering (CASE)

tools in AJAX RIA development. However, the difficulty level of implementing AJAX features in the same page increases, with the number of AJAX features in the page (Dissanayake & Dias, 2014).

One of the complexities we noted throughout the series of experiments is that the difficulties engaged in the file management of the project. Referring to the AJAX general architecture, standard practice when implementing an AJAX feature is, pointing the AJAX request to a dedicated PHP script file in the server. This dedicated script file contains the code for the logic, to provide the complete respond for the particular request. Usually these script files contain few lines of codes, needed to handle the single request. When the number of AJAX requests increases, the number of the script files also increase parallel. To provide more rich features in the application, the need for more AJAX features grows, and as more AJAX features implemented, probably the AJAX request handling script files will be piled up in the server. As the number of script files increases, the logic could be scattered and it may create a complex environment, where the management of the server-side implementation is difficult. This setting will lower the realization of the architectural structure of the system too. Furthermore – due to the aforementioned facts – in the needs of modifications of the RIA, the effort needed will be higher, and this environment may affect the sustainability of the project too.

To control this situation we propose a conceptual technique, we name it as the RIA-Bus (Dissanayake & Dias, 2014). Instead of maintaining numerous small script files in the server to handle the AJAX requests, we advise to keep a single script file – what we call the RIA-Bus – which contains the code to receive all the AJAX requests; direct the processing of the request to the necessary scripts or functions; and respond back the client, with the results returned from the functions in the other script files. Figure 01 illustrates the architectural structure of the RIA-Bus.

A parameter will be sent to the RIA-Bus along with the request by the AJAX engine, to indicate the type of the AJAX feature, which requests the service. Based on the type of the feature, the RIA-Bus can decide, to where the processing should be passed. RIA-Bus is responsible for reading all the data sent by the AJAX engine – using either GET or POST method – and pass the data to the function dedicated for processing the data. Figure 02 shows a sample PHP code of a RIA-Bus.

The script files may contain code for all the logic of the application and organized in a way easy to manage. For an example all the user related functions may be written in one file and products related function may be written in another file. These files can be included into the RIA-Bus as needed and the functions in them can be called according to the type of the feature of the AJAX request.
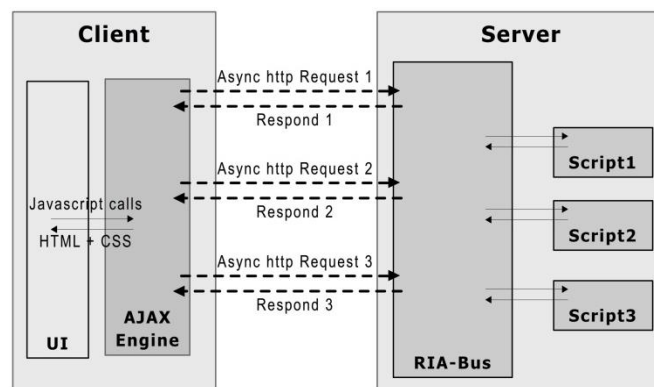

Figure 01: Architecture of AJAX-based RIA, using the RIA-Bus

```
$param = "";
if(isset($_GET["param"]))
{
        $param = $_GET["param"];
}
if(isset($_POST["param"]))
{
        $param = $_POST["param"];
}
if($param=="save")
{
        include_once("userData.php");
        echo saveData($_POST["uName"],$_POST["uAddress"]);
}
if($param=="read")
{
        include_once("userData.php");
        echo readData();
}
```

Figure 02: Sample PHP code of a RIA-Bus

Conclusions

According to the analysis of both literature and cross-sectional surveys we noted that a good understanding of the AJAX general architecture or a higher usage of CASE tools are not capable of reducing the difficulties in implementing multiple AJAX features in the RIA. AJAX based RIAs need good standards and proper architectural formalism (Dissanayake & Dias, 2014).

