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Canny Point of Care System to Detect Vital Signs of Patients

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Abstract— Proposed paper presents the methodology for monitoring patients remotely using GSM network. Patient monitoring systems consist of equipment, devices and supplies that measure, display and record human physiological characteristics, including blood pressure, body temperature and heart activity, A patient monitoring system for providing continuous monitoring of a patient includes a data acquisition and processing module receiving physiological data from the patient This unit may be inserted in a bedside display unit to display the physiological condition of the patient. The major reason for the development of the said system is to reduce the product size , power consumption & cost of the system. The remote monitoring & control of the physiological parameters can be obtained by interfacing GSM mobile unit with the patient monitoring system. The system architecture is described. Patient monitoring systems measure physiological characteristics either continuously or at regular intervals over time. The embedded system is developed using Keil IDE. An application of this method in Biomedical includes better accuracy, design security, productivity, speed and flexibility.

Keywords— Patient monitoring, Embedded, GSM, ARM7, Blood pressure.

I. INTRODUCTION

The present patient monitor systems in hospitals allow continuous monitoring of patient vital signs, which require the sensors to be hardwired to nearby, bedside monitors or PCs, and essentially confine the patient to his hospital bed. Even after connecting these systems to a particular patient, a paramedical assistant need to continuously monitor and note down all the vital parameters of a given patient by keeping track of all of his/her records manually. Adopting such a method is error prone and may lead to disaster in the case of a human error.

The need for well-equipped hospitals and diagnostic centres is increasing day by day as the people are becoming more conscious about their health problems. Now let's try to find some reasons behind the increasing percentage of the patients. In today's world the life has become very fast. The throat cut competition for success has made people to work for more than 10 hours per day. Also the factors like increasing population, increasing pollution has affected day-to-day life. The no. of vehicles and undisciplined traffic has invited the no. of accidents every day. Also the stress on the mind and brain popularly known as "Blues "are demanding the need for the well-equipped hospitals and diagnostic centers. The today's hospitals are big and covering large areas in a building. They may occupy no. of floors in one building. Different wards are situated at different places such as men's ward, women's ward, maternity ward, general ward, special rooms and more importantly ICU"s. Doctors need to keep monitoring all the patients in these wards continuously, and this requires more number of skilled nurses and other concerned employees. It's not feasible for the doctors to go to each ward and monitor each patient frequently say after each half an hour. Keeping all these aspects in the mind we have developed "BIOMEDICAL DATA TRANSMISSION SYSTEM" which can be used efficiently to get rid of the problems mentioned in above paragraph.

The choice of sensors in many cases is the most essential step while creating monitoring systems. Implementing different scenarios (indoor or outdoor monitoring) demands deploying different types of sensors. However, there are two major categories: wearable and non-wearable. The first includes all devices which require contact with the patient's body in order to provide measurements. They can often be attached to a different body parts or integrated with some clothes and represent, for instance, a common article of T-shirt. A main reason for close communication with person's body is peculiarity of the medical data, measured by wearable sensors. The most considerable parameters are: heart rate, blood pressure and body temperature. It is possible in some cases to avoid using wearable devices for measuring this data, and use, for instance, sensors embedded in pillows or blankets; however this approach is highly limited in terms of usage and can only be employed for monitoring at night. The second category contains all the sensors that can be appropriately used to provide information about surrounding environment. In many situations this data can make a huge impact for the overall analyses and play a vital role in maintaining patient's health condition. One of the examples could be blood pressure sensor which was incorporated into a wireless platform and provide user within formation on blood pressure level in the room. In this particular project it is embedded into the user's piece of equipment (e.g. fire-fighter boot), however other ways of usage are not excluded. There is also a several number of techniques for posture recognition and activity measurements implemented with cameras integrated in the living environment. Usually non-wearable sensors are combined into a sensor network which provides all kind of information, appropriate for overall analysis, but at the same time can significantly reduce patient's mobility and monitoring area. At the same time, one of the major aims of the

project is to provide a person with a sophisticated system which will maintain his/her activity level including outdoor activities (like shopping or taking a promenade). The second types of sensors are not capable of working in terms of permanently changing environment and therefore cannot be used.

