

E-CRADLE

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ABSTRACT

In today's fast paced life, it sometimes become a problem for parents and nurses to look after the infants, therefore, the baby is not taken care properly. Hence, it has become a need to develop a new automatic electronic cradle, as, existing cradles are to be swayed manually. This paper presents the design of a new E-Cradle that swings automatically when baby cries, for this it has a microphone detects the baby cry voice and accordingly the cradle swings till the baby stops crying and also checks whether the mattress is wet or not. The system is provided with an alarm that indicates two conditions – first when the mattress is wet, which is an important parameter to keep the baby in hygienic condition, second when baby does not stop crying with in a stipulated time of 2 min, which intimates that baby needs attention. This system helps parents and nurses to take care of babies without physical attention.

General Terms: E-Cradle, Automatic.

Keywords: Automatic Baby Cradles, Wet Sensor, Cry Analyzing System.

I. INTRODUCTION

In today's world, everyone is busy in its own life. Nowadays, even the mothers are working and there is a requirement of unattended cradle. The proposed E-Cradle is a novel solution to this problem. In the proposed design, there will be a circuit placed along the cradle which will sense the sound intensity of the cry of the child and takes necessary actions based on the sound intensity of the child's cry.

The system is designed to help parents and nurses in infants care. The design aims at following points:

1. Cradle starts swinging automatically when baby cry.
2. If the baby stops crying before 2 minutes, then the cradle will stop automatically after 3 minutes of swinging.
3. Sounds an alarm if baby cries for more than a stipulated time of 2 minutes indicating that baby needs attention.
4. Sounds an alarm when mattress gets wet.

ORGANISATION: Section (1) deals with the introduction of the research paper. Section (2) gives a brief description of the proposed design, which includes the basic principle, algorithm, block diagram and circuit diagram.

II. PROPOSED DESIGN

2.1 Basic Principle (Refer 1.):

Sound level of baby's cry in dB with a preset value and it swings if is greater than. The amplified signal is generated from the voice input. This amplified signal is then converted into a digital signal from which sound level x is calculated.

$$\text{soundlevel } x = 20 \log (V_{in}/V_o) \text{ dB}$$

Where,

V_{in} = Voltage (ADC count) when baby is crying.

V_o = Average reference voltage (ADC count) when baby is not crying.

The preset value is set initially as part of configuration of the system.

2.2 Block Diagram

Figure 1 depicts the flow chart of the system.

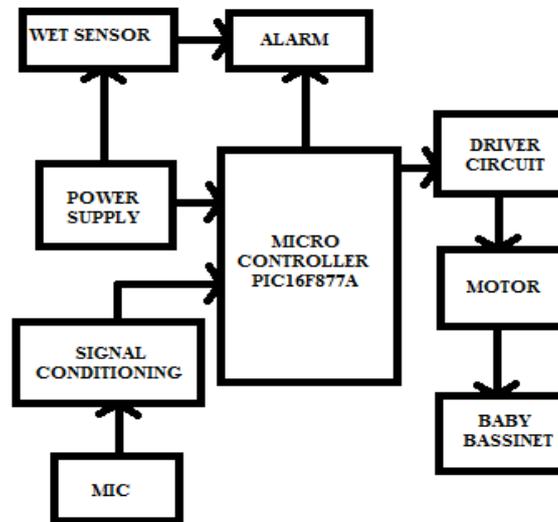


Figure 1 Block Diagram

2.2.1 MIC: When baby cries in the cradle, microphone detects it and converts the sound signal into electrical signal. The electrical signal is then fed into amplifier.

2.2.2 Signal Conditioning: Signal amplification is done here. Op-amp is used as amplifier for signal conditioning circuit. The electrical signal from MIC is provided as input to the circuit. The output from MIC is amplified by op-amp so that it can be used by microcontroller.

