INFANT MONITORING SYSTEM USING MULTIPLE SENSORS

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Abstract

This paper proposes an efficient health monitoring system for infants, using wearable sensor systems with wireless communication. We have developed a system including fully integrated sensors for measuring ECG, temperature and CO2 level around the infant's crib. This system can provide continuous monitoring of the infant's vital parameters and can be used in Neonatal Intensive Care Units (NICU) and at home.

Keywords: *Sensor, MQ-2, Arduino, LM-35,SEN 11574, Bluetooth Module*

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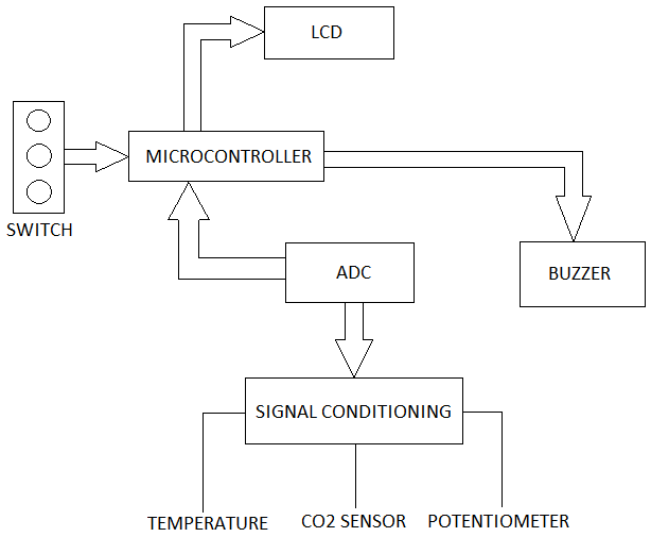
1. INTRODUCTION

The traditional method for monitoring an infant's vital signs requires direct supervision from hospital staff or parents. Sometimes it is difficult to identify certain physiological changes which may be of concern. This health monitoring system provides real time indication of any changes in the infant's status. We can conveniently monitor the infant's situation in the NICU or at home while they go about their daily activities. Traditional monitoring techniques are difficult to wear for long periods of time and may cause discomfort to the infant. Wireless and wearable sensors provide more convenient and long term monitoring.

Sudden Infant Death Syndrome (SIDS) is the unexplained death of an infant below the age of one year. It usually happens without any warning signs during sleep, which is why it is difficult to identify and predict. Therefore our proposed monitoring system would be an effective way to predict the onset of SIDS.

2. BLOCK DIAGRAM



The signals detected by the sensors are passed through a signal conditioning circuit for further processing and to convert the analog signals into digital values. The Analog-to-Digital convertor is defined by its bandwidth and signal-to-noise ratio.

The microcontroller which is used is ATmega328 interfaced using an Arduino Uno kit.

The system we are connecting with the PC via Bluetooth using RS232 serial communication modem. RS232 protocol is commonly used in embedded systems. In this, data is combined into a packet and sent bit by bit on a single wire between two communicating devices. This requires less maintenance and costly implementation. However, synchronization between communicating devices is necessary. Sometimes separate wires are required for two-way communication. This approach is widely used for long distance, high speed and reliable communication. This kind of communication can be used at home as well as in the hospitals for central monitoring systems.

Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price. We have establishes an upper and lower threshold limits for which the buzzer is activated.

The LCD which we are using is a 16x2 display. We use 8-bit mode to transfer data to the LCD display. In 8 bit mode, we first put data in the 8bit bus, then put command in the command bus and pulse the enable signal.

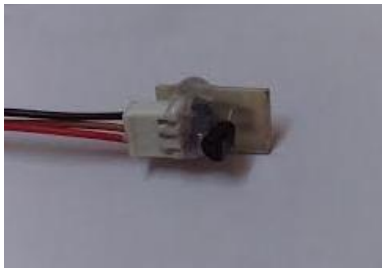
3. COMPONENTS

A. CO_2

We are proposing a method using CO2 sensors placed around the infant to monitor the exhaled air concentration from the infant. The data is sent wirelessly to activate the alarm if and when it crosses a certain threshold level.

B. Temp

Traditional method for measuring temperature is using a thermometer, which is inconvenient in case of long term monitoring. We propose a continuous temperature monitoring system using an LM35 sensor and wirelessly transferring the data to an LCD.