The integration of the RIA-Bus feature as an architectural concept, will facilitate reducing the number of script files in the server, and organizing the logic in the application in a more structured way. These facilities will provide a better management over the files and the logic, hence will enhance the realization of the RIA and help to maintain the sustainability of the project in both initial engineering and post deployment stages.

In future, we expect to use this RIA-Bus concept to enable better usage of Object Oriented Programming concepts with PHP, in AJAX based RIA development. We plan to incorporate Model-View-Controller architectural pattern with the RIA-Bus, to increase the realization of the RIA, hence reduce the complexities and difficulties in AJAX based RIA engineering (Dissanayake & Dias, 2014).

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Consumer mobile community

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Introduction

Whole population in the world can be identified as a group of consumers. The consumer protection is one of the important issues in this global village. Most countries use different methods and concepts to protect the consumer. Empowering the consumer with knowledge is one of the effective methods to protect consumer from market frauds. The consumer community, society, and consumer education programs are used to improve consumer knowledge in worldwide.

The Consumer Affairs Authority Act, No 09 of 2003 provides provision for consumer protection in Sri Lanka (Consumer Affairs Authority-2014). The consumer watch android mobile application and the Consumer Affairs Authority official web system have been published by the Consumer Affairs Authority in order to improve the knowledge of Sri Lankan consumer. The consumer watch android application provides facilities to search market prices, search consumer prices, search wholesale prices and search shopping lists in Sri Lanka. Using existing android application, consumer can only update the knowledge regarding the price list (Zmessenger - The Consumer Watch).

Though these improvements are introduced and established, still many market frauds and violence are reported in Sri Lanka. Therefore this project was carried out by the consumer mobile community android application to protect the Sri Lankan consumer from specific market violence, to empower customer with knowledge, make consumer mobile community application and to improve consumer's social awareness.

Methodology

The project was carried out at Uva Wellassa University using its computer facilities. Relevant consumer protection process, regulation and the technologies were collected. Android version 4.0.4, PHP, HTML, Java script, Json, SQLITE and MySQL were used as development languages. Android developer tools eclipse (Juno), Notepad++,   and XAMPP Control Panel 3.1.0 were used as development tools (Android Training API Guides; JSON Tutorial & AJAX Tutorial; Stack Overflow). The Use case diagram, Data Flow Diagram and the Entity Relationship Diagram were done under the logical design of the system. Android and the web development interface and the databases were developed under the physical design. Supportive admin panel web system was developed in the first stage of the project. The web system front end was developed using HTML and CSS. Ajax and the JavaScript function were used for the validation and PHP function call. Android web services and the web back end function were developed using PHP language.

Android mobile application was developed in the second stage of the project. APP interfaces were designed based on responsive Xml design. Therefore the mobile application is compatible with the different screen sizes of the mobile devices. Mobile application used HTTP request and response to communicates with the web system. Json array Format was used to send and received the information between mobile application and the web site. All back end functions in the website were developed using the PHP scripts. Both PHP and the android language were provided by Json encode and the decode function. Therefore it was great technical advantage to share large amount of information between server and the mobile application.

The main functions flow of the system is explained by Figure: 01 Data Flow Diagram .The consumer and the web admin are the main two users who interacted with the system. A consumer's mobile phone is registered automatically when the application icon is clicked, after which the consumer's profile information will be updated with the system. The login could be done after the profile is updated. After login process, consumer is able to perform functions such as make a call, search a profile and price list, share or read market frauds, make comments on share market frauds, browse web, and search GPS location etc.

