Smt. S. R. PATEL
ENGINEERING COLLEGE

DESIGN & DEVELOPMENT OF AUTOMATIC BABY CRADLE

Group No: 05

Prajapati Mitesh
Patel Gopal
Modi Kishan

Guided By : Prof. R. N. Mevada

Outline

- Introduction
- Project background
- Objective
- Literature review
- Project scope
- Methodology
- Design Part
- Calculation
- Conclusion
- References

Introduction

In the present scenario where both the parents are busy in their professional life, it has become very difficult for them to get sufficient time to take care of their babies. Sometimes it is not affordable for them to hire a nanny or admit their child to crèche during their job timing. It is found that in most of the times baby stops crying or sleeps when they are in cradle due to providing them gentle rhythmic motion. In today's life style, it is very difficult for parents and nanny to sit nearby their child and sooth them whenever they cry. Where working parents often feel it difficult to accomplish both the obligation of work & parenting, we have designed a system which would help the parents and even to house-wives during their household works to take care of their babies without paying physical attention.

Project Background

✓ The automatic baby cradle system is still new and does not much apply in local industry. The application of automatic baby cradle is rarely used excepting the developed big cities.

✓ The automatic baby cradle available in the market now-a-days are using the DC motor to provide the motion to the bassinet, the motor consumes the much power as well as it produces the noise also which disturb the baby and reduce the comfort level of the baby. Where as sometimes starting of the baby cradle have jerk full motion.

✓ The basic components used in now-a-days baby cradle are controller, motor, power supply, timer, sensor etc.

✓ Various sensors are used to control the function of the automatic baby cradle like voice sensor, wet sensor etc.

✓ The timer is set to the controller which provide the motion to the cradle for prior set time period.

Objective

- ✓ Improving the mechanism of providing the motion to the bassinet
- ✓ To help parents especially those who are busy, doesn't have maid, nursery and many more
- ✓ To attain the noiseless working of the cradle
- ✓ To achieve jerk free motion
- ✓ Make it economical and user friendly
- ✓ The built in timer in the microcontroller will regulate the operation time
- ✓ To reduce the time and energy used

Project Scope

- ✓ Automatic baby cradle can be used at hospitals
- ✓ Useful to nanny also for caring babies
- ✓ Convenient & affordable to working parents
- ✓ This mechanism is less power consuming so it is acceptable and affordable also
- ✓ If cradle is not in moving then by attaching gear mechanism we can produce small amount of energy.

Literature Review

DESIGN, FABRICATION AND ANALYSIS OF AUTOMATED CRADLE

By :Adwait B Kadu, Pranav C Dhoble, Jagrut A Ghate, Nilesh B Bhure, Vaidehi A Jhunankar, Prof. P M Sirsat

DC motor will provide rotational motion according to its rated power. As per microcontroller programming the motor rotates in clockwise direction for given certain time-period and in anticlockwise direction for certain time-period. When the motor rotates in clockwise direction it pushes the bassinet to front side & when motor rotates in anticlockwise direction it pushes the bassinet on the either side. And in this way the system will keep working.

Automatic E-Baby Cradle Swing based on Baby Cry

by Misha Goyal & Dilip Kumar

E-Baby Cradle swings automatically when baby cries, for this it has a cry analyzing system which detects the baby cry voice and accordingly the cradle swings till the baby stops crying. The speed of the cradle can be controlled as per the user need. The system has inbuilt 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, which intimated that baby needs attention.

An Arduino-Based Resonant Cradle Design with Infant Cries Recognition

By Chun-Tang Chao, Chia-Wei Wang, Juing-Shian Chiou and Chi-Jo Wang

This paper proposes a resonant electric cradle design having sensors which are designed to detect the oscillation state & infant cries recognition. By detecting oscillation state force is driven at the critical time to achieve the maximum output response while saving

energy according to the principle of resonance.

