International Journal of Network and Mobile Technologies
ISSN 1832-6758 Electronic Version
VOL 1 / ISSUE 1 / JUNE 2010

This paper is available online at
http://ijnmt.intimal.edu.my/

Design of Multimedia Messaging Service for Mobile Telemedicine System

Andik Setyono[1], Md. Jahangir Alam[2], and Raed Ali Al-Saqour[3]

[1] Faculty of Information Technology, Multimedia University, andik.setyono08@mmu.edu.my
[2] Faculty of Information Technology, Multimedia University, md.jahangir.alam@mmu.edu.my
[3] Faculty of Information Technology, Multimedia University, raed.ali.helal@mmu.edu.my

Abstract

The growth of information and communication technologies (ICTs) has already revealed an impact on our modern society. Mobile messaging technologies have already been considered as a key field for variety of research to pick up the knowledge how ICTs can help the modern society people, who are dynamically shifting toward information-based civilization. Multimedia messaging service (MMS) is one of the branches of mobile messaging technologies, which is a rich content message sending system that not only sends text but also sends image, voice, animation or combination of them. MMS can be sent to mobile phone number and also to email server. MMS are growing widely for many purposes, such as streaming, mobile learning, mobile commerce, telemedicine, etc. This research proposes an architecture and algorithm of MMS frame work for a mobile telemedicine system. MMS establishes a proper communication between the doctor who is working in the hospital and the nurse who is providing assistance to the patients at patient's living place. This telemedicine system is expected to provide an effective treatment to the patients who are living in remote areas.

Key words: Multimedia Messaging Service, Mobile Telemedicine, MMS framework

1 Introduction

In recent years, one of the sectors of information system application, which is medical sector, is increasingly showing interest in developing a communication system which can provide facilities for the doctors and nurses who are working at different places at the same time. The doctor might work in the hospital and the nurse might give assistance to the patient at patient's living place in the remote area. Supporting and integrating information technology in medical sector have born several kind of concepts that innovative in technical diagnosis and handling the patients, such as telemedicine [1]. Telemedicine is defined as the use of telecommunication to provide medical information and services remotely. By the definition, telemedicine is the practice of health communication using audio, visual and data [2]. Benefits of telemedicine include the 3-side of each other related to one another, namely patients, doctors and hospitals. Telemedicine provides direct benefits for patients, such as speeding access to patient's referral centers to get assistence while waiting for help from the private doctors, patients still feel close to home where family and friends can provide support directly, selected patients are taken to the hospital and non-emergency cases are not taken to the hospital for treatment [2].

The application of telemedicine system in general use a high level of technology and require a big funding to provide the hardware and software. This research attempts to design a telemedicine system, specially for telediagnosis using MMS and Java technology. It is expected that the created telemedicine system will be cheaper and affordable. The telemedicine system built with ICT becomes more effective and sustainable [3].

Telemedicine field is one of the coverage areas of biomedical engineering that needs multidisciplinary technologyies, such as computer, telecommunications, and also instrumentation to transfer medical information from one place to another and to assist the implementation of medical procedures [3]. Telemedicine is a part of telehealth, which is built based on the technologies by using telecommunication for the interaction between health professionals and patients in order to execute medical actions at distance [4].

In recent years, many telemedicine applications are using mobile technologies, such as mobile personal electrocardiogram using MMS [4],[5], mobile patient monitoring using WAP [6], mobile teletrauma system using 3G network [7],[8], etc. In this research, we develop MMS frameworks for a telemedicine system. By using MMS, we can send message in the form of multimedia content in mobile condition. The message can be send to mobile phone number and also to email server with a bigger data size comparing to any other mobile messaging services. We predict that mobile and internet technologies will be popular in future including MMS [9]. As we know that most of the new mobile phones are MMS capable, so that they can be used for developing telemedicine applications in mobile condition for anyone. This is the reason why we want to investigate the MMS framework for telemedicine**.**

