A Survey on Telemedicine Application in an Embedded System

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Abstract: In rural and remote areas, many people struggle to receive urgent medical treatment, also there is a lack of expert physicians in certain sectors of the health service. We can use telemedicine to provide health care at a distance. It can improve access to medical services in distant rural areas. Nowadays, telemedicine is forming a new structure of health-care services. The healthcare experts in the specialized fields can access or exchange information for diagnosis, treatment and prevention of disease. Telemedicine facilitates the delivery of the medical advice at the right time using new communication technologies for medical purposes. This paper proposes an application of telemedicine using GSM module and PHP.

Keywords: Telemedicine, GSM, Embedded system, PHP.

I. INTRODUCTION

Telemedicine refers to the use of telecommunication in the field of health-care system. India is geographically large country with many towns and villages located in remote rural areas. Few medical facilities exist to serve the large population in the villages. According to survey India has 80% of its main health-care centres located in cities that serves only 30% of the population. These percentages reveal a dismal health-care scenario where only 20% confined to rural community.[1] These reasons have propelled the growth of telemedicine in India. It can also save the patience's extra cost associated with the treatment such as travel and living expenses. With the help of tele-medicine we can transfer medical data from remote area to the well equipped city hospitals. System can be divided into two modes. First mode is patient data are available at the remote terminal immediately after acquisition, and store-and-forward mode, which involves sending data to the health care centre. GSM module is used to send data from remote area to city hospital. Remote area is nothing but client side and city hospital is server side. At remote area assuming there is no internet availability, GSM is used. Patient can take medical test here and send data to the city hospital and it may be displayed on the website. At client side application will automatically check for the temperature or the ECG data of patient.

II. BLOCK DIAGRAM

Following block diagram shows the proposed telemedicine system.

BLOCK DIAGRAM DESCRIPTION:

Single Lead Heart Rate Monitor:
It is an integrated signal conditioning block for ECG measurement. It will extract, amplify, and filter small signals in the presence of noisy conditions.
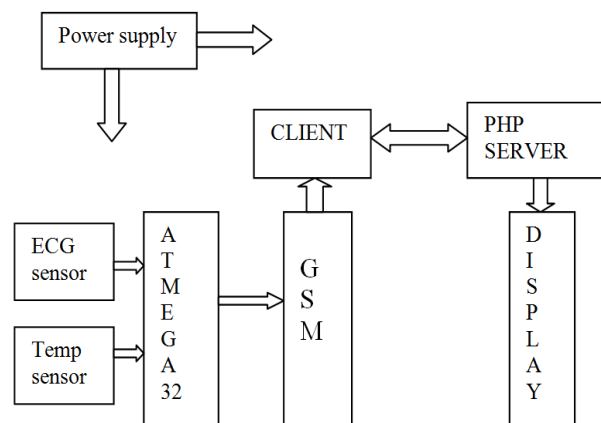

Figure1: Block diagram of telemedicine system

We can check the patient's ECG readings and can send it further for observations.

Body temperature sensor
This is waterproofed version of the DS18B20 Temperature sensor. Temperature reading is taken and can send it Further for observations.

AVR Microcontroller (ATmega32)
The ATmega32 is low-power CMOS 8-bit microcontroller based on enhanced RISC architecture.ATmega32 achieves throughputs approaching 1MIPS/MHz, allowing the system designed to optimise power consumption versus processing speed. It is used to convert analog signal to digital signal and GSM is initialised through AVR.

GPRS MODULE (SIM900)
It is standard developed by European Telecommunications Standards Institute (ETSI). The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. It delivers

GSM 8500 or 900 or 1800 or 1900MHz performance for voice, SMS, Data, and with low power consumption.GSM is used for establishing the internet connection in remote areas.

PHP Website Live streaming

PHP stands for Hypertext pre-processor. It is a script language used on Linux web server. We are using PHP to display live data on the website, which is fetched from the remote area. We can also plot the real-time graph for ECG data and analyse it on website.

