|| Volume 5 || Issue 12 || April 2021 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH & ENGINEERING TRENDS
Multidisciplinary Journal
Double-Blind Peer Reviewed Refereed Open Access International Journal

SMART BABY CRADLE

Mayuresh Khatavkar[1], Jayraj Kharadkar[2],Pradyumna Mane[3], S.G. Pokharkar[4]
Student, AISSMS IOIT PUNE [123]
Asst. Professor, AISSMS IOIT PUNE[4]
ommayur997@gmail.com, jayrajkharadkar91@gmail.com pradumnamane60@gmail.com, sagar.pokharkar29@gmail.com

***

Abstract: The Internet of Things (IoT) has the potential to transform the ways we live in the world; we have more-efficient industries, more connected cars, and smarter cities, all these as components of an integrated IoT system. The current number of working mothers has greatly increased. Subsequently, baby care has become a daily challenge for many families. Thus, most parents send their babies to their grand- parents' house or to baby care houses. However, the parents cannot continuously monitor their babies' conditions either in normal or abnormal situations. This paper proposes a "Smart Baby Cradle" through the use of IOT technology will help parents to keep eye on baby's motion, temperature and moisture. Cradle is an appliance which uses to carry a baby and oscillate for comfort sleep of a baby. It takes a lot of efforts from parents to physically rock the cradle to keep eye on baby and to generate swinging motion of the cradle. When baby is kept inside the cradle need to be constant monitoring parent to keep tracking of baby's activity. He proposed idea in this prototype of smart cradle will allow the cradle to efficiently integrate itself with a smartphone typically android device. ESP32 microcontroller will be used to assemble all the sensors and hardware component required. Constant monitoring of the baby inside the cradle will be done. If any activity such as urination or baby waking up from sleep or baby cry occurs a notification through an SMS will be sent to the parent's device. The Smart cradle will also have additional features such as rocking the baby automatically via geared motor mechanism. The cradle is suitable for parents who are not able to invest all their time at home sitting near the baby. Other applications of this cradle can be at a maternity hospital as an assistant to the staff who are responsible to lookafter the baby.

Keyword: *ESP32, Microphone, Ultrasonic Sensor, Servomotor, PIR Sensor, Cloud Computing*

***

I INTRODUCTION

Generally, the baby cradle is used for to make sleep and soothe to baby. For example guardian has to take care of their child till as they asleep. However, conventional cradle does not electronically equipped such like battery or adapter to automate the cradle automatically. In Addition to that, these kind of conventional cradle can be used in village areas or non-developed cities due to its low prices. But the problem of this kind of designated cradle is that you need manpower to take care of your child and your child may not be safe and feel comfortable in the conventional cradle. Thus, we need automatic cradle to take care of child which uses the battery or power source. Besides, there are extra features or function is Provided by the newly automatic cradle that is beneficial for parents. Because in the present world people are very busy in their professional life so they do not get ample time to take care of their infants. It will be very difficult control the babies and if someone is hiring professional to take care of their infants. It may increase your expenses from monthly expenditure. Moreover, in today, life it is very hard to even for the parents to sit nearby their babies and sooth them whenever they feel uncomfortable. Though, it is automatic this application is very useful for the nurses in maternity units of hospital. Since safety is necessary for baby, care has to be taken during production and assembly of its component parts. Many tools and equipment used in the domestic

as well as small scale industries are designed to help the personnel working in production facility. Special instruction books are given to help the care taker for easiness. Our project aims at the design and fabrication of an Electro Mechanical Cradle for the purpose of using it in nuclear family with medium income. The principle used here is that cam which will rotate according to the mechanical power given to it, in our project the carriage is being oscillated with the help of a U-frame which is coupled to a cam which is mechanically powered by motor. There are a lot of limitations encountered in the use of conventional cradle. Conventional cradle is not user friendly, has less comfort, more time consuming, and is less safe. The idea of automatic cradle which will overcome the above stated limitations. The design and construction of an automatic cradle ensures comfortable and safe sleep for the baby. It may be used without a necessary external assistance or assistance from a care taker due to the concept of the design. The project is aimed at designing and constructing an electrically powered mechanical cradle for rocking a baby in a carriage with ease and in the most economical way. The cradle is expected to work with minimal technical challenges and greater comfort due to its wide range of application.