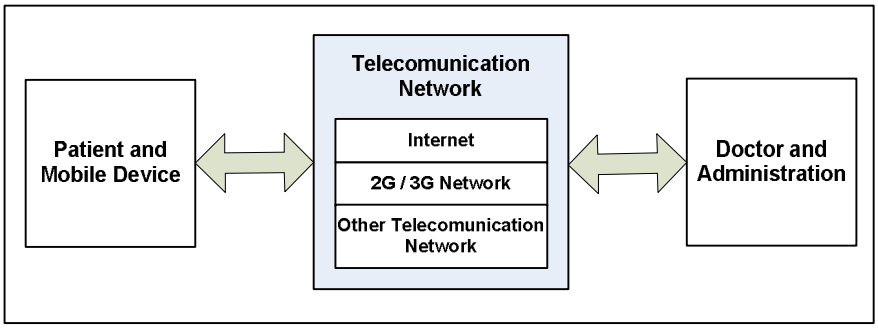

Figure 1. Block diagram of the telemedicine system based on mobile technology

The block diagram of a general telemedicine system based on the mobile technology including MMS is depicted in figuer 1. The patient who is at home with a mobile phone can also send message to the server in the hospital using the telecomunication network. The doctor who works in the hospital can access and upgrade the data.

Multimedia Messaging Service (MMS) is one of the communication applications that provides message sending services in many formats, like text, photo, graphic, animation, slide presentation, voice or video clip. Many new technologies are combindly used with browser, server, and new markup language in the modern mobile devices. Many service applications are implemented with these elements. MMS can be used interactively through wireless devices and the information can be sent from the server efficiently [1].

In this research, we try to develop a telemedicine system where the system can give information automatically to nurse at patient's home. When the doctor finishes the dignosis and tries to save the data in the hospital server, the information generator will create a message automatically and send it to the nurse at patient's home. Besides that, this application can be used to estiblish a communication channel between the nurse and the doctor in the hospital.

Through the system, the nurse will be able to send messages or do a live chatt with the doctor. It is expected that the system will provide a better treatment for the patients in mobile condition.

2 Proposed Design

The proposed design of the mobile telemedicine system is depeicted in figure 2. The proposed design looks similar to the idea given in the researach paper [4], but our research is singnificantly different from that idea. The research paper [4] describes only about data integration, vendor locking and interoperability. In our research work we emphasized on the framework design for MMS for a mobile telemedicine system.

In this research, we try to develop a telemedicine application that can be used to telediagnosis. Where a nurse at patient's home or even the patient himself/herself can send the information in the form of multimedia content using MMS technology. We use the Java technology for developing the system. Java 2 Enterprise Edition (J2EE) is used for creating the application in the server and Java 2 Micro Edition (J2ME) is used for creating the client application. Figure 2 explains how the nurse at patient's home can send patient's information, such as symptoms of illness, picture of wound, voice or video of patient to the doctor in the hospital. The information can also be sent through email system in the form of multimedia content. The data obtained from the mobile phone number or from the the email server is converted into a formatt which is suitable for storage in a database in the server. In this case MySQL will be used. It will also update the MMS contents automatically. The database will be used in future for diaognosis or research purposes.

