Hand Held Emergency Wireless Telemedicine System

Suganthi.J. [#], N.V.Umareddy [#] and Sridharan.B [*]

[#] Student AMC Engineering college, VTU Karnataka, India [#]professor AMCEC, VTU Karnataka, India [*]group lead, DRAX,C-DOT, Bangalore, India

Abstract—with the rapid development of computer science and communication technologies, doctors will employ electronic communication to facilitate patient care more and more. We have developed a portable telemedicine system which is much more flexible, robust and easier to use.It helps eliminate distance barriers and can improve access to medical services that would often not be consistently available in distant rural communities. It is also used to save lives in critical care and emergency situations. There are many healthcare technologies which have been implemented around the globe. Amongst these technologies, very few are used for an emergency case. In this paper we are going to introduce Portable Emergency System which is based on Locate-Diagnose-Move technique. This system is the collaboration of GSM/GPRS, GPS, sensors (wearable device) and P2P technology. This system is will be useful for all people especially for the emergency movement and diagnoses the roaming heart (Cardiac) patients, diabetes patients, elder peoples as well as accidental victim. The main aim of this system is to provide urgent provisional medication and movement of patient to the hospital which can save lives of many before the contact of expert doctors.

Keywords—India; TeleHealth; Telemedicine; GSM, GPRS; GPS;P2P (Peer to Peer); , mobile, wireless, Cardiac

I. INTRODUCTION

Recent developments in telecommunications and information technology enhanced availability of telemedicine system in health care fields. Telemedicine is defined as the delivery and sharing of medical information of patient over a distance using telecommunication. Existing telemedicine systems only exchange the information in a limited location. Using the portable device, the telemedicine service is feasible on the move.

Telemedicine provides the facility for patients to receive medical treatment from their own desired place. It helps to save the time and money for such people who cannot afford the travel along with the factor of cost. Telemedicine helps in providing significant services to those areas where medical facilities are not available commonly. Apart from benefits of telemedicine, there are such obstacles that exist in this area. Those barriers are legal issues of physician, patient confidentiality and so on. Currently telemedicine systems involve an integration of networking technologies with healthcare processes. The interoperability problem in telemedicine is clear in patient monitoring, diagnostic, decision support and communication systems needed at the point of care. Different telemedicine systems are made by different vendors and they apply different technology, standards and information [1]

II. EXISTING TELEMEDICINE SYSTEM

Early forms of telemedicine achieved with telephone and radio have been supplemented with video telephony, advanced diagnostic methods supported by distributed client/server applications, and additionally with telemedical devices to support in-home care.

Telemedicine can be broken into three main categories: store-and-forward, remote monitoring and (real-time) interactive services. Store-and-forward telemedicine involves acquiring medical data (like medical images, bio signals etc.) and then transmitting this data to a doctor or medical specialist at a convenient time for assessment offline. It does not require the presence of both parties at the same time.

Dermatology (tele dermatology), radiology, and pathology are common specialties that are conducive to asynchronous telemedicine. A properly structured medical record preferably in electronic form should be a component of this transfer. A key difference between traditional in-person patient meetings and telemedicine encounters is the omission of an actual physical examination and history. The 'store-and-forward' process requires the clinician to rely on history report and audio/video information in lieu of a physical examination.

Remote monitoring, also known as self-monitoring or testing, enables medical professionals to monitor a patient remotely using various technological devices. This method is primarily used for managing chronic diseases or specific conditions, such as heart disease, diabetes mellitus, or asthma. These services can provide comparable health outcomes to traditional in-person patient encounters, supply greater satisfaction to patients, and may be cost-effective.