2.2.3 Microcontroller: PIC16F877A is used to receive the amplified signal and convert this amplified signal to digital signal. Microcontroller controls the driver circuit that starts a motor and sways the baby bassinet. Microcontroller also controls the buzzing of alarm when the motor sways the bassinet for more than two minutes.

2.2.4 Driver Circuit: Motor driver circuit consists L293D IC, which supplies essential power to drive the motor. This isolates the PIC and ICs from electrical problems.

2.2.5 Motor: DC motor of 60 RPM, 12 volts, 1A is used to sway the baby bassinet. It is connected to PIC through a driver circuit.

2.2.6 Wet Sensor: It is a moisture sensor having two leads in mesh form. When baby wets the mattresses the two leads become short and signal is send to the alarm. This system helps in keeping the baby in a hygienic environment.

2.2.7 Alarm: Alarm will be generated on two conditions:

1. When mattress is wet, indicating parents that mattress and baby clothes need to be changed.
2. When baby cries for a specific time. For example, baby cries and baby bassinet swings for 2 min alarm will be generated. This indicates parents that baby needs attention

2.2.8 Baby Bassinet: Baby bassinet is the infant bed. This is connected to a motor which sways the baby bassinet based on the power it receives from the driver circuit.

2.3 Flow Chart:

Figure 2 depicts the flow chart of the system.

Sound level of baby's cry is compared with the preset value continuously. When the sound level of baby's cry becomes greater than preset value, the cradle will start swinging. If the baby does not stop crying for 2min, then the parents are intimated by buzzing the alarm.

A wet sensor circuit also continuously keeps on checking whether the baby’s mattress is wet or not. If the mattress is found to be wet, parents are intimated by buzzing the alarm, thus maintaining a hygienic environment for the baby.

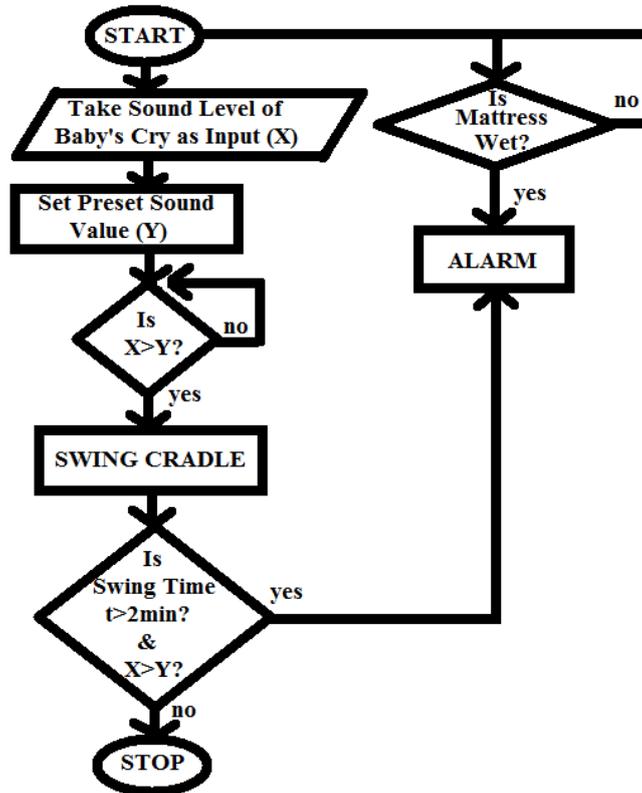


Figure 2 Flow Chart

2.4 Circuit Diagram:

Figure 3 Depicts the circuit diagram of wet sensor used in the system, comprising of two 1k resistors, an NPN transistor and an alarm. The two sensor probes are connected to a mesh which sounds an alarm when the circuit gets completed by the water.