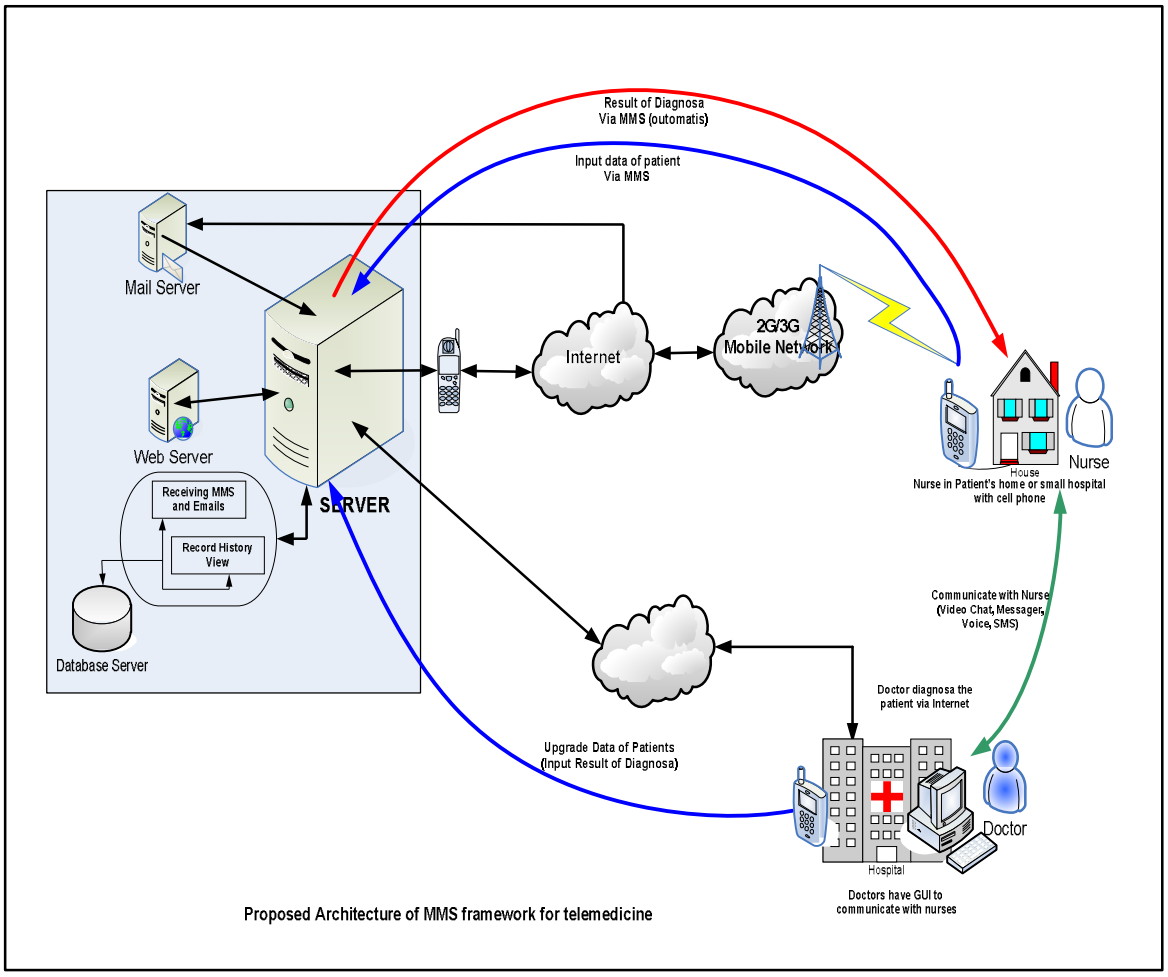

Figure 2. Proposed architecture of MMS framework for mobile telemedicine system

From stored data in a database server (MySQL), we can process and manipulate them using the telemedicine application. After receiving the patient data by the server, the system stores them in the databse. The doctor can observe the patient data and does the diagnosis accordingly. Once completed the diagnose, the doctor up-grades the database with inputing the results of the diagnosis to the system. Once finished the diagnosis and pressed the

button by the doctor for saving the data in the database, it will be recorded in the MySQL database and the system will automatically send the diagnostic results to the nurse at the patient's home through mobile phone number or email server based on the available communication systems. The nurse, who is at the patient's home, can communicate and consult with the doctor for obtaining conclusion remarks. The nurse can use SMS, phone, or chat by using the facilities of GPRS/UMTS.

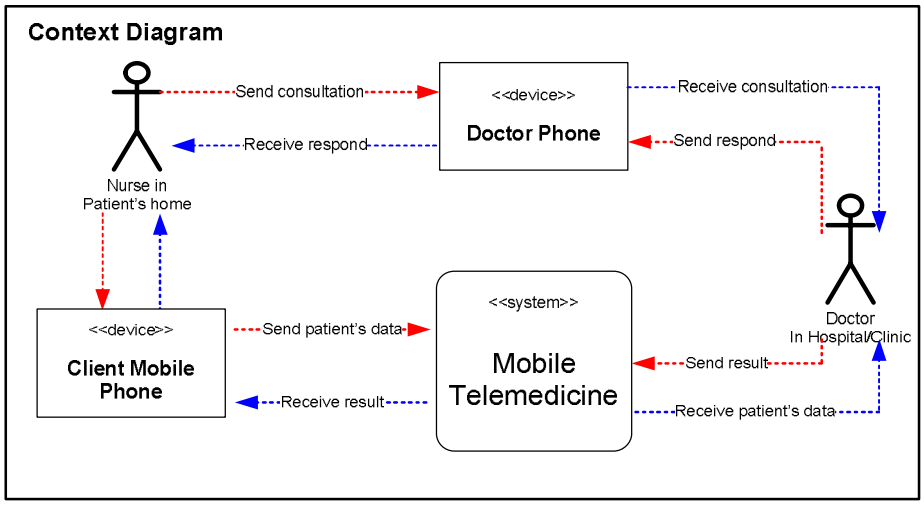

Figure 3. Context diagram for mobile telemedicine system

3 Discussion of development

This research tries to develop a mobile telemedicine system using MMS technology that will be built by utilizing Java technology. During the development phase, we will have to consider several research points, such as developing the algorithm for retrieving and converting data into database server, developing an automatice information processing system and also developing the algorithms for sending the data that exceeds the upper limit of MMS capacity. For this research, we focus on sending and receiving MMS that can exceed the upper limit data size.