Interactive telemedicine services provide real-time interactions between patient and provider, to include phone conversations, online communication and home visits many activities such as history review, physical examination, psychiatric evaluations and ophthalmology assessments can be conducted comparably to those done in traditional face-to-face visits. In addition, “clinician-interactive” telemedicine services may be less costly than in-person clinical visit[2] Telemedicine provides the facility for patients to receive medical treatment from their own desired place. It helps to save the time and money[3]

Tele monitoring is a medical practice that involves remotely monitoring patients who are not at the same location as the health care provider. In general, a patient will have a number of monitoring devices at home, and the results of these devices will be transmitted via telephone to the health care

provider. Tele monitoring is a convenient way for patients to avoid travel and to perform some of the more basic work of healthcare for themselves.[4]

In addition to objective technological monitoring, most tele monitoring programs include subjective questioning regarding the patient's health and comfort. This questioning can take place automatically over the phone, or tele monitoring software can help keep the patient in touch with the health care provider. The provider can then make decisions about the patient's treatment based on a combination of subjective and objective information similar to what would be revealed during an on-site appointment.[5]

Some of the more common things that tele monitoring devices keep track of include blood pressure, heart rate, weight, blood glucose, and haemoglobin. Tele monitoring is capable of providing information about any vital signs, as long as the patient has the necessary monitoring equipment at his or her location. Depending on the severity of the patient's condition, the provider may check these statistics on a daily or weekly basis to determine the best course of treatment.

III. PROPOSED SYSTEM

Heart failure is generally regarded as the inability of the heart to provide adequate blood flow to the body. This progressive disorder affects over 5 million people in the United States and around 15 million worldwide. There is a 20% lifetime risk of developing heart failure for both men and women. Mortality rates of 30%–40% during the first year after diagnosis have been published, and after 5 years, this percentage increases to 60%–70%. Out of these, more that 50% dies without the in-time treatment or emergency movement.

If we talk about road accidents in metros, average 30% to 40% victims die on road because of lack in communication and tracking systems. 10% die because of first-aid treatment. To avoid this type of death, a strong emergency system is required. [1]

In the case of emergency situation normal telemedicine system will not workout. Because in normal condition the doctors and patient will be present at both the ends. But in emergency situation we cannot expect the doctor at the other end. For that we have to add GSM module to the send SMS the patient information to the doctor and the nearby hospital. So they will send ambulance and doctor immediately to the patient place. In this way we can save the patient easily

- **THE GSM AND GPRS SYSTEMS**

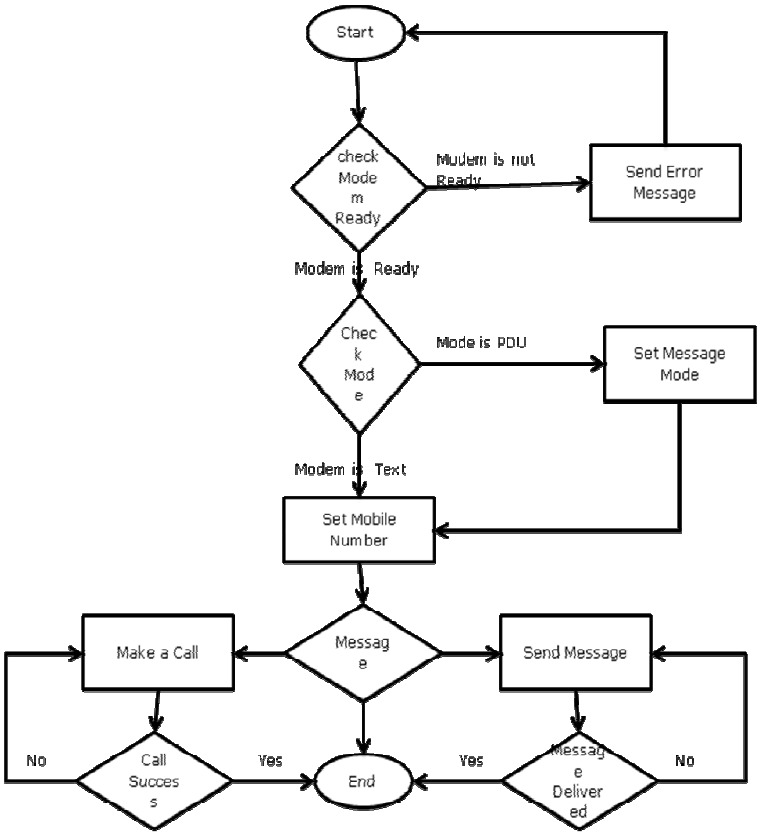
The main wireless technologies that are being used in wireless telemedicine systems are the GSM, GPRS, satellite, Wireless Local Area Network (WLAN) and Bluetooth. The GSM is considered as the second generation (2G) of the mobile communication networks.

