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Wireless Cradle

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Abstract: With fast growing pace of life and nuclear families working women find it difficult to come home and cradle their infants at night. Keeping a continuous watch on the baby and cradling him every time is not possible. We propose a remote operated cradle with a vertical movement that will give the effect of a mother's lap. The ZigBee transceiver will be used in the remote. The motor interfaced with the PIC microcontroller will cause the Vertical movement of cradle. The cradle has the provision of stopping at a certain angle. The cradle incorporates a baby monitoring system. The cries of the baby will be Detected at the remote and the voice of the mother will be heard at the speaker in the cradle. It also has Music player

Keywords: Zigbee, Cradle shape, MP3 Player, Motor Driver

I. INTRODUCTION

In rapid growth of automation, advancement of technology has led to reduction of human efforts. Our project aims at reducing the stress of working women, who must cradle their babies late at night, which becomes very tiring. By providing a vertical movement to cradle it will give the baby the feel of a mother's lap. The womb shaped cradle tries to incorporate the benefits of traditional "palna" system of Indian household. The cradle will swing stimulating senses but calms to make the child feel safe as if in a mother's womb. As the paediatricians say, to keep the baby elevated for a few minutes after feeding, as laying them flat on back will result in acid reflux. The cradle is provided with the provision of elevating it with 45 degrees for a few minutes using a timer. Additional features such as music would help to create prenatal conditions of a womb. Rocking of the cradle, elevation, timer and the music will be controlled by a ZigBee remote control device to operate the cradle from any corner of the house. The cradle will have an inbuilt baby monitoring system, with the help of which the cries of baby can heard from cradle onto the remote and voice of mother can go to the baby. Thus, reducing the need to monitor the child continuously.

II. LITERATURE SURVEY

Syslog Technologies introduces "Baby Cradle Monitoring System using Wireless Communication". This project has a LCD at the other end. If the wet sensor senses any input or when the baby wakes up, it is immediately seen at the LCD. When the baby starts crying the toys automatically starts rotating. [1]

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 colourful 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. [2]

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. [3]

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 increased. [4]

Gim Wong presented an Electronic device that can be attached to conventional pivotally mounted type crib, actuated by baby cry voice picked up by the microphone giving short throw type rocking action to crib which is 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. [5]

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

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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. [6] Anritha Ebenezer gives an approach to design a baby cradle consisting of cry analyzing system which detects baby cry. According to sound intensity, cradle swings. It has six rocks per minute. It has wet sensor to indicate baby wets, whenever baby wets resistance would change thus sending a signal. Other sensors include temperature sensor to display baby temperature, respiratory sensor that sends a signal in apnea condition. GSM modem via RS232 is used to send message to parents in case baby does not stop crying with in a particular instant of time. [7]

A. Shape of Cradle

The shape of the cradle is like a mother's womb which can be achieved even by tying a simple cotton cloth on a hook as in Indian household. But the cloth cradles are not safe if not tied to something solid, it can fall off. As well as putting bedding inside it may lead to suffocation. Making sure the baby doesn't roll over to his side is very important as it may lead to Sudden Infant Death Syndrome (SIDS). Our womb shaped cradle overcomes all these disadvantages. The little hollow shape in the middle will prevent baby from rolling over.

B. *Lateral Swing of the Cradle*

According to research of brain's interpretation of sensory input, forward rocking motion is the most comfortable and soothing motion for a baby. Side to side, lateral swinging stimulates the portion of the brain that perceives circular motion. For sensitive babies it may lead to dizziness. Hence, we are giving the cradle a forward movement. There are cradles in the market that has forward movement on the movement of the baby using springs.

C. *Elevation of Cradle*

Normal cradles are used to lay the baby flat on back. The elevation feature of cradle helps to tackle the problem of acid reflux. Mothers are advised not to lay the baby immediately flat on back after feeding, keeping them elevated for a few minutes may help in digestion. The little elevation helps in smooth breathing too

III. SYSTEM ARCHITECTURE

The architecture of the system consists of a transmitter and a receiver. The Zigbee remote at the transmitter gives the command to the Zigbee receiver at the other end. The motor is responsible for the forward movement and elevation of the cradle. The motor, the music and the baby monitoring system is interfaced to PIC 18f4550 microcontroller which controls the entire circuitry at the receiving end.