3.1.1 Sending MMS with Upper Limit Data Size

As we know that MMS can send the multimedia message upto 300 Kb. But in the real world, almost all of the cellular service providers only provide the data size of 100 Kb and this is very small data size for a telemedicine system. Doctor needs high quality of image, voice or video to diagnose the patient properly. For example, a nurse want to send the patient data in the form of image with a size of 500 Kb. Certainly, MMS can not send it because the maximum data size of MMS is 300 Kb. To solve this problem, we can develop an algorithm by splitting the image file into 5 files where every file is 100 Kb and send them one by one. Although this method is time consuming and costly, but this is very crucial for dianosis by doctor to produce the best results. After receiving the patient data successfully, the server application merges the seperate files into a single file again. The doctor does not care how the mulitmedia content arrives but he/she can observe and diagnose based on the single file of the multimedia content.

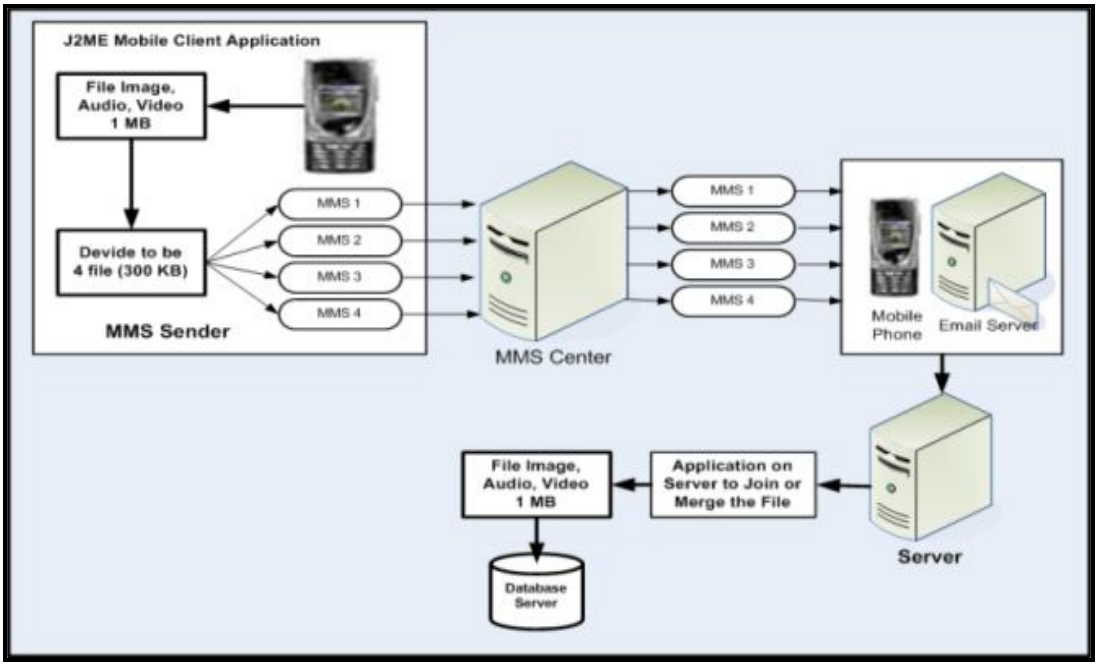

Figure 4. Design for sending upper limit data size of MMS

3.1.2 Design of Algorithm for Splitting Data

This is an innovatve idea in this research work. We try to develop the algorithm to split and merge the MMS data that can exceed the upper limit data size. Although it needs higher cost than if we could compress the data, but the compression may reduce the quality of the multimedia content, and then the doctor may face difficulties for diagnosis and ultimatley the outcome of the diagnosis may not be accurate. The system will be adaptive and efficient for using in remote areas. Figure 5 shows the flowchart of the designed algorithm for splitting and merging the data.