II EXISTING SYSTEM

2.1 Automatic Baby Rocker 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 cribwith gear ratio of 505.9:1. 2.2 Automatic Baby Cradle 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 actuate the rocking action and a timer to controller the duration of rocking action. 2.3 Smart Cradle 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

III PROPOSED SYSTEM

In our proposed system we worked on including ecosystem of sensors along with microcontroller board and communication system to get real time moisture and temperature update in baby cradle in order to avoid massive delay of physical presence. The temperature sensor senses the temperature in various parts of cradle and moisture sensors are used to obtain the relative moisture data inside the baby cradle. If sensors senses the temperature or relative moisture beyond the permissible values, the automatic generated message will be send on cellphone of the parents or guardian through GSM module via cloud service. ESP 32 Wi-Fi-Based Controller Board is an open source platform for IoT applications and is used as the main micro-controller in this project. It is used to gather data read by the sensors and Blynk app. It also receives commands given by the user to perform specific tasks via the MQTT server. ESP32 consists of physical programmable circuit board similar to that of any other development boards, such as Arduino board and Raspberry Pi. The programming of the ESP 32 can be performed using Arduino software, which is an

Integrated Development Environment (IDE), where the code of instructions is written and the micro-controller is uploaded. Generally, the baby cradle is used in various hospitals and maternity homes for infants to sleep in and for soothing them. Conventional cradles are used in villages or non-urban areas because of their low cost and simplicity. However, conventional cradles are manually swung and require manpower. They lack automation and are not electronically equipped. Consequently, conventional cradles should be automated to become more convenient, safe, and efficient in monitoring the baby's situation in real time

IV WORKING METHODOLOGY

4.1 Block Diagram

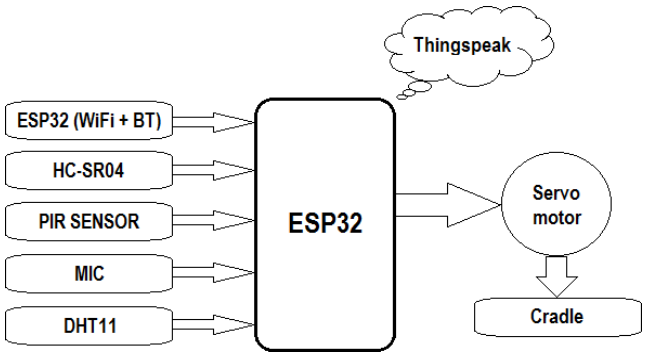

Fig.1 Block Diagram of the System and Its Explanation

This is a microcontroller based system using ESP32 microcontroller. This system uses a DHT11 i.e. humidity temperature sensor, MIC for audio input, moisture sensor to detect the moisture, HC-SR04 i.e. ultrasonic sensor and PIR sensor to detect movement of baby in the cradle. If any one of that parameter or any number of parameters which are being sensed by sensors are fluctuating above or below the predetermined permissible value specified for cradle, the microcontroller will take action and generate the respective automatic message and convey it to parents of the baby by using GSM module via cloud service. Cloud service will keep storing readings of sensors in emergency situation in order to perform analysis of those data log.

ESP32 Microcontroller

ESP32 is capable of functioning reliably in industrial environments, with an operating temperature ranging from –40°C to +125°C.ESP32 is highly-integrated with in-built antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power management modules. ESP32 adds priceless functionality and versatility to applications with minimal Printed Circuit Board (PCB) requirements.Engineered for mobile devices, wearable electronics and IoT applications, ESP ultra-low power consumption with a combination of several types of proprietary software. ESP32 also includes state-of- the-art features, such as fine-grained clock gating, various power modes and dynamic power scaling. ESP32 can perform as a complete standalone system or as a slave device to a host MCU, reducing communication stack overhead on the main application processor. ESP32 can interface with other systems to provide Wi-Fi and Bluetooth functionality through its SPI / SDIO or I2C / UART interfaces.

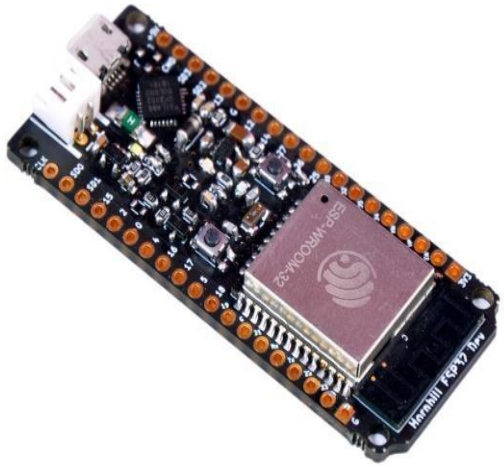

Figure 2: ESP32

4.2 Servomotor Micro

Servo Motor SG90 is a tiny and lightweight server motor with high output power. Servo can rotate approximately 180 degrees (90 in each direction), and works just like the standard kinds but smaller. You can use any servo code, hardware or library to control these servos.

|| Volume 5 || Issue 12 || April 2021 || ISSN (Online) 2456-0774
INTERNATIONAL JOURNAL OF ADVANCE SCIENTIFIC RESEARCH & ENGINEERING TRENDS
Multidisciplinary Journal
Double-Blind Peer Reviewed Refereed Open Access International Journal