The web administrator can directly login to the system via web admin panel. He has permission to manage the consumer registering profile and the consumer shared market frauds. Also he can enter, update and delete data used by the consumer via mobile application .Also market fraud's analytical reports can also be generated via web system.
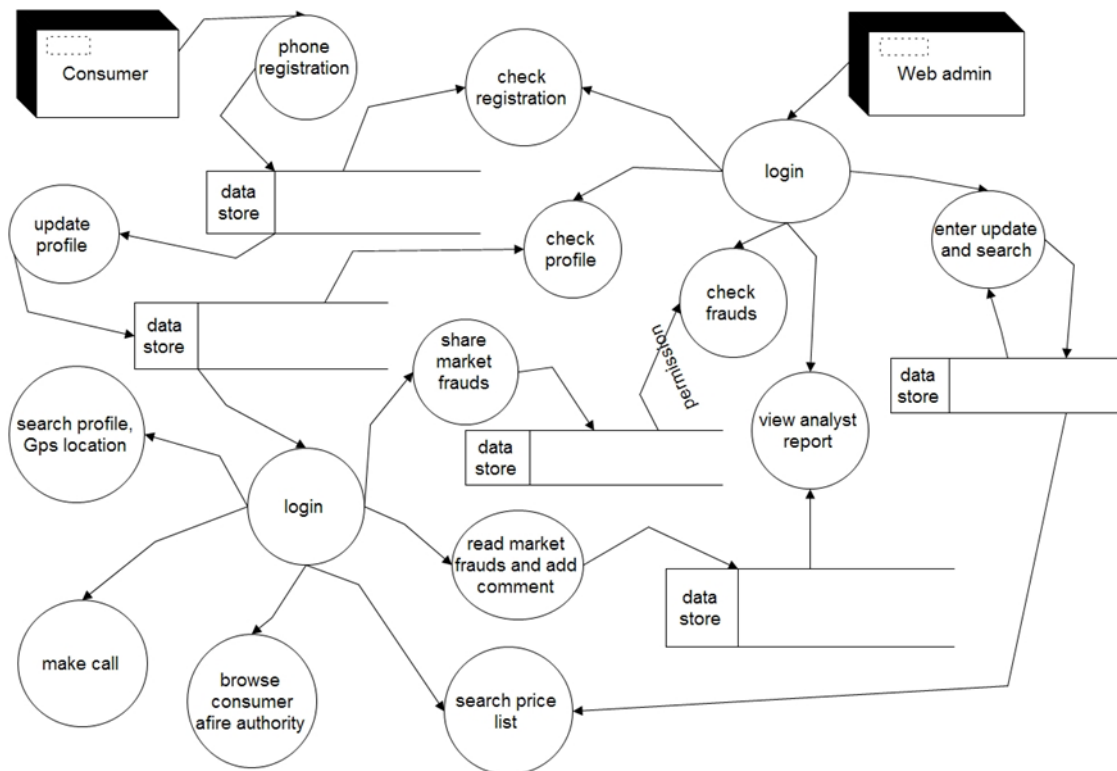

Figure 01: Data Flow Diagram

Result and Discussion

The Android mobile application with the Admin web system was the final outcome of the project. The mobile device is automatically registered with the web system when the user logged into the mobile application. Then all relevant basic information is downloaded and the stored inside the SQLite database in Android application. Mobile application uses the stored information, when user performs function using mobile application. Application provides facilities to upload and update the web system at real time. Search, complain, news, price list, ask help, consumer affair authority and your location are the main features of mobile application. Internet connection is essential requirement for the use of this app.

Web system provides facilities to perform delete, update, insert, observe, view and to get the analytical report. Web admin can access the web site after login the website. District price levels, Regulate products, Register business, Island price level page icon contain the update section on the main page. Sri Lanka Postal code, web links Update, Change Admin User and Add Contact Number List are on the preference section. Consumer Share news, Comment Analyst Reports, consumer profile search and Frequently News Share Shops icons contain the consumer section on the page. These entire icons are linked with web pages.

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Stock handling and analyzing system for multi-purpose Co-operative society, Eheliyagoda

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Introduction

The multi-purpose co-operative society is one of the largest business bodies around the area which has number of regional shops (around 40) throughout the division which are controlled by the head office situated at Eheliyagoda. This multi-purpose co-operative society offers large verities of consuming goods to fulfill the needs of the consumers around the area. In order to cope with this particular customer demand, a specific stock handling mechanism is needed. This stock handling mechanism should be run by the main store complex as the base under the co-operative supervision of a store manager and the head office authorities while regional shops playing an important role.

