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Automated Cradle

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Abstract

The project idea develops from the very fact that a woman finds it difficult to concentrate on her child owing to her busy schedule of house life. The situation aggravates when she has a job or has some household business, since she can neither compromise with her work nor she can ignore her child's needs. Many devices are available to ease her task and help her to balance between her work and the needs of her child. Our Automated Cradle proposes to be one of them. Unlike some of the existing designs, which uses a microprocessor as the controlling unit, the proposed model uses IR wireless technology for less complexity and easy access and the slider crank mechanism used for the swing makes the transition smooth. The user can control the swinging speed of cradle by a remote. The model here has two variable speeds for the cradle swing, which is advantageous in many ways. Once the baby is asleep, the cradle can be brought to low power mode with normal swing.

Keywords— Automatic swing, Remote control, Wet detection, childcare, IR connection.

I. INTRODUCTION

The main objective of this automated cradle is to control all the features of cradle by a remote while simultaneously doing some other task. Its advanced features will mitigate the burden of constant monitoring by the user. The features are as stated below:

A. Shukla, J.M. Patel, P.D. Solanki, K.B. Judal, R.K. Shukla, R.A. Thakkar, N.P. Gajjar, N.J. Kothari, S. Saha, S.K. Joshi, S.R. Joshi, P. Darji, S. Dambhare, B.R. Parekh, P.M. George, A.M. Trivedi, T.D. Pawar, M.B. Shah, V.J. Patel, M.S. Holia, R.P. Mehta, J.M. Rathod, B.C. Goradiya and D.K. Patel (eds.), ICRISET2017 (Kalpa Publications in Engineering, vol. 1), pp. 226–232

1. The cradle design is stereotypically Indian and the push and pull as conventionally given by hand is replaced by automatic oscillations using a dc motor.
2. The automatic swing can be operated at two different speeds.
3. The wet detection feature has been added to mother's advantage since it gives the indication that the child has peed.
4. A Music ON/OFF circuitry is provided to soothe the baby while sleeping.
5. The cradle is also facilitated with a fan, which is also controlled by a remote.

II. LITERATURE REVIEW

Yang Hu suggested an algorithm for adjusting the cradle swaying extent by the sensor signals. The cradle 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. [1]

Steven Bang invented automatic baby rocker having a noise sensor to detect baby cry. Noise sensor consists of Electric MIC with a pre amplifier. Signal from noise sensor is fed to microcontroller, which is used to control the DC motor. Few colorful lights made up of LED are used to entertain the baby while being rocked. [2]

The system designed by Nitin Bhatnagar, Kshitij Shinghal, Amit Saxena, Niket Tiwari, Shubham Bhatnagar, Shushant Kumar helps parents and nurses in infant's care. The design aims at automatic swinging of cradle when baby cries. If the baby stops crying before 2 minutes, then the cradle will stop automatically after 3 minutes of swinging. It also sounds an alarm if baby cries for more than a stipulated time of 2 minutes indicating that baby needs attention and another alarm when mattress gets wet. [3]

Rachana Palaskar, Shweta Pandey, Ashwini Telang, Akshada Wagh and Ramesh M. Kagalkar suggested a design so that nanny and parents could take care of child without physical attention. DC motor can offer movement motion according to its rated power. As per microcontroller programming the motor rotates in right-handed direction for three seconds and then in anticlockwise direction for three second. Additional features include: Alert parent when the mattress gets wet and information regarding the temperature by sending SMS. [4]

Marie R. Harper designed a crib adapted for automatic swinging. 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, the spring loaded motor begin to operate and the lever, which is attached, to crib is oscillated in back and forth movement. [5]

Misha Goyal and Dilip Kumar introduced a automatic baby cradle which includes an microphone to detect baby cry and to it convert into electric signal, op-amp which used as amplifier for signal conditioning circuit and a microcontroller to receive the amplified signal and to convert the amplified signal to digital signal. Microcontroller controls the drive circuit that starts a motor and sways the baby cradle. [6]

III. IMPLEMENTATION

3.1 Block diagram

The block diagram of designed model is shown in Figure 1. The voltage supply for different circuits is from 9 to 12 V. For easy use of the design, an adaptor is used. The ac power is indirectly used for continuous use of the various functions. The connection of various circuitries to the cradle is shown in figure.

