Automatic Cradle System for Baby using Arduino

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Abstract- **In today's busy life it becomes difficult to handle multiple work at a time. For working women who have a baby, it is necessary to monitor and taking care of various activities for baby. Out of which swinging a cradle for a baby manually becomes very time consuming and needs to be automated. This paper presents the work of a new design and implementation for low cost automatic baby cradle system with monitoring baby movement and baby crying. Based on these parameters an Arduino uno microcontroller operated control system to automatically switch baby cradle on or off depends on the baby condition is presented in this work. PIR sensor for baby movements and crying detection by audio sensor is used and required signals are generated to activate switch of a dc motor. Motor with driving mechanism is connected to the cradle for continuous swinging operation.**

Index terms- **Automatic cradle, Arduino uno, PIR sensor, Audio sensor, dc motor**

I.INTRODUCTION

The baby cradle is generally used to sleep babies in comfort. Babies feel soothe in the cradle that is why is most necessary for babies. But swinging of baby cradle manually it needs human being. In today's life everyone is busy in their work, but baby care is very necessary as well. In recent development automation is introduced in everywhere as there are so many technologies available. The baby cradle also needs to be an automated system. In this regards there are so many literatures are available on baby cradle automation and baby monitoring system.

The Arduino based baby monitoring system is presented in some literature where baby crying, movement, wet sensing when baby excretes, baby crying alarm is presented [1] [2] [3]. Another development is to sense various biological parameters of the baby like temperature and alerting baby mother for necessary action [4] [5].

In recent literature all this parameters senses and message conveyed on parents mobile phone [7]. An internet of things based baby cradle and baby monitoring system also developed [6].
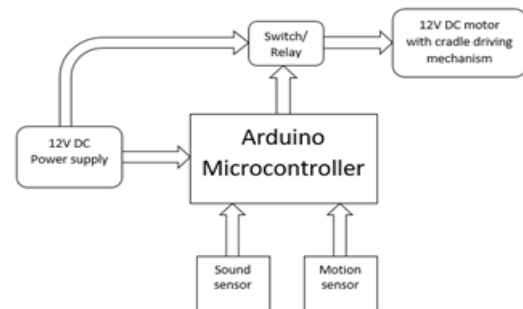

Fig.1 Block diagram of arduino operated automatic cradle system

Fig. 1 shows the block diagram of Arduino operated automatic cradle system. In this system baby presence in the cradle and baby movement is detected by passive infrared (PIR) sensor and signals transferred to Arduino microcontroller. Arduino makes dc motor switch on if baby movement detected otherwise dc motor switch is off. Sound sensor works in similar manure when baby crying, sound sensor senses it and Arduino makes dc motor on otherwise dc motor is off. For this system 12 volts dc supply is required for dc motor as well as Arduino board and it can be taken from 12 volt 2 ampere dc adaptor.

II. DESIGN OF CREDLE

A.   Components of cradle
1. DC Motor:

Fig.2 12 V DC wiper motor

For driving cradle a 12 volt vehicle windshield wiper motor is used [8]. A typical wiper motor with torque upto 30 Nm is suitable for the system at a current around 1.8 A on loading. This wiper motor comes with inbult over temperature and blocked rotor protection. A 20 cm long metal strip is connected to the motor shaft for required stretching to the cradle.

2. Arduino UNO microcontroller board:

Fig.3 Arduino UNO microcontroller board

Arduino UNO is a very basic board in Arduino family which uses Atmega 328P microcontroller. Arduino is an open source embedded system which can be easily programmed as per the required application. Arduino IDE is the required software for programming in Arduino board. Here Arduino is used to pragram for baby movement and baby cry sensing with the help of PIR and sound sensor.

3. Audio sensor:

Fig.4 High perciesion sound sensor

Figure 4 is the typical high precision audio sensor which senses sound surrounding to the sensor. The sensor accuracy can also be changed using variable resistor connected with the sensor mic. This sensor works on 5 volt dc supply.

4. PIR sensor:

Fig.5 Passive infrared (PIR) sensor

Figure 5 is the motion sensor which senses movements surrounding to the sensor. It transmits infrared on object front of the sensor and activate if change in the infrared signals. This sensor also works on 5 volt dc supply.