Steven Bang invented	automatic baby rocker having a <u>noise sensor </u>to detect baby cry. Noise sensor consists of Electric MIC with a pre <u>amplifier</u>. Signal from noise sensor is fed to microcontroller which is used to control the DC motor. Few colorful lights made up of <u>LED</u> are used to entertain the baby while being rocked
Yang Hu suggested	<u>algorithm</u> 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 <u>crying</u>, 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

Anritha Ebenezer and Anupreethi. S Proposed	an automatic swinging system having a microphone to detect the baby cry and which <u>converts the sound signal to electrical signals</u> which are then amplified by the amplifier and then sent to peak detector where cry peaks detected and further sent to microcontroller. Microcontroller controls the signals to be sent, then the output of which is sent to drivers which drives the Dc motor and makes the cradle to swing according to sound intensity.

Calculation
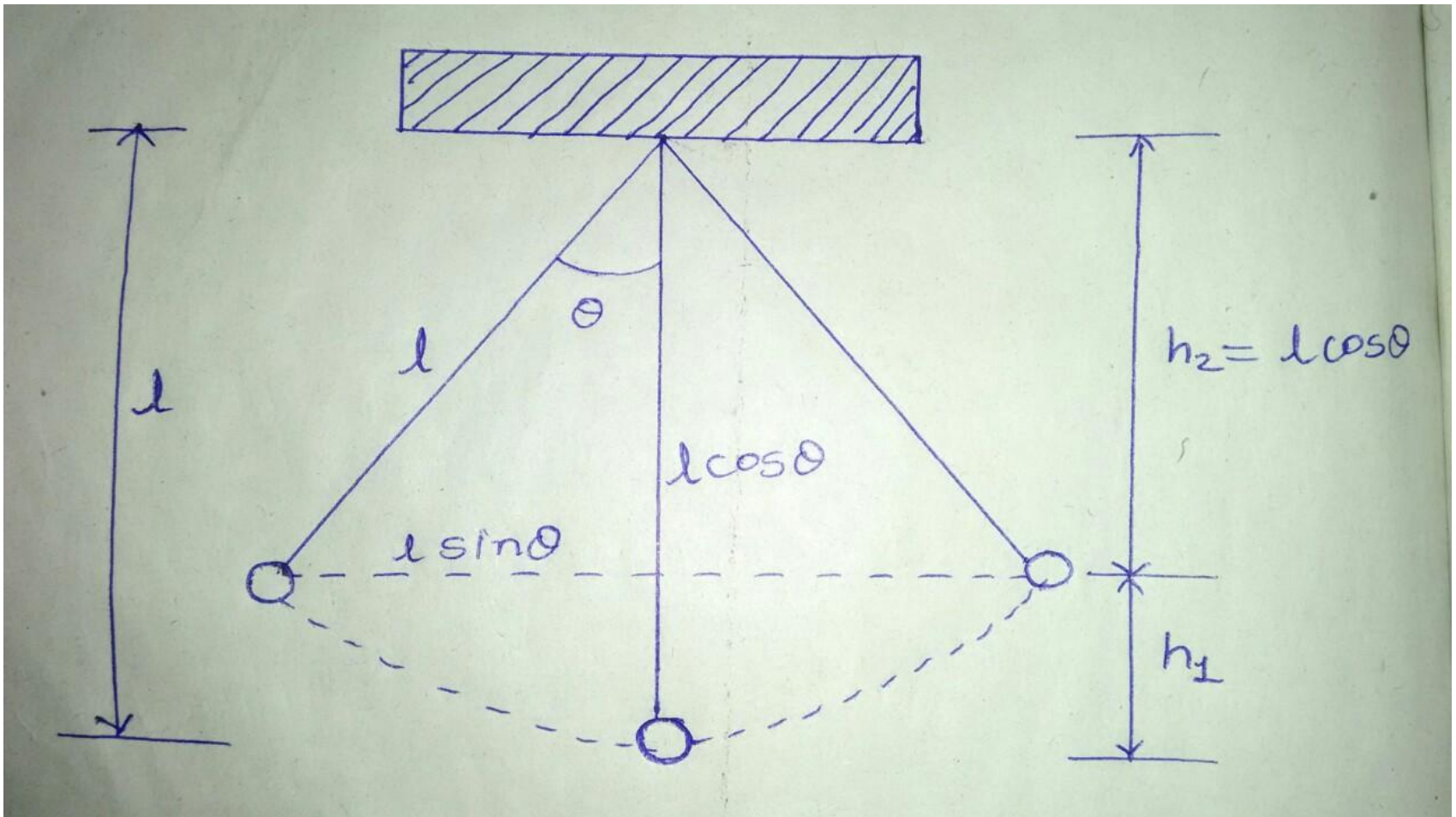
- Determination of the height of pendulum