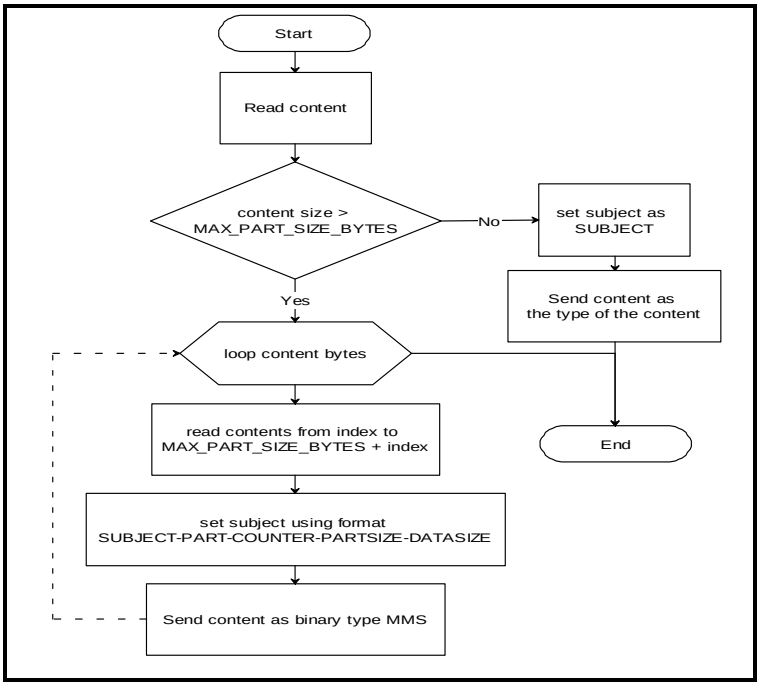

Figure 5. Design of algorithm for splitting data

The splitting process is done based on the file type and size. The data in the file is packed in the form of bytes. The first step is to check the original data size of the mulitmedia content, if it does not exceed the upper limit of the capacity, it can be sent via MMS directly using the service provider capability. If it is more than the upper limit size, it will be splitted into several files depending on the size and type of the content. Figure 6 shows the program for the algorithm explained above.

```
if(contents.length > MAX_PART_SIZE_BYTES + 1){
   isBigMMS = true;
   System.out.println("split message " + contents.length);
   messageSize = contents.length;
   for (int i = 0; i < contents.length; i++) {
   int istart = i;
   int iend = istart + MAX_PART_SIZE_BYTES;
     int len = iend > contents.length ? contents.length - istart :
   MAX_PART_SIZE_BYTES;
   iend = istart + len;
   System.out.println("istart:"+istart+"; iend:"+iend+"; len:"+len);

   // create image message part for mms
   mp = new MessagePart(contents, istart, len, mimeType,
   "id" + counter, contentLocation, null);

   // save message part in the messages vector
   messages.addElement(mp);
   counter++;
   i = iend; }
}else{
   System.out.println("make simple messagePart");

   // create image message part for mms
   mp = new MessagePart(contents, 0, contents.length,
   mimeType, "id" + counter, contentLocation, null);

   // save message part in the messages vector
   messages.addElement(mp);
   counter++;
}
```

Figure 6. Design of algorithm for splitting data using J2ME

3.1.3 Design of Algorithm for Merging Data

After retriving the MMS data from the mobile phone number or from the email server, it will be merged into a single file and will be stored in the database server (MySQL).

