GSM AND TOUCH SCREEN BASED PATIENT MONITORING SYSTEM OF CUMULATIVE PARAMETERS

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1. Keywords

GSM, Touch Screen, PMS, Flow sensor, SpO2.

2. Introduction/Background

Design and Implementation of a Wireless Multi parameter Patient Monitoring System:

In this paper, the design and successful implementation of a remotely operated physiological monitoring device has been described. Here, the prototype has performed the acquisition of three types of physiological measurements: Electrocardiography, finger photoplethysmography, and blood pressure plethysmography. Various components are shared in the acquisition of the three signals, such as the microcontroller, the communication module and part of the analog front-end to achieve a low cost integrated device. The waveforms are sent to a remote backend server using a wi fi internet connection. The system is designed so that the device can be controlled remotely without patient’s intervention.

The biomedical signals are acquired by the wireless measurement unit and sent to a remote computer with an internet connection. A graphic application running on the remote PC is used to visualize the signals and to issue commands, such as to start or stop signal acquisition. Signal conditioning is critical since the amplitude of the original physiological signals may be in the millivolt range.
Patient monitoring system using GSM Technology:

In this fast pace of life, it is difficult for people to be constantly available for their near ones who might need them while they are suffering from a disease or physical disorder. So also constant monitoring of the patient’s body parameters such as temperature, pulse rate, sugar level etc. becomes difficult. Hence to remove human error and to lessen the burden of monitoring patient’s health from doctor’s head, this paper presents the methodology for monitoring patients remotely using GSM network and Very Large Scale Integration (VLSI) technology. Patient monitoring systems measure physiological characteristics either continuously or at regular intervals of time.

With the wide spread use of cellular networks, this approach is also popular when small amount of data is to be transferred through the network. Extensive work has been carried out by researchers using this approach especially in medical field. (Patient monitoring system using GSM Technology, 2013) describe a remote monitoring system based on SMS of GSM. The system includes two parts which are the monitoring center and the remote monitoring station. The monitoring center consists of a computer and a TC35 GSM communication module.

The computer and TC35 are connected by RS232. The remote monitoring station includes a TC35 GSM communication module, a MSP430F149 MCU, a display unit, various sensors, data gathering and processing unit and developed a tele-monitoring system, based on short message service (SMS), to remotely monitor the long-term mobility levels of elderly people in their natural environment. Mobility is measured by an accelerometer-based portable unit, worn by each monitored subject.

The portable unit houses the Analog Devices ADuC812S microcontroller board, Falcon A2D-1 GSM modem, and a battery-based power supply. Two integrated accelerometers are connected to the portable unit through the analog inputs of the microcontroller. Mobility level summaries are transmitted hourly, as an SMS message, directly from the portable unit to a remote server for long-term analysis. Each subject’s mobility levels are monitored using custom-designed mobility alert software, and the appropriate medical personnel are alerted by SMS if the subject’s mobility levels decrease.
3. Objectives

PMS provides a facility for patients to receive medical treatment from their own desired place. It helps to save the time and money remote monitoring is a medical practice that involves remotely monitoring patients who are not at the same location as the health provider. In general, a patient will have a number of monitoring devices at home and the results of these devices will be transmitted via a mobile to the health care professionals.

PMS is a convenient way for patients to avoid travel and to perform some of the more basic work of health care for themselves. In addition to objective technological monitoring, most tele-monitoring. Most tele-monitoring programs include subjective questioning regarding the patient’s health and comfort.

Main Objectives are:

- Quantitative assessment.
- Better accuracy, design security and Flexibility.
- Solution for reliability and Power management.
- Less product size, low cost and low power consumption.

4. Methodology

Care of critically ill patient, requires prompt and accurate decisions so that life-protecting and life-saving therapy can be appropriately applied. Statistics reveal that many are losing life because of heart attacks. The objective of patient monitoring system is to have a quantitative assessment of various physiological parameters of the patient. Usually, the parameters like heart rate, SpO₂, body temperature, saline level is performed by the doctor visiting the Patients and conducting check-up, since these parameters give the doctor a fair idea about the patient conditions known as the vital parameters. However if these parameters are transmitted directly to doctor’s location, it saves time and imparts comfort to both patient and doctor. This project supports for two ways communication that is even the doctor can assure his concern to the patient at any instant by just giving a call. As the name cumulative parameters, the displayed results on command window can be retrieved from the database at any time.
This system will be a low cost health monitoring system available to every hospital in the days to come and can be used as a formal care for the elderly persons. It serves as wellness and disease management model where clinical personnel plays a supportive role in monitoring patient, and the independent living and remote monitoring model, where the medical personnel monitor health status. This paper provides a solution for enhancing the reliability and power management of the patient monitoring system

**Hardware tools:**

- Arduino Mega 2560
- Transformer
- GSM modem 900
- LCD (16x2)
- Heart beat sensor
- Temperature Sensor LM35
- Voltage Regulator 7805, 7808
- Buzzer
- Driver (NPN)
- FWR (with 2 parallel capacitors)
- Saline sensor
- SpO₂ sensor
- Touch screen
- Max 232
- Encoder
- RF transmitter
- Amplifier
- Speaker
- APR33A3
- 8051 Microcontroller
- Decoder
- RF receiver
Software tools:

- Keil µ Vision 3
- Sketch

Hardware Architecture of Transmitter Unit
Hardware architecture of Receiver Unit

Work carried:
5. Result and Conclusion

We have presented a few examples of physiological signals obtained using the device. In order to verify the effectiveness of PMS, experiments were carried out through a practical way by testing over different number of folks in our college CBIT. The multiple patient parameters were recorded locally and were transmitted to the particular GSM system to confirm the quality of the signals and the error rate of data transmission between the two units. Finally the data was also stored in the PC and the touch screen module was also successfully implemented.

In the past, the dominant products manufactured are mainly single parameter measurement. But the system described in this paper was successfully tested for multi parameters [3]. Here the sensors are interfaced with an arduino Mega 2560 which processes all the signals and displays the output on the LCD (16X2). Based on the experimental results, PMS is shown to be more convenient and economical. All the above work was appreciated and encouraged by the medical personnel.
OUTPUTS OF PMS ON LCD DISPLAY
Conclusion:

The system integrates Arduino based monitoring of multiple physiological parameters information and establishing two ways communication between the patient and the doctor. PMS is the most automated and standardized and reduces the risk of human error, such as information entry and data transmission. It greatly enhances the efficiency of work of medical personnel by enabling the off-site doctors to view and edit diagnosis immediately. The result of the given hardware prototype make us confident that this PMS is a ray of hope of the people for the survival of existence. The proposed design offers the following advantages: It is very useful for Real time continuous monitoring of the patients physiological parameters sending the information to the doctor, Provide proper and better treatment, Improves disease management, Wide coverage area, Two way communication, Patient friendly interface- Touch screen, Reliable, portable and inexpensive, Very useful product in hospitals as, “LIFE SAVING EQUIPMENT”.

Future work:

Broadly speaking, only vital parameters of the patient were evaluated which makes it difficult to scale it to a real life ailments and diseases, hence it is believed that the system can be further intended to the use of High speed communication techniques and to evaluate for particular widespread disease such as HIV, with a special focus on their long-term sustainability. This would be a very promising future work.