A. System Block Diagram

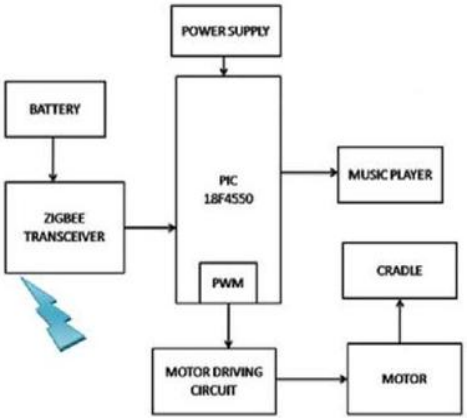

Fig 1: System Block Diagram

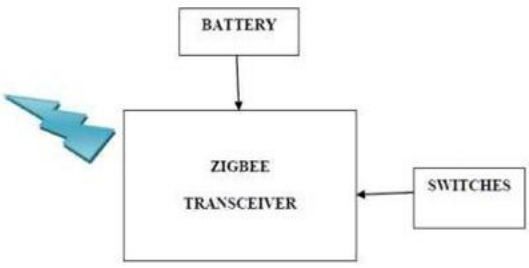

Fig 2: Remote Block Diagram

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B. Block Diagram Description

Battery/Power Supply:
The battery of 5V is used to power the microcontrollers.
Zigbee requires a supply of 3.3V.

Microphone: The microphone is used in the baby monitoring system to hear the cries of the baby and to hear the mother speak at the receiver section.

Music Player: The music player generates sounds in the cradle. The MP3 module used in our project is FN-M16P.

ZigBee Transceiver: It is a mesh network specification for low-power wireless local area networks. It is based on the IEEE 802.15.4 Wireless Standard Created by the ZigBee Alliance. Topologies used are star, cluster tree and mesh. It is used in the remote to send the data at the receiver section. ZigBee at the receiver receives the data and informs the microcontroller to perform the function required.

Motor driving circuit: It consists of a motor driver and a DC motor. We used L293D motor driver.

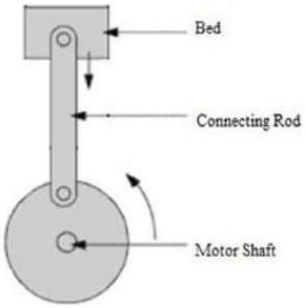

Fig 3: System Mechanism

As shown in the Figure 3 connecting rod is fixed to Rotating Shaft. The rod is attached to the bed of the cradle. When the motor rotates in the clockwise direction, the connecting rod changes its orientation and the bed is elevated from the upper side. The hinge makes sure that the bed is not movable from the bottom end. When the motor rotates in the anti-clockwise direction the bed is brought back to its original position

