Automatic E-Baby Cradle Swing based on Baby Cry

Ankit Sharma[1], Dhruv Arora[2], Samarth Khanduri[3], Yashwant Bhatnagar[4], Monika Kaushik[5]

Abstract: In this paper we have proposed automatic e-baby cradle using microcontroller Arduino Uno along with GSM module SIM800L. We have used the concept of wireless communication. The system detects baby cry audio and automatically sends the message to the guardian. The moment guardian reply's, the cradle will start swinging. Also, when the baby stops crying, the cradle will swing for 10 more seconds to comfort the baby. This system helps parents and nurses to take care of the baby without physical attention.

Keywords: *Wireless Communication, Audio Sensor, Cry alerting system.*

I. INTRODUCTION

Parents in the present world are busy in their professional life, so they do not get sufficient time to take care of their babies. It may be expensive for the household to afford a nanny. Today's woman has to manage home along with their office work simultaneously. After long working hours, they have to take care of the home along with the baby. They may not get enough time to swing the cradle manually and sooth the baby. Moreover, in today's life style, it is very difficult even for the housewives to sit nearby their infants and sooth them whenever they cry.

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

- When the baby starts crying a message will be send to the guardian.
- The guardian can control the cradle wirelessly.

II. LITERATURE REVIEW

Steven Bang designed automatic baby rocker having a noise sensor to detect baby cry. Noise sensor consists of Electret MIC with a pre amplifier (2n3904 transistor). Signal from noise sensor is fed to microcontroller Arduino ATmega 328, which is used to control the DC motor. Few colorful lights made up of LED are used to entertain the baby while being rocked. Mabuchi RE-260RA DC motor with Tamiya 6 speed gear box is used to create the rocking motion of the crib with gear ratio of 505.9:1.

Yang Hu proposed an algorithm for adjusting the bassinet swaying extent by the sensor signals. The bassinet is made up of an adaptive swaying device and other sensors network. While baby is crying, the sensors network can judge the reason according to detecting parameters, giving the different signals to control circuit. At the same time, the bassinet starts to sway slightly. The swaying rhythm can be adjusted according to parameters from baby status. They used three pressure sensors located in the bassinet bottom, one at the center and others at left and right of the bottom.

Marie R. Harper invented a crib adapted to be rocked automatically. Once the crib is manually tilted in one direction and released, this permits the inertia to actuate the locking and actuating arms to operate under the biasing force of spring in conjunction with the gear. Thus, spring loaded motor begin to operate and the lever arm is oscillated in back-and-forth movement. This provides the same effect as would be achieved by the mother rocking the crib containing the baby. Oscillation of crib is stopped when the slightest resistance is incurred.

Gim Wong presented an Electronic device that can be attached to conventional pivotally mounted type crib.Which is actuated by baby cry voice picked up by the microphone giving short throw type rocking action to crib.Very similar to a person rocking the crib by pushing and pulling on the foot or headboard. There is a sensitivity control so that baby voice only actuates the rocking action and a timer to control the duration of rocking action.

Chau-Kai-Hsieh proposed a baby cry recognizer which includes an amplifier circuit for amplifying a received sound signal. In response to the amplified sound signal, a pulse generator circuit generates a pulse signal having zero crossings which are aligned with zero crossings of the amplified sound signal. The pulse signal, in turn, is inputted to a signal recognition circuit. The signal recognition circuit outputs a signal indicating that a baby's cry was detected.

III. COMPONENTS USED

- Arduino Uno
- Arduino IDE
- Audio Sensor (CZN-15E)
- GSM Module (SIM 800L)
- Servomotor
- Cradle(model)

These are the main components used in the project:

- **Arduino Uno**: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

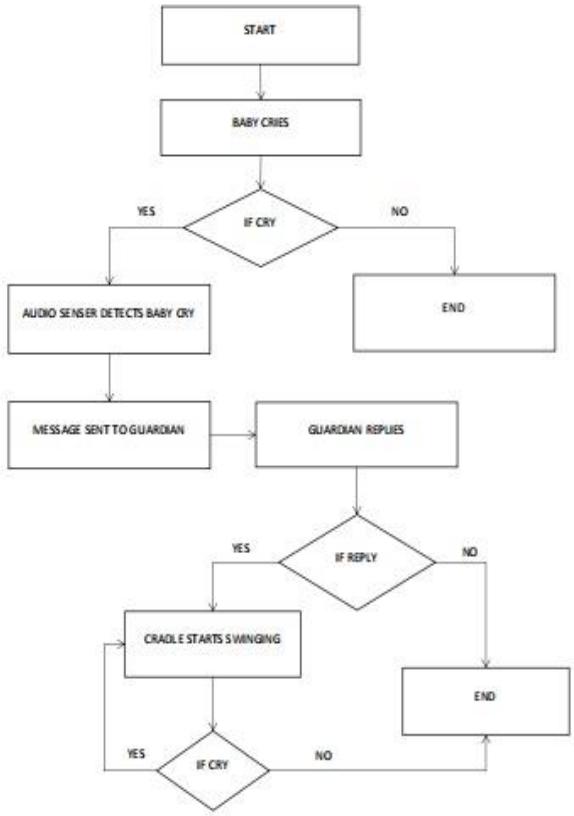
Arduino IDE: The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors.

