Physiological Parameter Monitoring System for Patient and Doctors Interface

M. Bhanuvardhan Reddy
Research scholar, DRKIST,
Hyderabad, India

Dr. R. V. Krishnaiah
Principal, DRKIST,
Hyderabad, India

Abstract

The physiological parameter monitoring system is one of the major improvements in the hospital patient administration and service due to recent development. A wireless patient monitoring system is used to measure heartbeat, room temperature and respiration by using embedded technology. This Embedded system has been designed and developed a low cost model which is used for monitoring the patient's situation by GSM technology. This Embedded system's temperature sensor, heartbeat sensor and ECG are connected to the patient. Then the all physiological parameter values are measured using these sensors of embedded system and which will be displayed on the desktop of the doctor to which the system is connected, in turn the doctor will get the message if any abnormal occurs for any patient in the hospital or ward. The doctor can suggest medicine to patient either directly or indirectly in abnormal condition. The same information will be send to the mobile phone of patient. This Embedded project uses ARM9 micro controller which is 32-bit controller. The specialist or doctor staying at a distance can monitor the patient condition remotely so that he can save the life of the patient.

Keywords: *ECG Sensor, LM35 temperature sensor, SPO2 senor, at89s52 micro controller, ARM9 board, Zigbee, Gsm, Mobile phone.*

1. Introduction

There is a need for low-cost physiological monitoring solutions that are easy to use, accurate, and can be used in the home or ambulatory settings. Smart phones are becoming more popular, more powerful and have a variety of sensors available to capture information from the outside world, process the data in real-time, and transfer information remotely using wireless Communications. These factors make smart phones an ideal option as a "take-anywhere" physiological monitor without the need for additional hardware, and their potential has been explored for many medical tele monitoring applications. The main aim of the project is to design **"Physiological Parameter Monitoring System for Patient and Doctors Interface".** We show that a mobile phone can serve as an accurate monitor for several physiological variables, based on its ability to record and analyze the varying colour signals of a fingertip placed in contact with its optical sensor. We confirm the accuracy of measurements of breathing rate, cardiac R-R intervals, and blood oxygen saturation, by comparisons to standard methods for making such measurements (respiration belts, ECGs, and pulse-oximeter, respectively). Measurement of respiratory rate uses a previously reported algorithm developed for use with a pulse-oximeter, based on amplitude and frequency modulation sequences within the light signal. We note that this technology can also be used with recently developed algorithms for detection of atria fibrillation or blood loss. We also measured here room temperature it will be helpful for knowing patient whether condition.

2. Methods

The Physiological Parameter Monitoring for patient and doctor interface. A wireless patient monitoring system to measure heartbeat, body temperature and respiration by using embedded technology. Our Embedded project is to design and develop a low cost feature which is based on embedded platform for monitoring the patient's situation by using SMS. Our Embedded Project connects the temperature sensor, spo2 sensor and ECG to the patient. All the outputs are connected to micro controller. The controller processes this information and transmits through Zigbee as a data to ARM9 board where received data is displayed on the display unit, even ECG waveforms can displayed on

display unit but here we are displaying the digital value then doctor will see that display if any abnormal situations occurred doctor will respond through phone, can contact directly, or in case if he is busy then he can send the message to the patient. Our Embedded project uses S3C2440 micro controller which is 32-bit controller. The specialist staying at a distance can monitor the patient condition through mobile so that he can save the life of the patient