IV. CIRCUIT DIAGRAMS

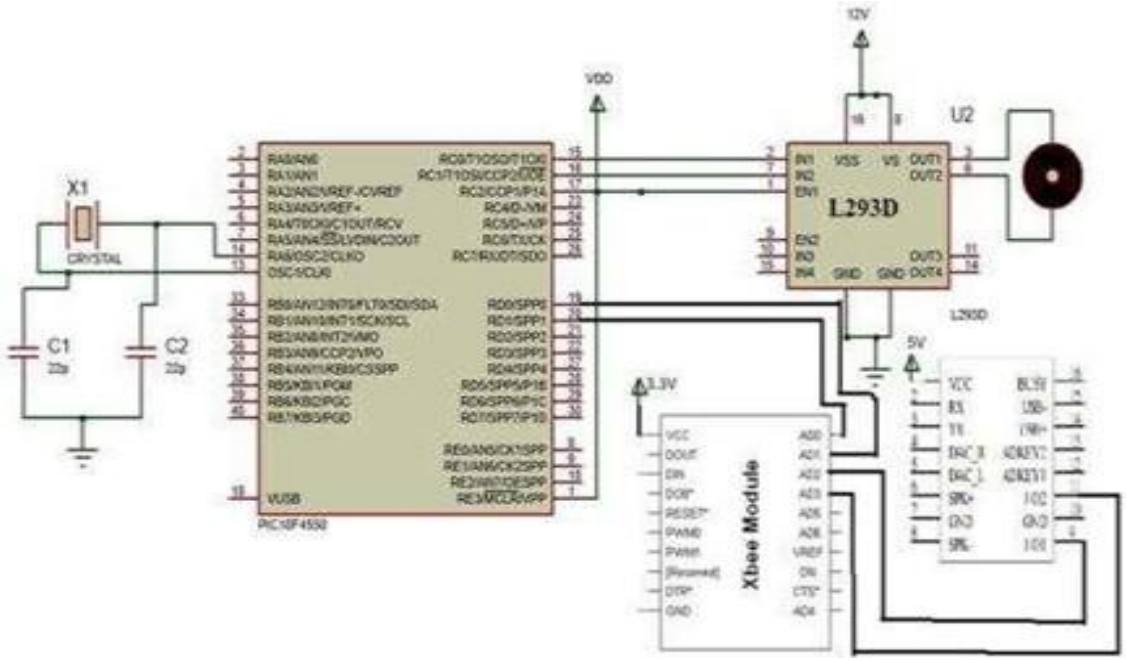

Fig 4: System

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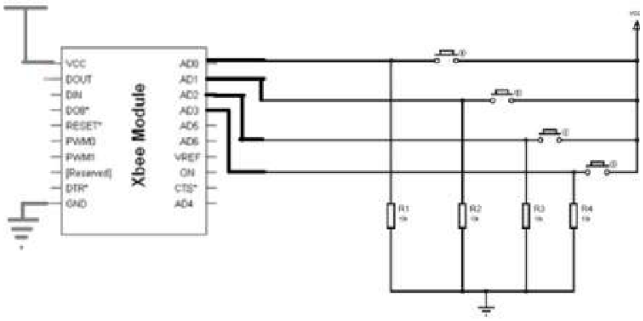

Fig 5: Remote

V. HARDWARE

A. MP3 Module

The MP3 module used in our project is FN-M16P. The speaker is connected to pin number 6 and 8 of the module. Vcc given is 3V to 5 V. Pin number 9 and 11 are connected to Microcontroller at the receiver side.

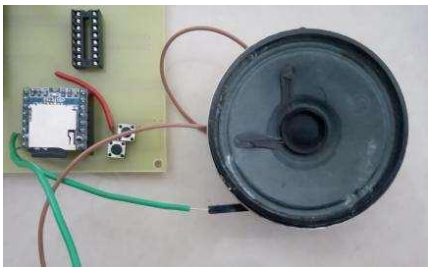

Fig 6: FN-M16P

B. Motor Driver

Motor driver IC used in this project is L293D. It's a dual H-bridge driver IC. This 16 pin IC is used to drive the motor both in clockwise and anticlockwise directions. Drivers 1 and 2 are enabled by connecting pin 1 to 5v and motor is connected to pin number 3 and 6. The speed of the motor is controlled using PWM available in the microcontroller. Connections are made to microcontroller through pins 2 and 7. Pin number 8 and 16 are connected to 12v.

Fig 7: L293D

C. Zigbee

When button Switch is press from the ZigBee Remote the output at receiver Zigbee goes high then the microcontroller gives a positive signal to Pin number 2 of L293D. Motor is connected to pin 3 and 6. The motor Rotates when input from microcontroller at pin 2 is high.

Fig 8: Zigbee as Remote

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VI. RESULT AND CONCLUSION

A. Weight Bearing Capacity

Weight barring capacity is tested by putting 4 bottles filled with water of approximately 4 kilogram

Figure 9: Weight Bearing Capacity

B. Elevation of Structure

When switch is pressed at transmitter side the cradle is elevating at 45 degrees

Figure 10: 0 Degree

Figure 10: 45 Degree

C. PWM SIMULATION

We used PROTEUS 8 for simulation. The PWM simulation was done by connecting a Digital Storage Oscilloscope to 17 pin of PIC18F4550 as shown in figure 2 and burning code in it. The results are as follows

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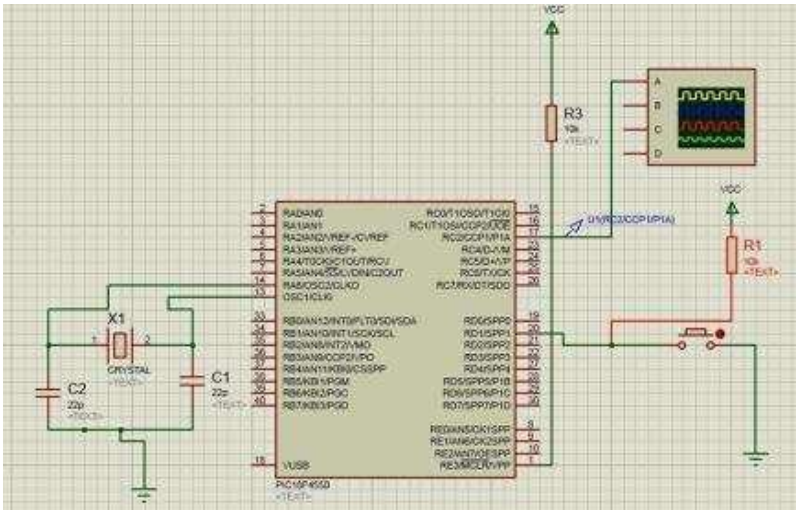

