ICU Patient Monitoring System using Wireless Technology

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Abstract— The project aims at the development of a system which is capable of transmitting the patient's medical parameters like heart rate, temperature and oxygen availability in cylinder wirelessly using controller LPC2148, heart rate sensor, temperature sensor and pressure sensor respectively to the doctor's section and announces the parameters when requested by the doctor along with a display system. Also, this system provides the mechanism of prescribing the medicine to patients in case of emergencies. This helps in decreasing the death rate by acting immediately.
Key words: Medical parameters, Controller LPC2148, Heart Rate Sensor, Temperature Sensor, Pressure Sensor, Wirelessly

I. INTRODUCTION

Wireless technologies are transforming our lifestyles, social interactions and work-places. One of the most promising applications of wireless technology is healthcare and its wellness management. Healthcare is moving forward characterized by early detection, prevention and good maintenance of health conditions. One of the current trend places a contribution on the monitoring of health conditions. This is particularly important in countries with a significant aging population, where wireless technology can significantly improve the management of health conditions and thereby improve quality of life.

For example, continuous recording of an electrocardiogram (ECG) or PPG by a wearable sensor can provide a realistic view of the heart condition of a patient during normal daily routines and can help to detect such conditions as high blood pressure, stress, anxiety, diabetes and depression. In addition to that automated analysis of recorded biomedical Signals could support doctors in their daily practices and allow the development of warning systems. This would bring several benefits as it would increase the health noticeable collaboration among doctors and doctor-to-patient efficiency and thereby decrease the health care costs. Moreover such continuous monitoring would increase early detection of abnormal health conditions and therefore provide a great potential to improve the quality of life of patients.

II. LITERATURE REVIEW

K. Mathan Kumar and R.S. Venkatesan[1] proposed a system for Smart Health Monitoring Using Android Mobile Devices which enables doctors to monitor the vital bio signal such as ECG, Respiration rate, heart rate and temperature of patients in ICU using the real time waveform and data monitoring function of installed Java based application on the mobile phone. In the proposed system patient's body temperature, heart rate and oxygen level in the cylinder are monitered. This project discusses the benefits of patient monitoring using android technology. It discusses the technology to collect data from a patient monitoring system, to feed the same to two separate interfaces displaying the patient parameters and details and sync the important information to a web based server. This can in turn accessed by the doctor remotely using an application installed in his android phone, which he analyses and sent feedback in order to take preventive measures before he reaches the hospital.

M. Wcislik et al [2] monitors patient's body temperature, pulse rate, ECG wave and patient's body position using ARM cortex M4F micro controller. Android app is created for monitor these values. Bluetooth connection is used for connecting microcontroller and Android phone. In our project also ARM controller LPC 2148 and Bluetooth for wireless communication are used.
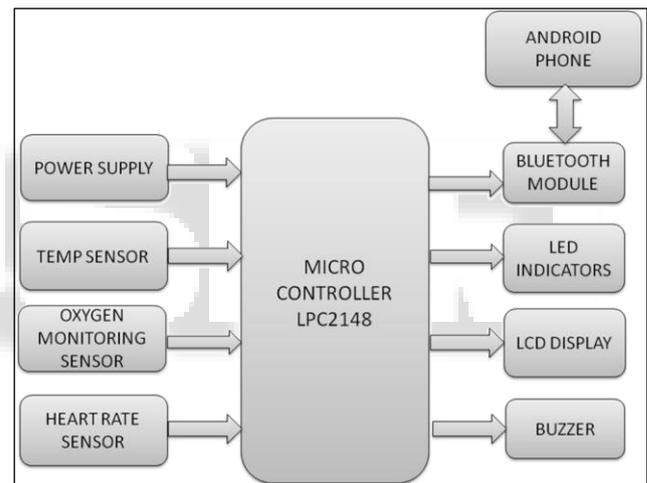
III. PROPOSED SYSTEM

Fig 2: Block diagram

This device able to monitor patient's heart beat rate, body temperature with the help of various sensors values read by LPC2148 ARM cortex M3 processor. These measured values are displayed on LCD and android and if measured value increased at abnormality level, it sends alert message to doctor's mobile by using Bluetooth module.

A. Sensors

1) Temperature Sensor (LM-35):

This sensor has a place with LM 35 arrangement, which is accuracy coordinated temperature sensor, whose yield voltage is straightly relative to the centigrade temperature. For the most part LM 35 arrangement gives temperature in the scope of - 55 to +150°C however our sensor gives yield from 2 to 150°C. It's low yield impedance, direct yield and exact innate adjustment makes interfacing extremely basic with no need of flag molding. It works from 4 to 40v and gives 10milli volt simple yield for per centigrade (°C) change in temperature. So simple to computerized converter is utilized to change over this yield to twofold yield.

2) Heart rate sensor(CI-6543B):

The PASCO CI-6543B Heart Rate Sensor works with a PASCO Science Workshop® PC interface to screen a man's heart rate. Not at all like an electrocardiograph (EKG), which screens the electrical flag of the heart, the Heart Rate Sensor screens the stream of blood through a piece of the body, for example, an ear projection, by sparkling a light through it and observing the adjustment in power. As the heart pumps and powers blood through the veins in the ear flap, the light transmittance through the ear projection changes. The sensor comprises of a Heart Rate Sensor intensifier box, a link with DIN connectors for associating with a PASCO PC interface, and an ear cut. The ear clasp can be joined to a piece of the body, for example, an ear cartilage, a fingertip, toe, or the web of skin between the thumb and forefinger. The sensor sparkles an infrared light through the ear cartilage and measures the adjustment in light that is transmitted. The light source is a little infrared light radiating diode.

3) Pressure sensor(MPS-2000):

This is MPS-2000 pressure Sensor, Differential Output of pressure sensor is converted into UART data and 8 bit data Output .This device senses the pressure and converts it into an electric signal where the amount depends upon the pressure applied.It has the features like rugged design, smooth performance, highly efficient.

B. Processor(LPC2148)

Here LPC2148 ARM Cortex-M3 is a general purpose, 32-bit microprocessor, which offers high performance and very low power consumption. LPC 2148 Processor is having inbuilt ADC and fast frequency response so that we get output of sensor reading at LCD and Remote PC very fast.

All parameter values read with the help of ARM cortex M3 processor. Receiver unit is mobile Phone .This device able to monitor patient health wirelessly by using RF transmitter and receiver which having range limitation. It means it able to transfer and receive data at 2.4 GHz band up to 100 meter distance.

C. Bluetooth module(HC-05)

It is a class-2 Bluetooth module with Serial Port Profile, which can configure as either Master or slave. A Drop-in replacement for wired serial connections, transparent usage. You can use it simply for a serial port replacement to establish connection between HC-05.

IV. RESULT

Microprocessor LPC 2148 directly measures input data of various sensors and directly display output at LCD, if sensed parameters reaches at abnormal level then values are messaged to doctors mobile via Bluetooth. Device is useful to people who needs constant care.

Fig. 3: Hardware connection setup for ICU patient monitoring system using Bluetooth module

V. CONCLUSION

This system is able to monitor patient's heart beat rate, temperature and oxygen level in the oxygen bag. If these values reach above or below threshold limit it can send notification to doctor's mobile so that patient can get treatment as early as possible. Patient can be monitored continuously anytime. System is able to display physiological parameters on LCD and sends notification to doctor up to 100 meter range. To overcome this we have to increase network range which is very costly so need to design economical network area device. Hence proposed device is economical and operated at low power.

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