Block Diagram

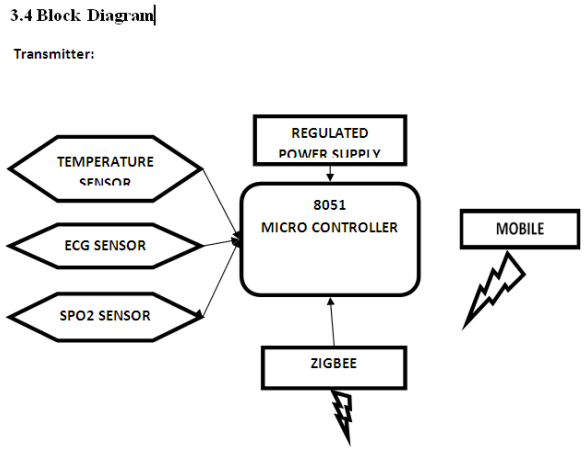

Figure 2. : Transmitter

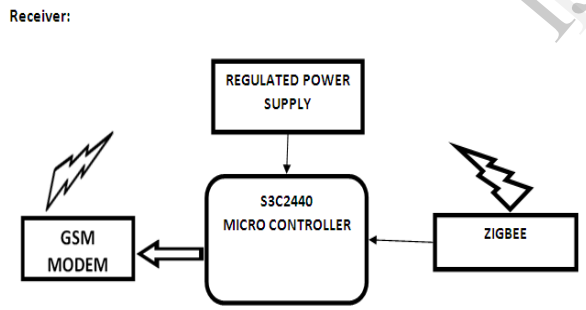

Figure3: Receiver

2.1 Working Principle

A wireless patient monitoring systems is used to measure the room temperature, oxygen content in the blood of human and the heart electrical conduction system of human. For this we are connecting LM35 temperature sensor, spo2 sensor and ECG sensor to the ADC. Where we are using the 0809ADC (analog to digital convertor) this ADC is 28 pin DIP IC and this is based on successive approximation technology. Out of 28 pins 7 are control pins,8 are input pins,8 are output pins, 2 are reference voltage pins, 1 is VCC pin,1 is GND pin and 1 is clk pin. So now these sensors inputs (analog data) give to the ADC inputs i.e IN3, IN4, IN5 remaining IN0-IN2 and IN6-IN7 are not used. There are 7 control pins they are ALE, SC, EOC, OE, A, B, C. when ALE pin active high the inputs are connected to the input pins then, when SC pin active high then starts conversion , when OE pin active low the conversion completed and output will be at ADC output pins. In ADC we don't have inbuilt clock oscillator so using 555 timer circuit generate clock pulses. This output gives to the comparator it compares with reference voltage then resulted pulse stores result register. Then ADC interfaces with AT89s52 Microcontroller, while interfacing we give the output of ADC to the port1 of the microcontroller and controller pins to the port2 of the microcontroller then it process the data trough serial Communication RS232 to the ETRX357 Zigbee(tx). In between these two we use MAX232 IC it is used to convert TTL/CMOS logic level to the RS232 logic level Now the from Zigbee (tx) transmits data to the another Zigbee(rx) then from this Zigbee data transfers to the ARM9 board in this the values are displays on the 4 wire resistive touch screen. Then doctor will see the values give suggestion to the patient from that touch screen only. Then this message transfers to the GSM, where GSM connected to ARM9 board. Then from GSM the message reaches to patient mobile. So finally with this doctor can save the patient.

3. Results

We successfully designed The Physiological Parameter Monitoring for patient and doctor interface. when we tested this system we got the values of temperature 28^{o}c , ECG value we got here digitally that value is 164 and spo2 value got 88. The results are shown with screen shorts as follows.

The following figure shows the transmitter block, it consists temperature sensor, ECG sensor, spo2 sensor, AT89s52 microcontroller and Zigbee. All three sensors are connecting to the ADC then it interfaces with microcontroller then interfaces with transmitter Zigbee.

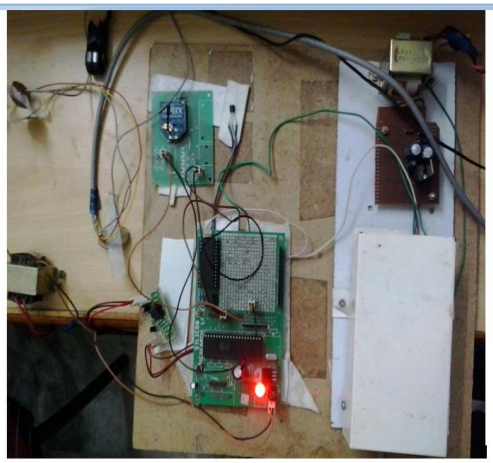

Fig:6.1 transmitter kit

The following figure shows the receiver block, it consists receiver Zigbee, ARM 9 board and GSM modem. The receiver Zigbee and GSM interfaces with the ARM9 board. and power on the ARM9 board and it shows GUI graphical touch screen.

Fig:6.2 receiver kit

The following figure shows the ARM9 board touches screen which is designed by Qt software, where we displays the values.

The following figure shows the connecting sensors to the human body.