Figure 11: Hardware connection in proteus

We obtained different pulses for duty cycle of 25% and 75% as shown in Figure 7.5 and Figure 7.6 respectively

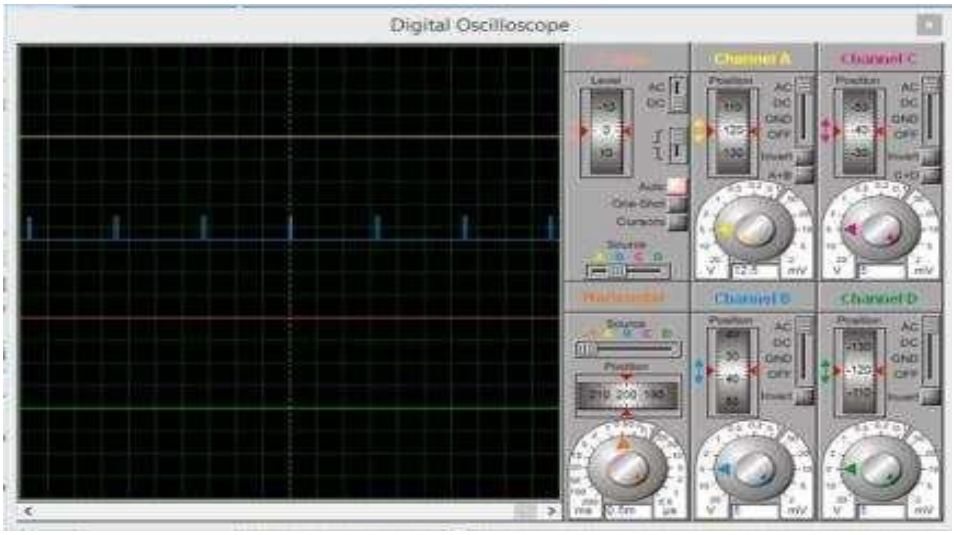

Fig -12: 25% Duty Cycle

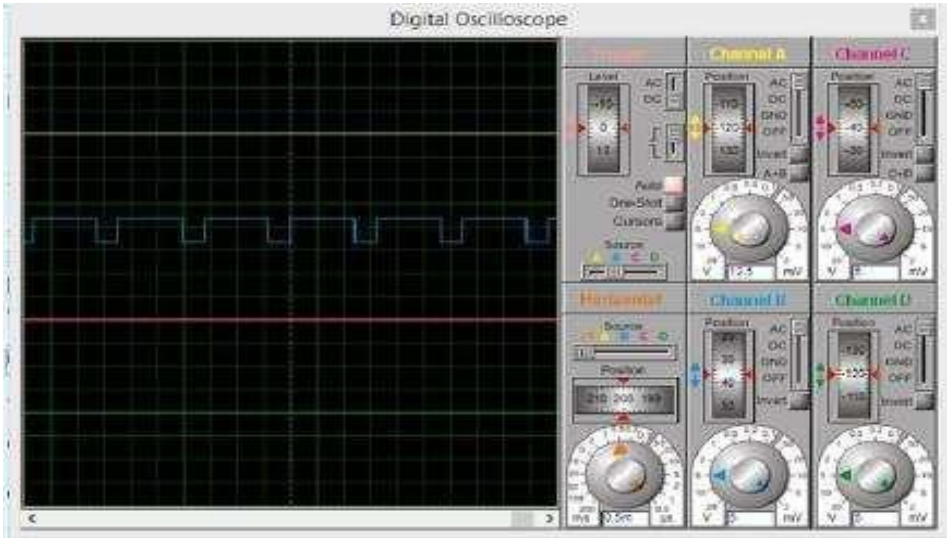

Fig -13: 75% Duty Cycle

This is a cost effective wireless operated cradle.

1. Its vertical movement gives the feeling of a mother's lap to the child. It is beneficial for the working women who find it tiring to cradle their babies at night.
2. The cradle is womb shaped that creates prenatal conditions for the child.
3. A provision to stop the cradle at 45 degree is given so that the baby can be kept elevated after Feeding. Thus, prevents SIDS.
4. The ZigBee operated as remote controls the cradle in a range of 30 meters
5. There is a built-in music player for the child

VII. FUTURE SCOPE

1. The cradle can be fitted with wheels so that it can be used as a pram.
2. Wheels will make it portable.
3. A rechargeable battery will make it portable as well as it can provide backup during power shut down.
4. With an LCD screen in the cradle and other LCD screen with the mother, the baby can stay in touch with his mother during the working hours too.
5. Also, a security system can be installed for a safe cradle

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BIOGRAPHIES

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