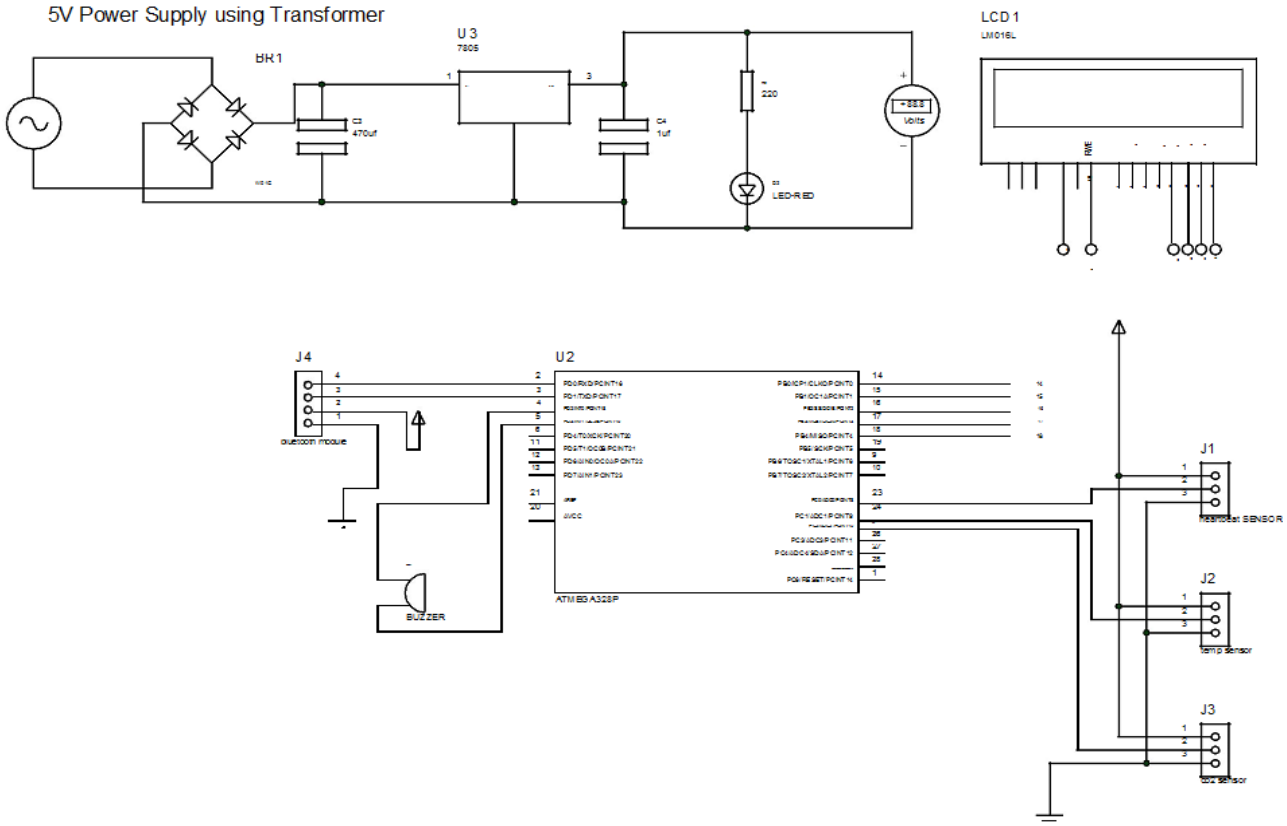
C. Heart Beat

The use of traditional method of monitoring heart rate, such as stethoscope, is inaccurate at times. Therefore it is preferred to use sensors for measuring heart rate. Continuous monitoring of heart is widely done in NICU.

D. Arduino

It is a microcontroller development platform and is programmed in Arduino Programming Language (APL).

4. CIRCUIT DIAGRAM



5. CONCLUSIONS

We have proposed a wireless Bluetooth approach for an infant monitoring system using multiple sensors. This system provides several advantages in compared to the traditional method.

Apart from the sensors we have proposed, more parameters can also be integrated and each sensor can be connected to a processing board via a wireless module. Our proposed multi-sensor system can also be implemented in the infant's mattress for temperature measurement or even in the baby's clothing for heart rate measurement. Several CO2 sensors can be implemented around the crib of the infant for continuous monitoring of exhaled air.

ACKNOWLEDGEMENT

We have been given support continuously throughout our project by several individuals.

We truly appreciate their support. We would like to thank Prof. P.A Chougule for his guidance and supervision in completing the project.
We are grateful for the motivation received by our family and friends towards the completion of our project.

In the end we are thankful to our Principal Sir and our college in supporting our project.

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