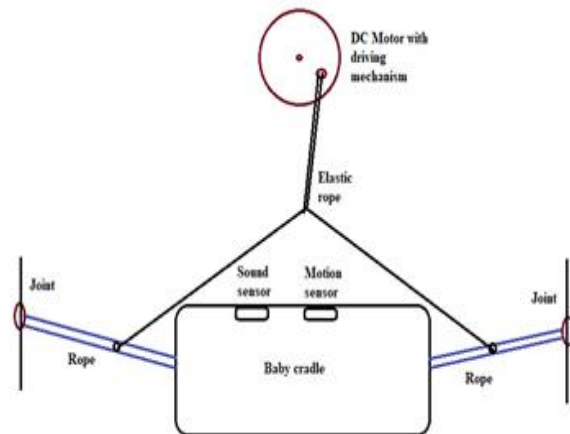B.   Cost effective design of cradle

Fig.6 Cost effective simple design of cradle

Fig. 6 shows the cost effective design of an automatic baby cradle. In this design the rope of the cradle can directly be mounted to wall on both sides and baby cradle is connected exactly center. Here an elastic rope is connected on both side of the cradle and another end of this elastic rope is connected to the driving mechanism which is attached to the shaft of dc wiper motor as shown in fig. 6. As soon as the dc wiper motor start rotating, this stretches elastic rope hence cradle start swinging and continuous in motion until motor rotates. The purpose of the elastic rope is to give swing cradle smoothly
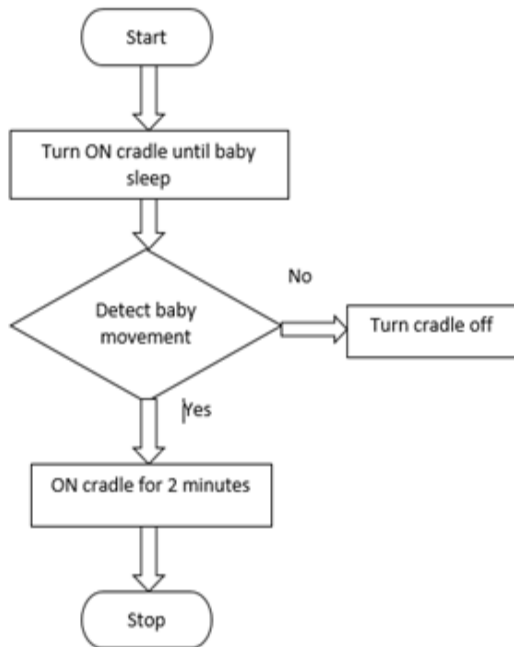
III. AUTOMATIC OPERATION OF CRADLE

Sound sensor works in similar manure as that of movement detection. When baby crying, sound sensor senses it and Arduino makes dc motor on for 2 minutes otherwise dc motor is remains off.

IV. CONCLUSION

This paper presents the design and implementation of an automatic baby cradle system which uses simple design of a cradle driving with the help of 12 V dc wiper motor. Baby movement and crying is detected by sensors to switch on and off dc motor. Controlling can be achieved by Arduino uno microcontroller.

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Fig.7 Flowchart of baby movement detection

Flowchart of baby movement detection is given in fig. 7. In this system baby presence in the cradle and baby movement is detected by passive infrared (PIR) sensor and signals transferred to Arduino microcontroller. Arduino makes dc motor switch on for 2 minutes if baby movement detected otherwise dc motor switch is off.
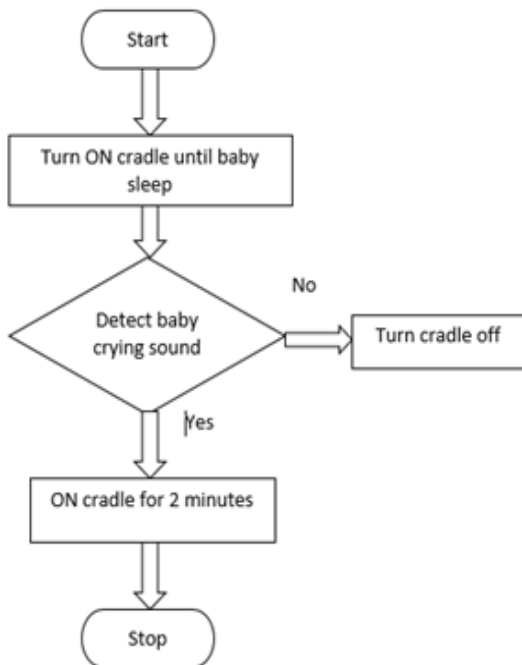

Fig.8 Flowchart of baby crying detection

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