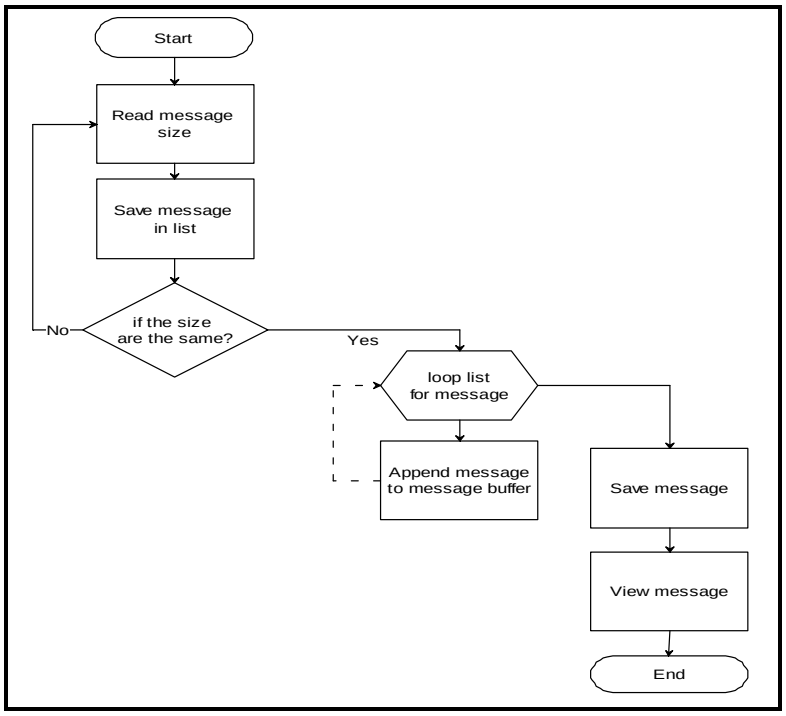

Figure 7. Design of algorithm for splitting data

Figure 7 shows the flowchart of the merging algorithm. The first step of the algorithm is to read the original message data size. If the total messases data size is bellow the original messsage date size, all the individual message with a particular file identifier will be stored inside the database in the same folder. When the total size is equivalent to the original data size, all the splitted messsages in the same folder will be merged into a single file. Then, the message will be stored in the database. The doctor will be able to observe the whole message content as a single file.

4 Evaluation of development

The system is expected to provide solutions for the problems related with the mobile telemedicine system using MMS technologies, such as retrieval of MMS data from the mobile phone number or from the email server and and conversion into the database server (MySQL), the adaptive transmission of the MMS which can transmit data exceeding the upper limit data size, the data is splitted on the client mobile phone and merged on the computer server. Here, we try to show that MMS capability can be increased. This research work proposes to design a model of a mobile telemedicine system. The system is expected to provide an illustration about an internet application that can be accessed in mobile condition. Hence, user is a center, wherever he/she is, can consult with the doctor using the system without coming to the hospital.

5 Conclusion

The main contribution of the research paper is to provide an understanding about the MMS framework for mobile telemedicine system. Secondly, it shows how to design a model and algorithm for sending and receiving MMS contents exceeding the upper limit data size. We use splitting and merging algorithm to solve this problem. We do splitting on mobile client and merging on the database server. Finally, it gives an understanding how to utilize MMS technology and try to increase the capability. The outcome of the proposed reseacrh is expected to produce a system which is efficient and adaptive. We can increase the MMS capability for sending MMS. As our future work, we intend to use the MMS framework for internet applications that will be efficient and adaptive for a mobile telemedicine system.

Reference

[1] [Edy Djunaedi (2006), Design and Implementation of Telemedicine Information System based on MMS Technology, stttelkom.ac.id.
[2] [http://www.idi-sumsel.org/index.php.
[3] [Kelompok Keahlian Teknik Biomedika (2006), Sistem Telemedika Berbasis ICT Dalam Pengelolaan Masalah Kesehatan Masyarakat, Sekolah Teknik Elektro & Informatika.
[4] [Asadullah Shaikh, Muhammad Misbahuddin, Muniba Shoukat Memon (2007), A System Design for a Telemedicine Health Care System, I.T University of Goteborg, Sweden and Mehran University Pakistan
[5] [Ashraf A Tahat (2008), Mobile Personal Electrocardiogram Monitoring System and Transmission Using MMS, Proceedings of the 7th International Caribbean Conference on Devices, Circuits and Systems, Mexico.
[6] [Kevin Hung, Yuan-Ting Zhang (2003), Implementation of WAP-Based Telemedicine System for Patient Monitoring, IEEE Transactions on Information Technology in Biomedicine, Vol. 7, No. 2.
[7] [Yuechun Chu and Aura Ganz (2004), A Mobile Teletrauma System Using 3G Networks, IEEE Transactions on Information Technology in Biomedicine, Vol. 8, No. 4
[8] [Polley R. Liu, Max Q. H. Meng, Fanny F.L. Tong, X.J. Chen, Peter X. Liu (2006), A 3G based Network Solution on the Telehealthcare Robotic System, IEEE.
[9] [Andik Setyono, Md. Jahangir Alam, Raed Ali Al-Saqour (2009), Evaluation and Analysis of Multimedia Messaging Service (MMS) in Message Delivery, Malaysia.