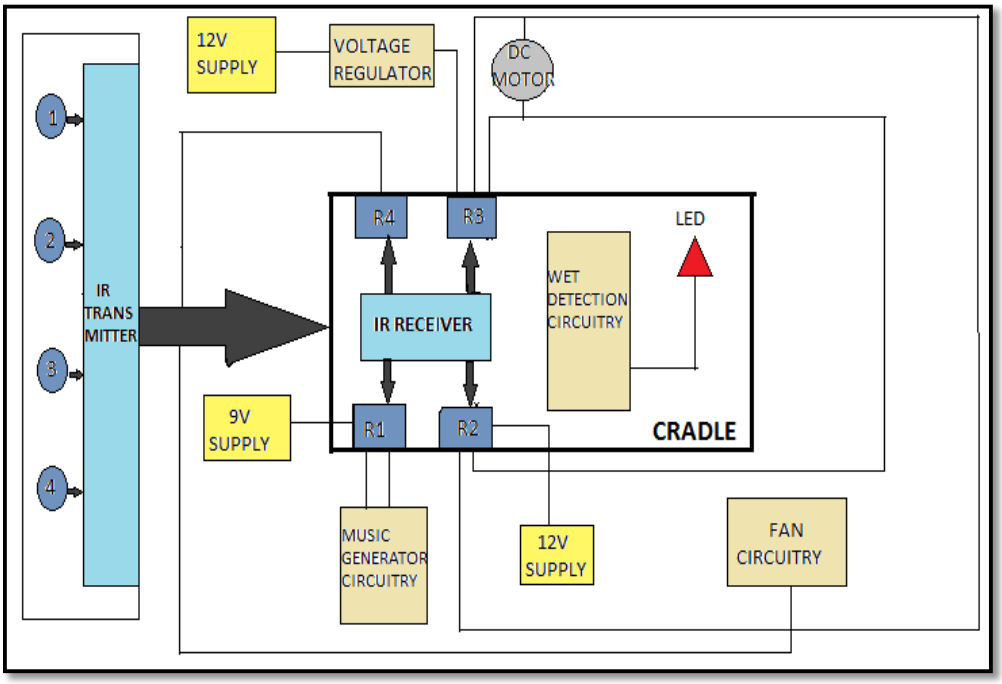

Figure 1: Block diagram

3.1.1 Controlled by remote

The cradle features like speed and music ON/OFF are kept controllable by an IR remote. The IR transmitter-receiver circuit has been designed such that only a single IR LED and single IR receiver has been used and 4 channels have been created by the means of encoder and decoder circuits.The

carrier frequency of the transmitter circuit is 38 KHz. The generated pattern defers for each of the four channels. The pattern is determined by which of the push button switch is pressed. The receiver

section consists of decoder HT12D which decodes the codes it receives from the encoder and as per the code activates output at one of the output pins. These outputs can be interfaced to do variety of operations like driving a relay.

3.1.2 Automatic Swing

The automated cradle works on two modes: a low speed mode and a high-speed mode. While providing both the modes, sufficient care has been taken to maintain a speed in such a range that the baby doesn't get disturbed during the change of mode.

The speed of the DC motor is directly proportional to the supply voltage it is provided with and hence if the supply voltage changes, the speed of the motor varies accordingly. Here the voltage regulator is designed using LM317. For speed control purpose, voltages of 12V and 7V are given to the DC motor. While the 12V is directly derived from the supply mains via an adapter, 7V is derived using LM317.

3.1.3 Wet Detection

The indication is through a LED. Care has been taken that the wet detection circuit operates on low voltage levels to reduce the risks of baby experiencing discomfort.

The wet detection circuit is basically an astable multivibrator circuit with a break in its path in the form of detector. Detector is actually two plates with a break in between hence when a liquid falls in the path, it completes the conductivity route and hence generation of waveforms occurs.

3.1.4 Music Generation

The music circuit is controlled by a remote control. The mother can vary its volume and can turn music ON/OFF according to the requirement. The volume range is appropriately decided such that it does not sound disturbing.

The Music Generator circuit is essentially a melody generator using UM66. A supply voltage of 6V is given to the IC. The IC outputs the melody in terms of current changes in the output of the IC. A transistor is used to drive the speaker as per the melody and music is thus generated.

3.1.5 Fan Facility

The fan can be conveniently turned on and off by the remote.