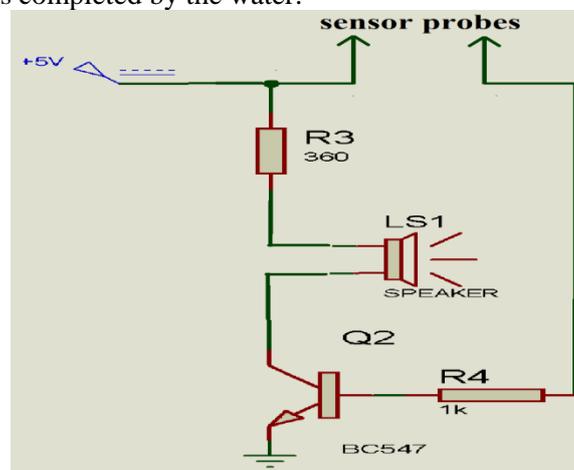


Figure 3 Circuit Diagram of Wet Sensor

Figure 4 Depicts the power supply of the system, comprising of a Step-Down Transformer, 3-Terminal IC of LM78L05, a Rectifier / Wheat-Stone Bridge of Four NPN Diodes, Two Capacitors of 0.1uF, One Capacitor of 102 uF and One Capacitor of 120 uF.

Step-Down Transformer takes 220V a.c. supply and gives the output by lowering the voltage to 12V a.c. Wheatstone Bridge or Rectifier converts this 12V a.c. to 12V d.c. LM78L05 IC again lowers this 12V dc to give an output of 5V dc. An LED is connected so as to check that the circuit of power supply is working properly.

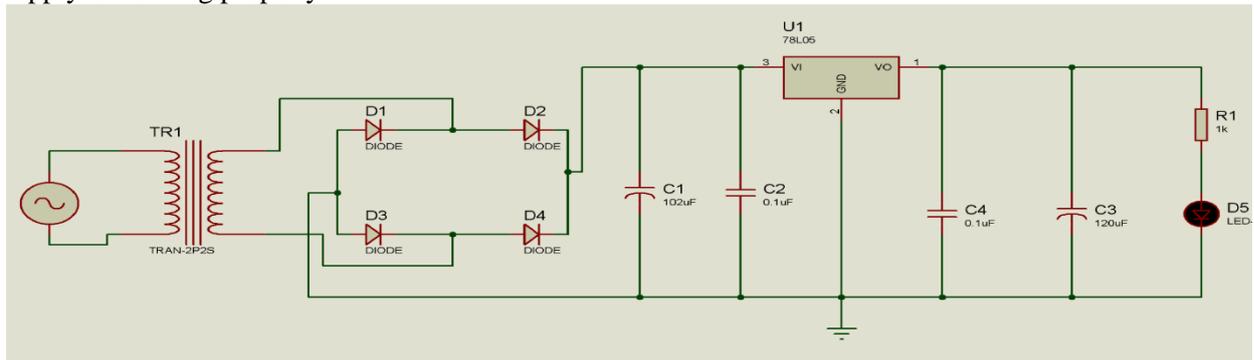


Figure 4 Circuit Diagram of Power Supply

Figure 5 Depicts the main circuit of the system, comprising of PIC 16F877A, MIC, L293D and Buzzer. PIC 16F877A is the main controller of the circuit, which gets the input from the microphone and compares the input with the preset value. If the input is greater than the preset value then it sends the high voltage to the Driver Circuit of L293D which ultimately turns on the motor for swaying the cradle.