The height of pendulum can be determine by following equation,

$$h_1 = l - h_2 \quad \text{where } h_2 = l\,(\cos\boldsymbol{\theta})$$

$$h_1 = l - l\,(\cos_{\boldsymbol{\theta}})$$

$$= l\,(1 - \cos\theta)$$

- **Determination of the force of pendulum**

The force of pendulum can be determine by following equation,

Potential energy = Transfer distance

$$mgh = F \times d$$

$$F = \frac{mgh}{d}$$

$$F = \frac{mg(1 - cos\theta)l}{2l\ sin\theta}$$

Where   m=mass of bassinet and baby

= 15 kg

g = mass gravity

= 9.81

$$\theta = 30°$$

$$F = \frac{15 \times 9.81(1 - cos30°)}{2sin30°}$$

$$F = 42.48 \ N$$

- Determination of the load of pendulum

The load of pendulum can be determine by following equation,

$$W = m \times g$$
$$W = 15 \times 9.81$$
$$W = 147.15 \ N$$

- Determination of the angular velocity of pendulum

The angular velocity of pendulum can be determine by following equation,

$$\omega = \sqrt{\frac{G}{L}}$$

$$= \sqrt{\frac{9.81}{0.4}}$$

=4.95 rad/sec

- Determination of the speed of pendulum

$$\omega = \frac{2\pi N}{60}$$

$$N = \frac{\omega \times 60}{2 \times \pi}$$

$$= \frac{5.71 \times 60}{2 \times 3.14}$$

N = 55.54 rpm

Force exerted at various angle

θ	F
1°	1.28 N
5°	6.42 N
10°	12.87 N
20°	25.94 N
30°	39.42 N

Components

✓ Bearing

- A ball bearing is a type of rolling element bearing that uses balls. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft).

✓ Battery

- An electric battery is a device consisting of two or more electrochemical cell that convert stored chemical energy into electrical energy. Each cell has a positive terminal, or cathode, and a negative terminal, or anode. This battery is used to store the energy which later can be used to run the cradle without electric supply.
- Voltage: 12 v
- Current: 1.4 A

✓ Magnet

- A magnet is a material or object that produces a magnetic field. This magnetic field is responsible for the force that pulls on other ferromagnetic materials, such as iron and attracts or repels other materials. The overall strength of a magnet is measured by its magnetic moment or, alternatively, the total magnetic flux it produces. The local strength of magnetism in a material is measured by its magnetization.

- Dimensions:-10cm*7.5cm*3.2cm

✓ Bassinet

- A bassinet is a small bed specifically for baby contains a child. Around two or three years of age, children are able to climb out. Bassinet prevents them for an injurious fall while escaping the bed. This bassinet mainly contains a cloth and a frame required to support it. The mosquito net is used to cover the baby for protection against mosquito attack