III. RELATED WORK

According to the paper "A Novel Emergency Telemedicine System Based on Wireless Communication Technology AMBULANCE" early specialized pre-hospital management contributes to the survival of emergency case. They have developed a portable medical device that allows long-distance diagnosis with the support of mobile healthcare providers by experts. The device allows the transmission of vital bio-signals and the still images of the patient from the emergency site to the city hospital site using the GSM mobile telephony network. The device can telemetrically "bring" an expert specialist at the site of the medical emergency, allowing evaluating patient's condition, and managing the patient's condition **until** the patient is brought to the hospital. The performance of the system is then validated in different countries and a set of specific patients per country treated has been collected and analysed.

[1]Many parties have already demonstrated many telemedicine applications that use mobile phones and the Internet. "Kevin proposes the current trend in telecommunication is the confluence of wireless communication and computer network technologies, and the appearance of the wireless application protocol (WAP) devices is an example. Since WAP is going to be common feature in future mobile devices, it is worth to investigate its use in telemedicine. The implementation with a WAP-based telemedicine system for patient-monitoring is proposed in this system.

Utilization of WAP devices as mobile access terminals for general inquiry and patient-monitoring services. Users can browse the patients' general data, monitored on WAP devices in store-and-forward mode. The applications are written in wireless mark-up language (WML), Perl in a content server. A database system was set up to store the readings, BP, ECG data, patient record and other hospital information; it can also save the doctor's appointments with patients. For testing, a WAP phone compliant with WAP 1.1 is used at GSM 1800 MHz to connect to the content server through a WAP gateway. The system shows how WAP can be useful for remote patient-monitoring and data retrieving. [2]

Dong-Her Shih, Hsiu-Sen Chiang, Binshan Lin, proposed an ECG reasonong system for elderly patients.

In this paper, the integration of novel embedded mobile ECG reasoning system with RF identification is done. It is used to monitor an elderly patient. As a result, According to this paper, the mentioned method has a good accuracy in heart beat recognition. It also enables continuous monitoring of the elderly patient and can identify when the patient is alone In order to examine the proposed system, it has managerial research model. [3] Mr. Prafulla P. Chaudhari proposed an Embedded System in Telemedicine.

This paper is based on ARM-7 processor. It establishes an embedded telemedicine platform on LPC1768 and uses embedded application technologies such as USB, embedded Internet, and infrared communication. The volume of the hardware is very small so the power consumption is also low. The functions are bigger. The whole running system is more stable, also the program maintenance and update is more convenient. The system has been tested to be stable and efficient. [4] According to a survey given in the paper, "Telemedicine Diffusion in a Developing Country: The Case of India (March 2004)" Telemedicine is the best possible solution to some of the medical difficulties that face many developing countries. In this study, they have examined the current state of telemedicine in a developing country, India. Telemedicine has brought a plenty of benefits to the populace of India especially those living in rural and remote areas. Approximately about 70% of India's population is living in rural and remote area. They have discussed three Indian telemedicine implementation cases, one is consolidate lessons learned from cases, second peak with potential researchable success factors that account for the growth and third one is the modest successes of telemedicine in India [5]

"Wang Ping Wang Jin-gangShi Xiao-boHe Wei" suggested a telemedicine system based on embedded device, which is designed for the need of immediate medical treatment in remote areas. In the system embedded Linux is customized and used into the monitor terminal. Data is exchanged between the terminal and remote area using GSM. This system is very convenient and portable. It can monitor bio-signals, such as cardiograph, blood pressure, and temperature through GPRS. It is of great improvement for the development of telemedicine in developing countries.[6]

IV. CONCLUSION

We have done survey of different research papers, and to conclude the same we found that, there are different approaches mentioned in all papers for applications of telemedicine and each one of them is providing the improved performance and accuracy. The sections mentioned above are all the compared results of methodologies. To provide better performance we can implement PHP website live data streaming method through GSM, to retrieve the patient's data from remote area, for further observations and analysis.

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