II. LITERATURE REVIEW

The more sensors we use the wider spectrum of possible scenarios and events we are able to cover. However, overloading patient with electronics can cause inconvenience and affect his mental condition. Moreover, a power consumption problem is a serious consequence in this case, which was previously addressed and leads to unnecessary complexity of the system .At the next stage, sensor layer of every remote monitoring system is typically connected to the processing device. This communication can be either wired or wireless, depending on initial goal of the application. The wireless communication is usually provided by GSM confection. The opposite to wireless is a wired sensor network, where each sensor in the system is connected to a processing device. Normally, it is a wearable sensor network which integrates sensors, electrodes and wired means of communication in order to monitor patient's health the design of portable low cost systems for remote monitoring of patients with chronic diseases is one of the most important fields in telemedicine and telecare. Using Bluetooth communication technology, which can be added to some medical equipment, may enhance the efficiency of patient monitoring. In this paper a low cost, secure portable system with wireless transmission is presented to monitor vital parameters such as heart rate, O2 level ...etc. Transmitted data is archived and visualized both on a mobile phone and on a central server [1].

A wireless system for remotely monitoring a patient's oxygen saturation (%SPO2), sphygmo (pulse) and plethysmogram levels is described. The data was continuously measured using a pulse oximeter and transferred to a central monitoring station via a IEEE 802.15.4 wireless sensor network for storage and display. MicaZ wireless motes were programmed with nesC and a graphical user interface was used to capture and display incoming measurements for all patients being monitored. Evaluation of the system was done based on the WSN performance criteria (packet loss and network lifetime) and also based on the accuracy of the collected medical data. In both respects the system performed very satisfactory and has been successfully implemented[2]. Wireless Sensor Networks (WSN) is a significant technology that has a considerable attraction in many areas, particularly in health sector. On the other hand Wireless Mesh Networks (WMN), which are an extension of LAN, have far better range and also reduce the amount of cabling needed to connect to the backbone network. In this paper a scheme that is Wireless Sensor based Mesh Networks, which is an integration of the above two technologies has been used for monitoring the patients status as follows: The patient's temperature, heart beat and pressure is monitored automatically using a bio-medical kit that is connected with the patient. A LCD is provided with the kit that is used to notify the nurse about the patient's health status. The information is then sent to a mesh node through Zigbee technology. The mesh node is generally a PC that helps the duty doctor to monitor all the wards that are present in the hospital. This ensures that the patient's health status is monitored even in the absence of the nurse. From the mesh node, a SMS is sent to specified doctors through GSM connection. With the help of the information got through SMS, the doctors can be able to attend the patient very quickly. Since the monitoring is done automatically there is no need for any person to look after the patient [3]. Governments in under developing countries face serious problems for offering quality healthcare services at reasonable cost due to rapidly graying population and patients with chronic diseases. Due to currently healthcare resources are not sufficient; many deaths without medication are produced. Thus, this increasing important issue needs to be attended. Our approach to tackle this issue is based on Multi-agent system (MAS) architecture. Our Remote Patient Monitoring (RPM) system monitors patients taking into account physiological and environmental parameters. In this way, RPM provides reliable and low-cost healthcare to elderly, chronically, and acutely people either indoor or outdoor environment. Our hypothesis is that an effective use of healthcare resources, entails reduction of unnecessary hospitalizations, minimizes among others: cost, treatment, and monitoring. However, despite of RPM potential applications, it has not become an integrated part of patient care in heterogeneous environments, mainly due to the lack of knowledge and infrastructure. This paper presents the design and implemented MAS architecture for RPM, identifying barriers and providing perspectives for the future [4].

III. PROPOSED SYSTEM DESCRIPTION

The proposed system is designed for monitor the patient is in any place. The system would constantly monitor important physical parameters like temperature, heartbeats, systolic and diastolic and would compare it against a predetermined value set and if these values cross a particular limit it would automatically alert the alarm and doctor via a SMS. This system provides a continuous health monitoring service. Using GSM modem message is transmitted to the doctor mobile number when the measured temperature exceeds the allowable value or if the pulse measured is abnormal. GSM is abbreviated as Global System for Mobile Communication10. GSM modem has a slot for inserting SIM (Subscriber Identity Module). GSM network contains Mobile Station, Base station subsystem and Network subsystem. Mobile station contains IMEI number and SIM has IMSI number. Base station subsystem contains Base Transceiver Station which has antennas for communication and Base Station Controller which controls multiple base stations. Network subsystem contains VLR (Visitor Location Register), HLR (Home Location Register), AuC (Authentication Center) and EIR (Equipment Identity Register). MSC (Mobile Switching Center) is the major part which is the gate way for communication between mobile station and PSTN. HLR stores the information about the subscriber and the current location of subscriber. VLR provides the services to the subscribers of HLR who are visitor users. AUC gives the security of the user and to identify the location of the subscriber. EIR is also for security purpose and to identify the mobile station. MAX232 is connected to GSM modem so that it is useful for serial data transmission. OSS (Operation Support System) is used to control the traffic of users.