- Dimensions: 77cm*41cm*22cm
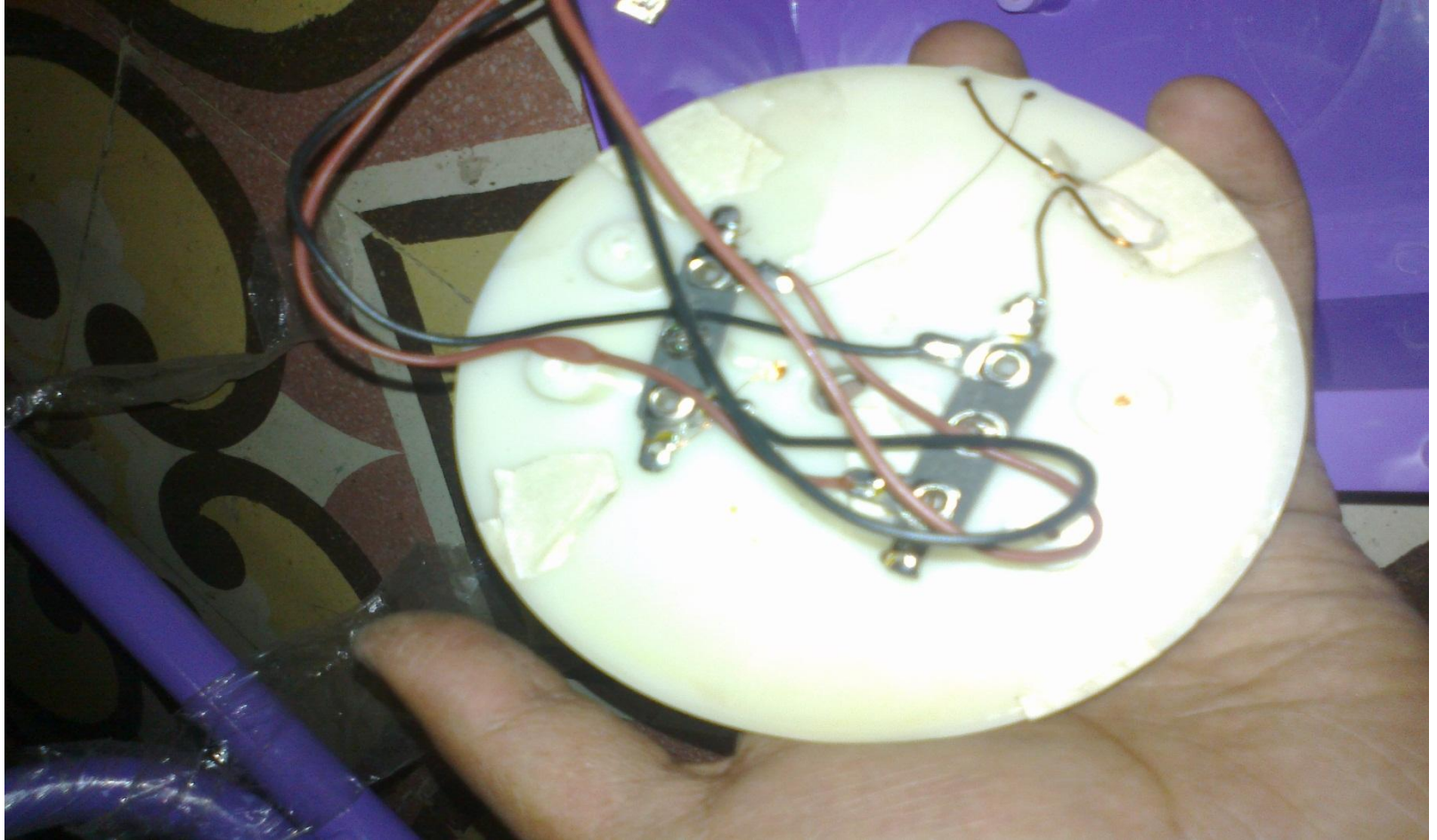
Conclusion

- The automatic electronic baby cradle is the finest solution for those house working mothers & working parents who can not find the sufficient time for their babies.

- This automatic baby cradle would let the working mother to do their household works with taking care of their baby at the same time.

- The easily conversion of baby cradle to baby stroller mechanism will be of great use.

- The used magnetic force mechanism will comparatively consume the less power.

- Such many more features of this device makes this product sophisticated and easily acceptable.

References

[1] Misha Goyal; Dilip Kumar; , "Automatic E-Baby Cradle Swing Based On Baby Cry" International Journal Of Computer Application(0975-8887), Volume 71- No.21, June 2013.

[2] Adwait B Kadu; Pranav C Dhoble; Jagrut A Ghate; Nilesh B Bhure; Vaidehi A Jhunankar; Prof. P M Sirsat; , "Design, Fabrication And Analysis Of Automated Cradle" International Journal Of Mechanical Engineering And Robotics Research, ISSN 2278 – 0149, Vol. 3, No. 2, April, 2014.

[3] Makeen Bin Mohd Amin; , "Automatic Baby Swing" University Malaysia Pahang, Department Of Mechanical Engineering, November 2009.

[4] chun-Tang Chao; Chia-Wei Wang; Juing-Shian Chiou; Chi-Jo wang; , "An Arduino-Based Resonant Cradle Design With Infant Cries Recognition"Department Of Electrical Engineering, Southern Taiwan University Of Science And Technology, ISSN 1424-8220, August 2015.

[5] Dynamics Of Machinery Book By Tech-Max Publication

Thank

You