- **Audio Sensor (CZN-15E):** The CZN-15E sound sensor with microphone is able to detect sound. This sensor or for example used in a so called "clap sensor". The sensor is binary, it only measures if there is sound or not and is therefore incapable of determining sound frequency or amplitude.

- **GSM Module (SIM800L):** GSM Module SIM800L is a complete Quad-band GSM/GPRS solution in a LGA type which can be embedded in the customer applications. GSM Module SIM800L support Quad-band 850/900/1800/1900MHz, it can transmit Voice, SMS and data information with low power consumption. With tiny size of 15.8*17.8*2.4 mm, it can fit into slim and compact demands of customer design. On board LED displays connection state (no network coverage - fast blinking, logged in - slow blinking).

- **Servo Motor:** A servo motor is a rotary actuator or a motor that allows for a precise control in terms of the angular position, acceleration, and velocity. It makes use of a regular motor and pairs it with a sensor for position feedback. It is a self-contained electrical device that rotates parts of machine with high efficiency and great precision. Moreover, the output shaft of this motor can be moved to a particular angle.

IV. BLOCK DIAGRAM



V. WORKING

When the baby starts crying, the audio sensor detects the baby cry and sends a message "Baby is crying" to the guardian indicating that the baby needs attention. If the guardian reply's with:-

1. **"Start"**- The cradle will start moving until the baby stops crying and will further swing for 10 seconds to soothe the baby and if the baby starts crying again, the cradle will start swinging automatically without the need of any reply from the guardian.

2. **"Stop"**- When this message is sent by the guardian, the cradle will not swing even if the baby is crying.

VI. RESULT AND COMPARISON

The individual devices were assembled and were observed to be working efficiently at the time of baby's cry detected by the audio sensor and swing the cradle automatically. The developed device was able to send an SMS to the user. The message "Baby is crying!" is sent to the guardian's mobile phone. This project helps to overcome various problems in the society by providing solution as in the points mentioned below:

- Reducing burden on women as a mother
- Allow women to contribute more towards the society
- Develop a system capable of soothing and monitoring the baby itself
- Design a smart cradle, with distinctive features i.e. automatic swing (using cry detection), interactive toys and two-way communication

There are quite a few features which make our baby cradle stand out from rest of the products in the market. The major distinct characteristics of our automatic baby cradle are as follows:

- **The "No" Reply Feature:** Usually, the other baby cradles available in the market don't have this feature to stop the cradle according to the guardian's will but we have included this particular feature to let the guardian decide when the baby needs attention. If the guardian is close to the baby and it starts crying the guardian can reply as "No" to the message sent by the cradle and the cradle won't start to swing on its own again.
- **Cost Efficient:** We have tried to make our cradle as affordable as possible so that everyone even if they belong to a lower middle-class household can afford it because everyone can't afford to hire a nanny for their babies. So, our product stands out in terms of cost effectiveness.

VII. CONCLUSION

This Automatic Baby Soothing and Monitoring System detects crying infant voice on all sides or around the cradle, classifies it and decides whether to rock the cradle or not, based on the reply sent by the guardian. Moreover, the cradle will be set automatically if the guardian replies with "Start" for the first time in a day. And if the guardian is close, he/she can reply accordingly to stop the rocking motion of the cradle so that they can take care of the baby themselves. In this way, it aspires to bring a certain amount of relief to the mother, and help her balance work and domestic life.

VIII. FUTURE SCOPE

- We'll be developing our own android app to control the cradle remotely through a mobile phone.
- A camera can be included in the system which would help in monitoring the baby remotely through the app.
- Moisture level detection can be done using moisture sensor through raspberry pie.
- Two-way communication between the cradle and the parents can be achieved

IX. REFERENCES

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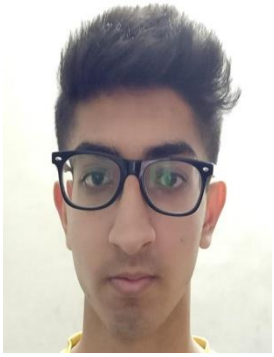

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