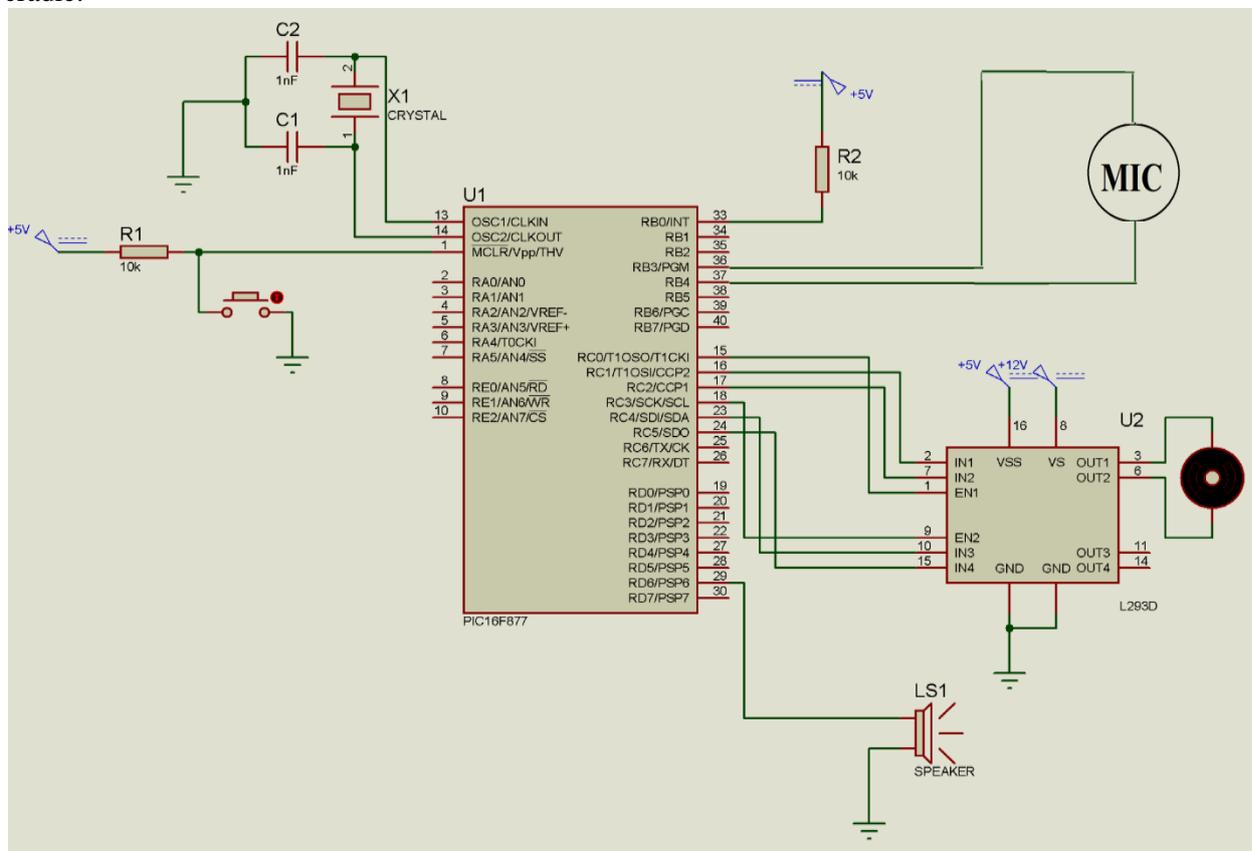


Figure 5 Circuit Diagram of E-Cradle

III. RESULT & DISCUSSION

Minimum sound level of baby's cry was found to be 20 dB. The system is programmed in such a way that it moves the motor of the cradle when the microphone gets the sound of more than 20 dB and if the baby stops crying before 2 minutes then will continue to sway for a total of 3 minutes, so that the

baby feels cozy and sleeps properly. Else if, the baby does not stop crying for 2 minutes then it will sound the alarm, indicating that the baby needs attention.

However, the proposed design is working properly but it has some errors like it may start at any voice greater than 20 dB of sound level. Also, the speed of DC motor is a bit high, which has to be calibrated during implementation.

IV. CONCLUSION

Looking after babies is hard problem worldwide. Babies are society future. This system emphasizes the importance of child care. The above designed system is economical and user friendly and very useful for working parents and nurses. They can manage their work efficiently.

With the development of technology day to day work has been eased for parents along with baby care. Otherwise, mother's lap would be best cradle for baby.

V. FUTURE WORK

This system can be enhanced with more features like with baby rotating toy with music and camera. Parents can monitor their baby live via 3G. Also, instead of Alarm, parents can be intimated by sending an s.m.s. to the parents' mobile phone.

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