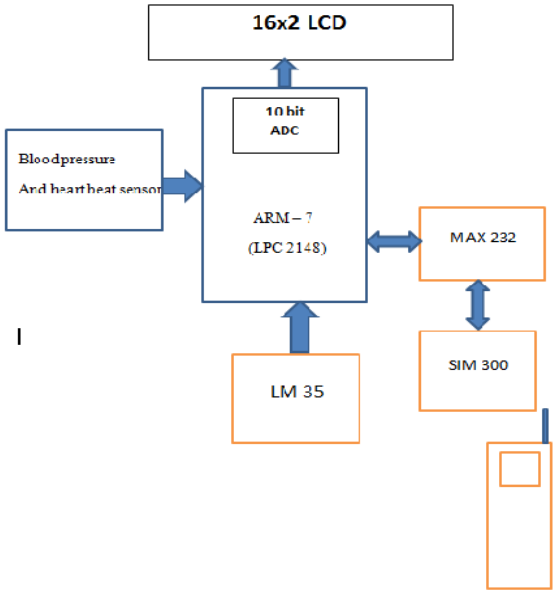

Fig 1. Block Diagram

Fig .1 shows Block diagram of our system where parameter sensors are interfaced with ARM 7 (LPC 2148).The display is used to indicate the parameters. Also GSM module is used to send the information via SMS. GSM module is interfaced with Processing unit using MAX 232.

It includes various sensors like Temperature sensor, Heart beat sensor and Blood pressure sensor, ARM processor (The ARM TDMI-S is a special ARM purpose 32-bit microprocessor, offers high performance and very low power consumption. ARM architecture is based on RISC principles, instruction set and related decode mechanism are simpler than CISC Pipeline techniques employed ARM Processor supports both 32-bit and 16- bit instructions via the ARM and Thumb instruction sets), display, and GSM SIM 300 Module circuit.

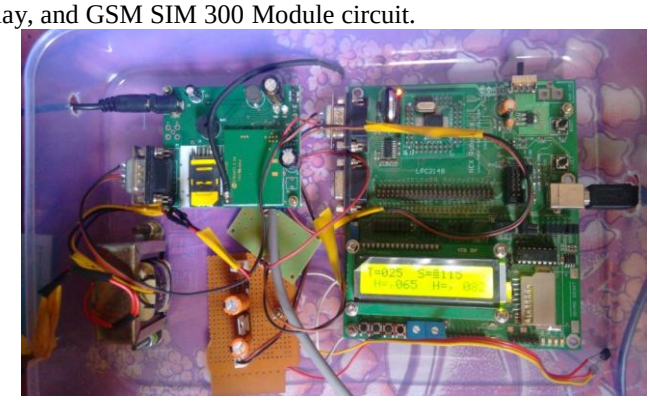

Fig.2 Original Implemented System

Fig.2 shows original implemented system showing Embedded Hardware along with GSM module, Display is used to show the parameter values. Also the required power supply circuit is implemented.

Fig. 3 Implemented Systems with Results

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Fig.3 shows the actual results of blood pressure sensor as well as the same results are received at the receiver end which shows successful implementation of proposed system. Here we can verify the accuracy of our system.

IV. CONCLUSIONS

The present system can support doctors with real-time, low-power, low-cost, long-distance, and dual-mode monitoring, which is suitable for patients who require continuous monitoring. The real-time monitoring system for patient physical states is based on GSM technology. It can be taken by patient and keep the patient movement intact because it is miniature and portable. The system can monitor and record the physical states and movement parameters real-time, and then provide an auxiliary means for the correct diagnosis of doctor.

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