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Electronic Cradle

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***Abstract*—Typically, new born children wake at all hours of the night forcing caretakers to get up and sooth the child back to sleep. Our goal was to create a baby cradle that would rock the baby to sleep if it awoke and began crying. We needed a microphone to detect the baby's cry and a motor to make the crib rock.**

We also designed a body temperature controller for maintaining body temperature of the new born. Maintaining body temperature is important for any human, but new born are not able to do so themselves, hence we setup a temperature control system using a DC lamp which would help the baby maintain a constant body temperature. It is also important to note that there is no case of burn or exposure to high temperature. A wetness detecting circuit was added in order to detect urination of the baby; the detection of water content activates a LED to notify.

Keyswords – frequency, temperature, infant

I. INTRODUCTION

Recent advancements in the field of technology have led to the development of cheaper and more efficient systems. In the field of infant care, electronic or automatic cradle are recent advancements which is based on the development of microcontrollers. In this project we have employed the most widely used microcontroller PIC

FEATURES

There are a few commercially available version of automatic cradle but all these are not affordable and are not used for medical use. Through this project we intent to provide a less costly alternative for domestic use and an advanced system which can be used in hospital environments, especially in Neo-natal Care ICUs and Nurseries. This extreme environment demands a lot from the system. The system needs to be:

- Efficient
- Fail-proof
- Reliable

These are the main features any system used in hospital environment must have. Such system effectively helps nurse's to concentrate more on important issues. In domestic case, aids parent in child care.

OVERVIEW

Generally, baby cradle is used as an application for the baby to sleep. For example, the mother or care takers have to cradle their infant till they are asleep. During night this is tedious, each time the baby wakes up parents have to sooth the baby back to sleep. In hospitals, it is very difficult to monitor baby continuously especially body temperature. The baby make also be disturbed due to urine wetness of the bed.

These are the main points of view during course of the project. When the baby in the cradle cries, the cry will be detected by the microphone where, sound signal will be converted to electrical signals. The signals are then amplified by the amplifier then it is sent to the peak detector where cry peaks will be detected and further the signal is sent to microcontroller. Microcontroller controls the signals to be sent, and then the output of the microcontroller is sent to the drivers which drives the DC motor and makes the cradle to swing according to the sound intensity
(baby's cry).

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PRINCIPLE

The microcontroller performs all the decision making processes. The microcontroller used was PIC16F877A. PIC is one of the leading architecture for low end applications which requires 8 or 16 bit processors. All PIC microcontrollers are low-cost, self-contained, hardware architecture in structure, pipelined, RISC, single accumulator with fixed reset and interrupt vectors.

Inbuilt peripherals in PIC include USART, ADC, TIMER, EXTERNAL INTERRUPT, RTC, SPI. The main features that it has made it quite useful are:

1. Synchronous serial port with I2C
2. Interrupt capability
3. Timer1: 16-bit timer/counter with prescaler.

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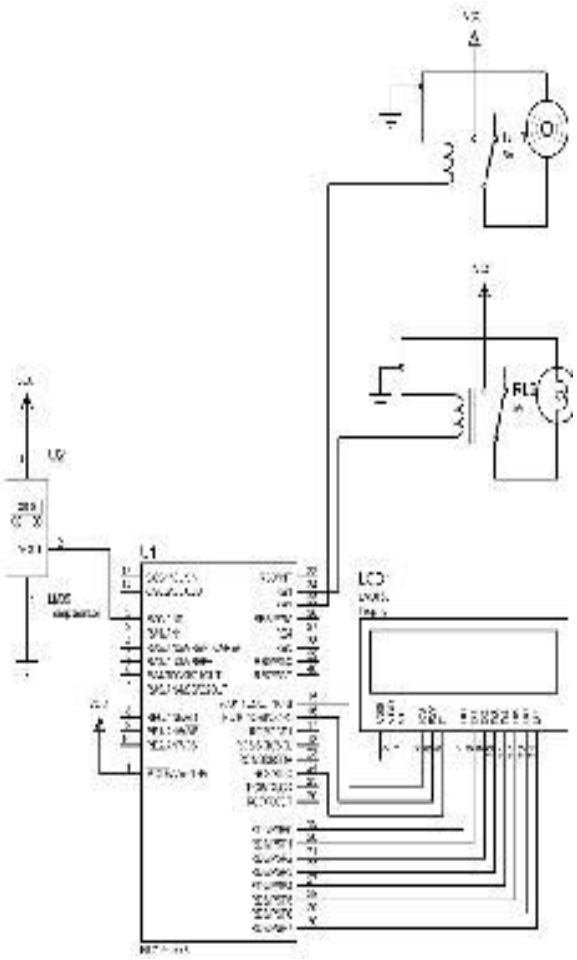