TABLE I
GSM AND GPRS FREQUENCY BANDS AND DATA TRANSFER RATES

Type	Frequency band	Data transfer rates
GSM	900/1800/1900 MHz	9.6 – 43.3 kbps
GPRS	900/1800/1900 MHz	171.2 kbps

When GSM is in the standard mode of operation, it provides data transfer speeds of up to 9.6 Kbps (see Table I). Throughout the years a new technique was introduced in the GSM standard called HSCSD (High Speed Circuit Switched Data). This technology makes it possible to use several time slots simultaneously when sending or receiving data, so that the user can increase the data transmission up to 43.3 Kbps [3].

The theoretical maximum downlink data rate for GPRS is 171.2 kbps



Flow chart of GSM Operation

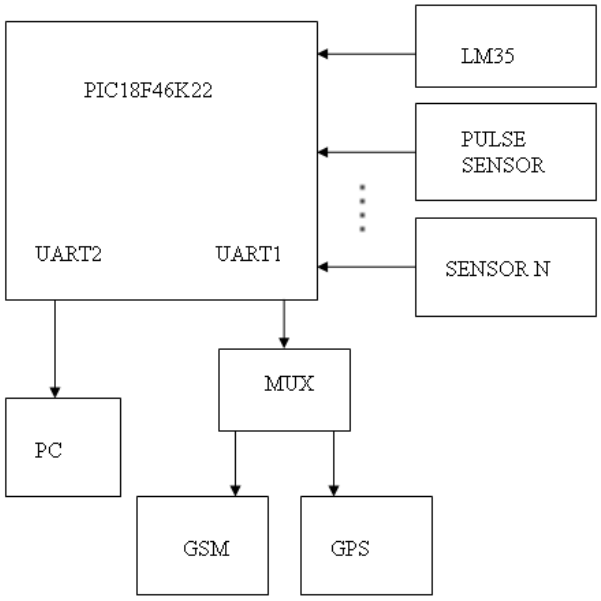


Figure 1. Block diagram

IV WORKING OF THE SYSTEM

These technologies permit communications between patient and medical staff with both convenience and fidelity, as well as the transmission of medical, imaging and heath informatics data from one site to another. This device works as telephone using GSM/GPRS, for locating patient GPS etc. as well as to measure few biological parameters like pulse rate (PR), blood pressure (BP), body temperature etc.[1]

The heart of the circuit is PIC18F46K22 microcontroller. This family offers the advantages of all PIC18 microcontrollers – namely, high computational performance at an economical price – with the addition of high-endurance, Flash program memory. On top of these features, the PIC18 (L) F2X/4XK22 family introduces design enhancements that make these microcontrollers a logical choice for much high performance, power sensitive applications.

All of the devices in the PIC18(L)F2X/4XK22 family offer ten different oscillator options, allowing users a wide range of choices in developing application hardware.

The entire sensor's output is given to the microcontrollerThe wearable system consists of an PIC processor Two links run at RS-232 levels, and are for dedicated RS-232 devices. Any commercially available device that runs RS-232 (such as a GPS, GSM) can be connected.

If the doctor at remote distance wants to communicate with the patient, he or she can do so through a microphone-loudspeaker that's incorporated into the device. If necessary, an ambulance can be quickly dispatched to the patient's location. The patient is easily found with the built-in GPS receiver

- Red Alert Button, which will alert the heart patient that something, is going wrong. That might be abnormal pulse rate or BP or body temperature or combination of any parameters. This alert will be for specific time of 30 sec., after that automatic call goes to Monitoring Center.
- Speaker, which is used for telephonic conversation.
- Call Button, which is useful for talking with Monitoring Center or with the relatives in emergency when the red alarm starts.
- Display, which is useful to display normal time, phone numbers as well as other bio-parameters like BP, pulse rate, body temperature etc. time-to-time with the help of motion keys.