3.2 Hardware model

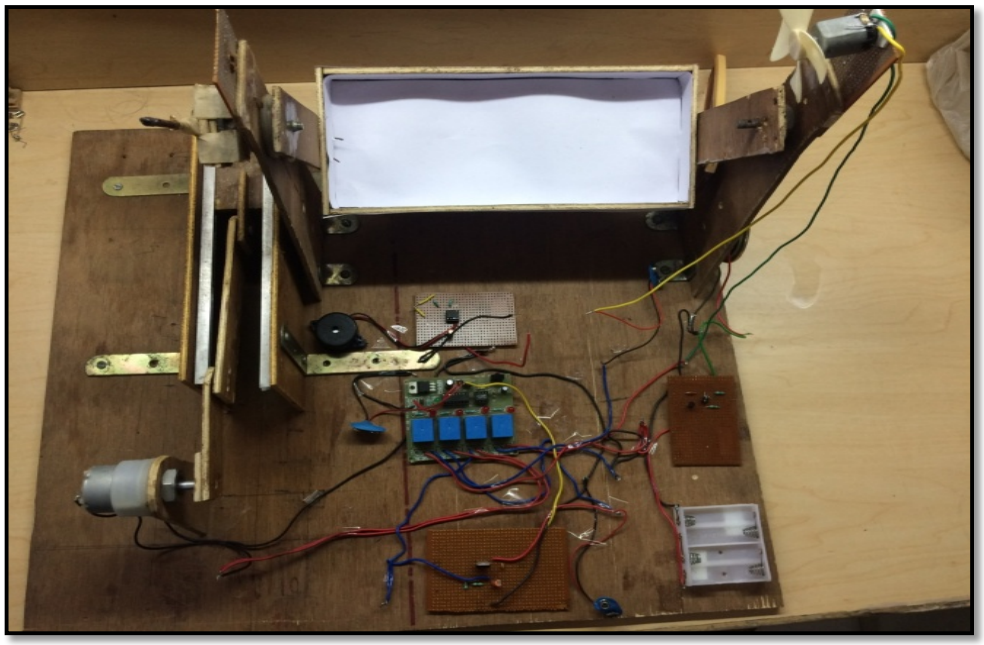

Figure 2: Prototype model

The developed prototype model is shown in figure. The cradle swings with the help of a slider crank mechanism. This mechanism is connected to dc motor, which in turn is connected to a voltage regulator circuit.

3.3 Software Simulation

The wet detection circuit uses NE555 timer circuit. The simulation of the circuit is done using Proteus software. The actual hardware has a buzzer that will ring in case the baby pees.

This happens when the drop of pee closes the open contact and the circuit path gets completed. In the simulation, LED demonstrates the functioning of buzzer.

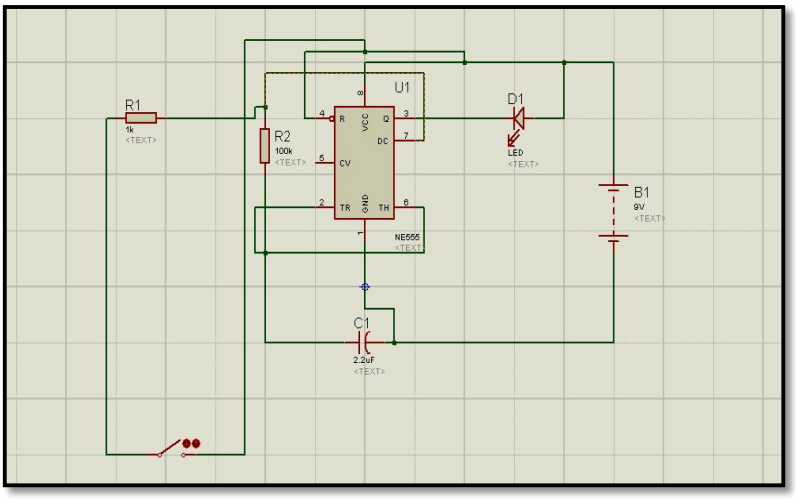

Figure 3: Wet detection simulation

IV. RESULTS

In the simulation, the blinking of LED indicates that the baby has peed. Thus, when the circuit is completed, the timer IC actuates and the supply voltage is available to the LED which will light it on.

After power is supplied to the hardware model, the functioning is controlled by a remote. Four buttons are used for following control actions:

1. Swing of cradle at predefined high speed
2. Swing of cradle at predefined low speed
3. Turn on/off lullaby sound
4. Turn on/off fan

V. FUTURE SCOPE

In this system, a level sensor can be used for considering the baby's safety; such that if baby goes above a specific level, the system will alert the parents about it. Moreover, camera can also be provided for constant monitoring of baby.

VI. CONCLUSION

Thus, the above designed system would be of great use to the working parents and nurses for taking care of the infants while doing other task simultaneously. This system emphasizes the importance of childcare and child health.

VII. ACKNOWLEDGEMENT

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