With the existing manual stock handling procedure, it is difficult to maintain the stock details and to communicate between the store complex, head office and the regional shops. As an example, if a regional shop manager wants to tally the consumer demand information, he/she needs to do it manually and needs to come to the main store complex in order to handover the consumer demand information and then the store keeper has to carry his/her reports to the head office. In this context proper application is needed to integrate the regional shop manager, store keeper and the head office authorities in stock handling procedure. After receiving the customer demand report, the head office authorities need to look for the suppliers from whom that particular goods can be bought for a fair price. This is also a time wasting and exhausting task. In this context, they need an effective mechanism to call prices for the required goods hence they can decide the optimal supplier to be reached which means this system can help the co-operative society to build a strong links with external suppliers..

Methodology

In order to cope with above mentioned short comings, a proposed system has come up with two solutions. The first one is the desktop software application which helps the internal parties (regional shop managers, store manager, head office authorities) to integrate each other for effective stock handling procedure. The other solution is the web application which helps to call prices from the external suppliers and ultimate to build some strong links with external parties.

Data collection, Result and Discussion

The data collection was done by an advanced discussion and a smooth study. nThe advanced discussion covered the entire process flow of multi-purpose co-operative society, Eheliyagoda. The authorities have pointed out the weak links/vacuums which are generally can be seen their process flow. That was really a complex one comparing to a general scope of a final year project of a bachelor's degree. The fact that has been pointed out by them was the requirement of an effective procedure of stock handling. There are specific forms can be seen in order to use in their stock handling process flow. These forms helped greatly to draft the Skelton of the system and carry it on.

According to the drafted system, four roles can be understood. They are;

    I.   Regional shop managers.
    II.   Store keeper.
    III.   Head office authorities.
    IV.   External suppliers.

The proposed system comprises with a desktop application to integrate regional shop manager, store keeper and the head office and the web application integrate the firma and the external suppliers in order to call prices. Java, PHP, CSS3,

HTML5, javascript have been used to develop the system. Apart from that, NetBeans was the Integrated Development Environment while notepad++ has been used as the text editor.

The ultimate output of the system was generating the real time profit and loss account of the main store complex which can be viewed by both the store manager and the head office authorities in order to do decision making.
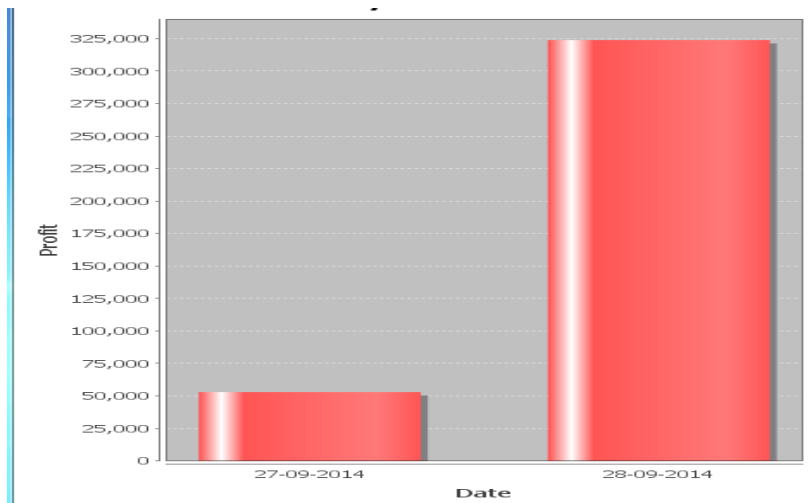

Figure 01: The comparison of the real time net profit.

Conclusions

This system will help the co-operative society as a standout performer among the other business bodies around the area and if this can be developed further which is going to be a great boosting for the entire co-operative sectopr in SriLanka. The final goal of the software application is generating a life time value to corporate society by laying the Information Technology based foundation to cope with existing global competition and providing customer satisfaction effectively.

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