V EXPECTATION

The Telemedicine system makes health care system more affordable and easily accessible to everyone. It can be life saver in cases of emergency situation. The telemedicine system approach is a way to enable extremely powerful strategies for preventing diseases and improving health and the overall quality of life for elderly and chronically ill persons living alone into their homes. When taken one by one, the architecture of each system component. With the hope that Telemedicine can address rural and urban healthcare needs, The system offers a realistic, face-to-face experience remotely while concurrently offering high resolution video images, as well as high-fidelity telephonic audio. In the case of emergency situation normal telemedicine system will not work out. Because in normal condition the doctors and patient will be present at both the ends. But in emergency situation we cannot expect the doctor at the other end. For that we have to add GSM module to the send SMS the patient information to the doctor and the nearby hospital. So they will send ambulance and doctor immediately to the patient place. In this way we can save the patient easily.

Telemedicine is a generic term covering the application of a variety of proven electronic and communication techniques in providing healthcare. The techniques have already been applied in the context of teletriage, telediagnosis, telefollow up and telemonitoring.

Telemedicine has a variety of applications in patient care, education, research, administration and public health. It has the potential to deliver several benefits to patients, clinicians and the health service as a whole.

VI. CONCLUSION AND FUTUREWORK

The small portable device will play an important role in the TeleHealth system by providing Locate-Diagnose-Move services to the roaming heart patients and accidental victims to save their lives. If we utilize the available resources in Indian metros (initially) like GSM/GPRS network. GPS services (ISRO) etc. Using this system, we can save up to 50% lives that are losing it without primary treatment in emergency.

In future, we will come with P2P- system. Further we would like to propose Wearable Tele-Bio Watch with additional facilities to reduce the rate of mortality without treatment. We

are supposed to add facilities like speed alarm, which will alert you if you are crosses the speed limit to avoid accidents. Another facility of display your location, which will help you to locate yourself in emergency. In future this device can replace your mobile phone completely.

REFERENCES

[1]. TeleHealth: Healthcare Technologies and TeleHealth Emergency (THE) System
Minesh Ade,Nikolaos Doulamis,Shyam S. Wagle,M. Ghazanfar Ullah
978-1-4577-0787-2/11/$26.00 ©2011 IEEE

[2]. Portable emergency telemedicine system over wireless broadband and 3G networks
SungHye Hong, SangYong Kim, Jungchae Kim, DongKyu Lim, SeokMyung Jung, DongKeun Kim, Sun K. Yoo September 2-6, 2009

[3]. The Role of Service Oriented Architecture in Telemedicine Healthcare System
Asadullah Shaikh ,Muniba Memon,Nasrullah Memon,Muhammad Misbahuddin
978-0-7695-3575-3/09 $25.00 © 2009 IEEE DOI 10.1109/CISIS.2009.181

[4.] Requirement Study of Telemedicine System and product, 2010 3rd International Conference on Biomedical Engineering and Informatics (BMEI 2010)

[5]. Transforming Telemedicine for Rural and Urban Communities
Telemedicine 2.0 - Any Doctor, Any Place, Any Time,978-1-4244-6376-3/10/$26.00 ©201O IEEE

[6]. W. M. Omar and A. Taleb-Bendiab, ”Service oriented architecture for e-health support services based on grid computing,” Proceedings of the IEEE International Conference on Services Oriented Computing, Chicago, IL, September 2006

[7]. The Study of Auxiliary Telemedicine system, 2010 International Conference on Advances in Energy Engineering

[8]. Adaptive bandwidth reservation and scheduling forEfficient wireless telemedicine traffic transmission
0018-9545/$26.00 © 2011 IEEE

[9]. Fair and Efficient Scheduling for Telemedicine Traffic Transmission
over Wireless Cellular Networks 978-1-4244-2517-4/09/$20.00 ©2009 IEEE

[10] . A Multimedia Telemedicine System 978-1-4244-5316-0/10/$26.00 ©2010 IEEE

[11]. HCPP: Cryptography Based Secure EHR System for Patient Privacy and Emergency Healthcare 1063-6927/11 $26.00 © 2011 IEEE DOI 10.1109/ICDCS.2011.83

[12]. Systems of systems applications for telemedicine 9th RoEduNet IEEE International Conference 2010

[13]. Wireless Networked Chinese Telemedicine System: Method and Apparatus for Remote Pulse Information Retrieval and Diagnosis 0-7695-3113-X/08 $25.00 © 2008 IEEE DOI 10.1109/PERCOM.2008.45

[14]. Advanced Telemedicine Services through Context-aware Medical Networks Charalampos Doukas, Ilias Maglogiannis, and George Krementz’s