Circuit diagram

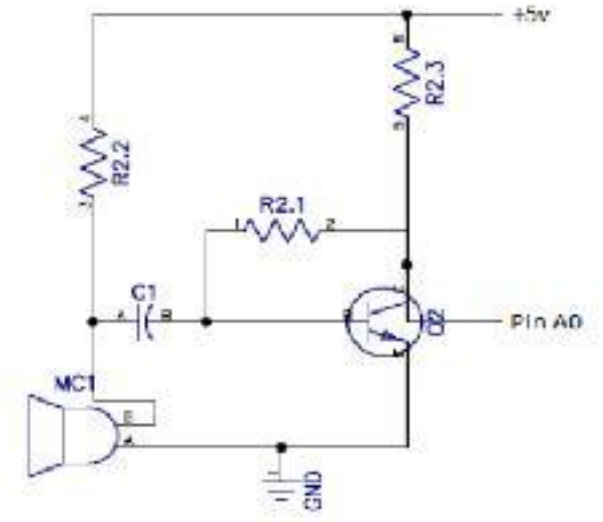
The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

When the baby cries at a frequency (1.5KHz to 5KHz) greater than normal human voice(less than 1.5KHz), hence the filter. The sound signal is detected by the microphone where, and is converted to electrical signals. The signals are then amplified by the amplifier which is then sent to the peak detector where cry peaks will be detected and further the signal is sent to microcontroller. Microcontroller controls the signals to be sent, and then the output of the microcontroller is sent to the drivers which drives the DC motor and makes the cradle to swing according to the sound intensity.

IMPLEMENTATION

1.1Microphone

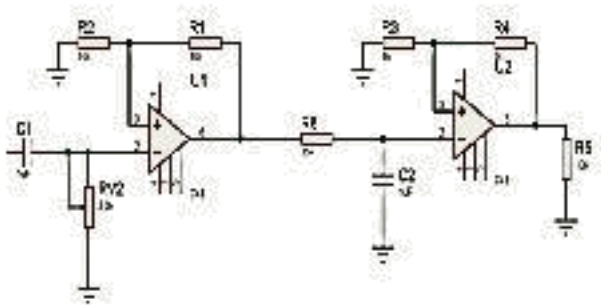
Microphone interfacing circuit, used to convert sound into electrical signal, here it is used to pick up the cry of the baby (input) and is given to the (output) microcontroller.



microphone circuit

1.2 Filter Circuit

Band-pass filter 1 K-5 KHz range in order to obtain the cry of the baby. The baby's cry is usually in the range 1 K-5 KHz. This frequency range essentially filters unwanted signal and noises.



BAND PASS FILTER

CONCLUSION

This project was made with provisions for further development, our main aim was to provide system which can be put to use in both hospital and domestic environment. But these two are different environment and requires different specification.

Several monitoring systems can be included in this electronic cradle project such as PPG, ECG, etc. Features such as remote monitoring and central monitoring can be included. These instruments are widely used in Neo-natal ICU for monitoring. Another major addition that can be made is a Nebuliser which is an instrument used for medication of children, mainly used in relation to respiratory diseases, it is now a unavoidable part in paediatrics with increasing cases of asthma.

At home, the system doesn't need to perform as a critical care system. The main aim here is to comfort and sooth the baby in absence of parents. The major advancements that can be made in home environment are including remote monitoring; send distress signal using GSM technology, using 3G technology for viewing live feeds of the baby.

The scope of the project Electronic Cradle is not limited, future developments can be included for providing better infant care systems.

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