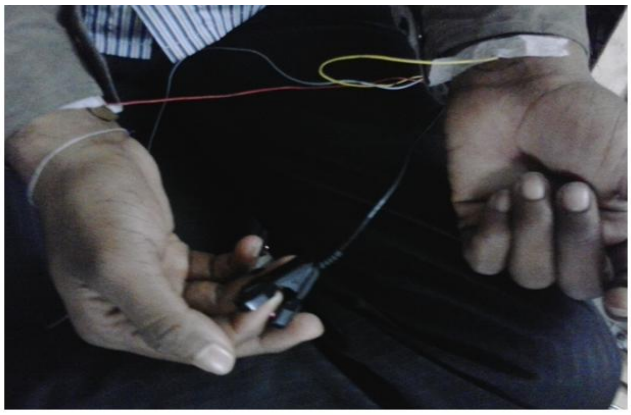

Fig:6.4 sensors connected to the human body

The following figure shows the values on the touch screen when we press find button. These are the temperature, ECG, spo2 values.

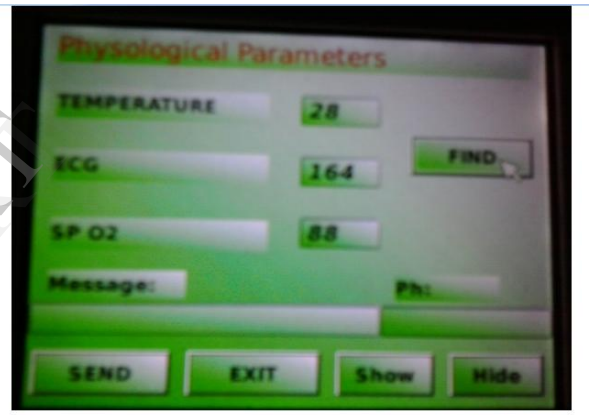

Fig:6.5 displayed values on touch screen

The following figure shows the typing message on the touch screen

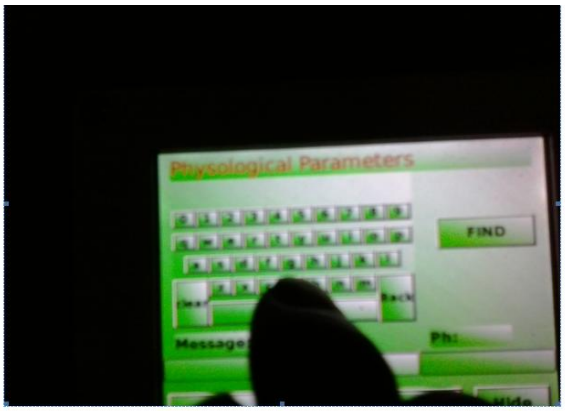

Fig:6.6 keyboard on touch screen

4. Conclusion

The project The Physiological Parameter Monitoring for patient and doctor interface. has been successfully designed and tested. It has been developed by integral features of SC32440 processor and software used. Using highly advanced ARM9 board and with the help of growing technology the project has been successfully implemented. The pulse oximeter has become one of the most common physiological monitors used in hospitals today. Moreover, algorithms have been reported to detect atria fibrillation, blood loss, and autonomic nervous system disorders, in addition to traditional vital sign measurements of HR, respiration rate, and oxygen saturation from the dynamics in a pulse oximeter signal. We have shown that mobile phone cameras have the potential to monitor the pulsatile PPG signal. Current mobile phone technology extends beyond simply monitoring and measuring with ease for a patient; it could also be used to relay the information to medical professionals. This gives a patient the ability to carry an accurate physiological monitor anywhere, without additional hardware beyond what's already included in many consumer mobile phones. In the current project we are connecting temperature sensor, spo2, ECG to control board. Using microcontroller board hardware as well as cost is increased. By connecting the sensors directly to ARM9 board we can reduce the hardware components as well as cost. In the proposed system we are monitoring the patient details like temperature, heart beat regularity and oxygen content in the blood by sending the message through GSM modem. But we are not monitoring the details on webpage. In future we can directly monitor the patient details on web page by interfacing Ethernet to ARM9 board. Along with this by using SQL LITE in future we can maintain the database in the server. By using this type of system we can develop a system for hospitals through which doctor can monitoring patients remotely where the patients are in ward rooms.

5.References

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