Figure 3: Servomotor

FEATURES:

- 10RPM 12V DC motors with Metal Gearbox and Metal Gears
- 18000 RPM base motor
- 6mm Dia. shaft with M3 thread hole
- Gearbox diameter 37 mm.
- Motor Diameter 28.5 mm
- Length 63 mm without shaft
- Shaft length 15mm
- 180gm weight
- Rated torque 120 kgcm
- No-load current = 800 mA, Load current = up to 7.5 A(Max)

4.3 PIR Sensor

The Passive Infrared Sensor (PIR) sensor module is used for motion detection. It is often referred to used ”PIR”, ”Pyroelectric”, ”Passive Infrared” and ”IR Motion” sensor. The module has an on board pyroelectric sensor, conditioning circuitry and a dome shaped Fresnel lens. It is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically-activated lighting systems.

Figure 4: PIR Sensor

FEATURES

- Colour: White + Green OR White + Blue
- Infrared Sensor with Control Circuit Board
- The Sensitivity and Holding Time Can be Adjusted • Working Voltage Range: DC 4.5V- 20V
- Current Drain: ¡60uA • Detection Range: ¡140° 7Figure 4: PIR Sensor
- Voltage Output: High/Low level Signal: 3.3V TTL output
- Detection Distance: 3 to 7m (can be adjusted)
- Delay Time: 5 to 200s (Can be Adjusted, Default 5s +/- 3
- Blockade time: 2.5s (Default)
- Work temperature: -20-+80°C
- Dimension: 3.2cm x 2.4cm x 1.8cm (Approx.)
- Sensitive Setting: Turn to Right, Distance Increases (About 7M); Turn to Left, Distance Reduce (About 3M)

- Time Setting: Turn to Right, Time Increases (About 200S); Turn to Left, Time Reduce (About 5S).

4.4 Ultrasonic Sensor

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target). In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emissions of the sound by the transmitter to its contact with the receiver. The formula for this calculation is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound 343 meters/second). For example, if a scientist set up an ultrasonic sensor aimed at a box and it took 0.025 seconds for the sound to bounce back, the distance between the ultrasonic sensor and the box would be: D = 0.5 x 0.025 x 343 or about 4.2875 meters.

Figure 5: Altrasonic Sensor

4.5 Microphone

The sound module is the most sensitive to the environment sound intensity, commonly used to detect the intensity of the sound of the surroundings. When module in the intensity of the sound environment cannot reach a set threshold, the OUT will output a high level, when the intensity of the sound from the outside environment more than a set threshold, the module OUT output a low level; Small digital output board OUT can be direct to the microcontroller, through single-chip microcomputer to detect the high and low level, thus to detect sound environment.

Figure 6: Microphone

FEATURES:

- Can detect the intensity of the soundenvironment
- Working voltage 3.3-5V
- Output form: digital switch output (0 and 1)
- Has a fixed bolt hole
- Convenient installation

4.6 Cloud Computing

Storing a huge amount of data on local machines can be a tedious and costly process. Processing limits on the local machines are also limited, and for complex operations and applications, the cloud seems to be a viable option. To understand the role of cloud computing in IoT, let us think of a situation where we take some of the components out of the system and put it on the cloud that can be accessed through the internet. Now, the system doesn't break, but it provides an alternate way of storing and processing the data in a combined system of IoT and Cloud Computing.

Figure 7: Cloud Computing

V CONCLUSION

The present work reduces the human effort and particularly mother's stresses in working times. The equipment Baby care includes a motor, sensors, and oscillating carriage. The overall mechanism is mobile which allows easy movement from room to room. The electric powered motor will actuate the links by shaft and the links actuates the bed in a constant speed which is attached to the carriage. The main advantage of this device is its low initial cost, and has allowed operating cost. The device affords plenty of scope for modifications for further improvements and operational efficiency, which should make it commercially available and attractive.

REFERENCES

- Acredolo, L. and Goodwyn, S " putting Energy into Vibration, from journal publish in 2000",Graph Frequency of vibration of theswing...2000.
- Andrews, L. "For Baby Swing Consideration before Installing Baby Swing, Automatic baby swing". 2002.
- E.Ngale Haulin, A.A. Lakis, Ravine, "Optimal synthesis of a cardle link mechanism used in hand prosthesis", Mechanism and Machine Theory , 2000, 36, 1203-1214.
- G. Gilardi, and I. Sharf, "Literature survey of contact dynamics mode-ling," Mechanism and Machine Theory, vol. 37, no. 10, pp. 1213-1239, 2002
- Jimenez J M, Alvarez G, Cardenal J and Cuadrado J (1997), "A Simple and General Method for Kinematic Synthesis of Oscillating Spatial Mechanism", Mechanism and Machine Theory, Vol. 32, No. 3, pp. 323- 341.