



A Review Paper on “Smart Cradle System”

¹Ms. Diya Karkhanis, ²Mr. Yogesh Kendre, ³Ms. Siddhi Hande, ⁴Mr. Sagar Dhawale

^{1, 2, 3} B.E Students, ³ Assistant Professor

¹Electronics and Telecommunication,

¹Dr. D Y Patil School Of Engineering And Technology, Lohgaon, Pune, India

Abstract: The cornerstone of our project is Women Empowerment; by providing them a Smart Cradle System with a special focus on developing countries. This paper proposes the use of “Smart Cradle System” which involves the use of the Internet of Things. The proposed solution involves live monitoring of the child through a mobile application remotely. The smart cradle incorporates the use of a sound sensor for the detection of the child’s crying activity and automatically swings the cradle to soothe the child. The IR contactless temperature sensor notifies the parent about the body temperature of the child, when the temperature of the baby goes above the set threshold. The solution also includes a wetness sensor and methane sensor to maintain the hygiene of the child. The proposed system uses the cloud service for remotely monitoring the child. [3]

Index Terms - : Internet Of Things (IOT), Arduino Uno, GSM Module, Cradle, Sensors, Cloud server, Mobile Application

INTRODUCTION

Child care is of most extreme significance for a parent. The present quick paced world makes it hard for parents to continuously look after their kid. After long working hours, it is hard for parents to constantly watch out for their kid. To help such parents, this paper represents the idea of a SMART CRADLE SYSTEM. The smart baby cradle helps working women balance their work and domestic chores. Besides, there are extra features or functions provided by the newly automatic cradle that are beneficial for parents. In this busy life it will be very difficult to control the babies and if someone is hiring a professional to take care of their infants, the security of the infant is questionable. Moreover, in today's life, it is very hard even for the homemakers to sit near their babies and soothe them whenever they feel uncomfortable. Hence, the use of the Internet of Things helps in dealing with this problem. Smart cradle systems for child monitoring using IoT allows parents to monitor the child through the Mobile application.

The main circuits used for this work are Sound sensor, moisture sensor, methane sensor and contactless temperature sensor. The proposed work implements a Smart Cradle System using cloud services for monitoring the baby inside the cradle and measuring the body temperature, monitoring bed wet and smelly diaper condition, automatic swinging of cradle if sound frequency exceeds threshold value and comforting the baby by monitoring room temperature and turning on the fan. It will also remind parents to feed the baby after every 2 hours or user defined hours. Also this system will also notify parents about activities of the baby and activate alarm. Parents can also watch their baby live even when they are not at home. Thus, the project bridges the gap between the working parent and their child. The entire system works with the purpose of providing convenience by continuously monitoring every activity of the infant and thereby providing real time details and updates to the parents.[2]

Objectives

- To design the development of a smart baby cradle, which has the ability to monitor bed-wet, smelly diaper condition and body temperature.
- To make a baby cradle safe and comfortable for the baby with the use of various sensors to monitor the baby's life through the camera as well as to detect bed-wet conditions to keep the baby away from an unhygienic environment.
- To make cradle innovation that is more flexible and less expensive to the Indian market. [3]

Methodology

The working methodology of the proposed smart cradle system is as shown below:

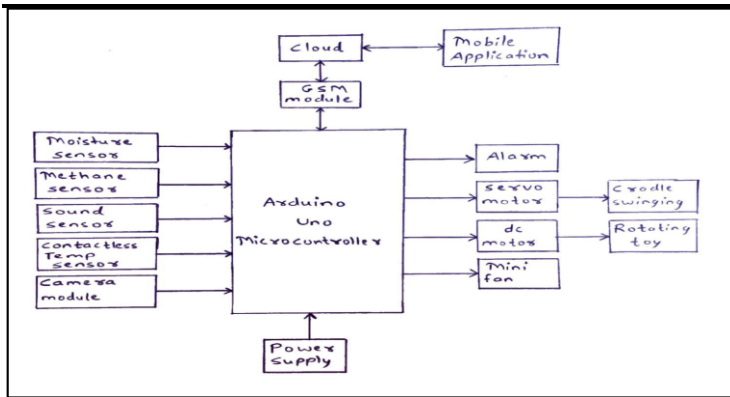


Fig. Block diagram of the proposed system

When the baby is made to sleep on the cradle, various sensors are implemented to monitor minute activities of the baby. Various sensors used are Sound sensor, moisture sensor, methane sensor and contactless temperature sensor. If the sensor value exceeds the threshold value, the system will activate the alarm and also notify parents about the specific activity of the baby. All this data will be stored and analyzed at regular intervals on cloud which can be accessed using mobile applications. [2]

Components

1. Sound sensor(KY -037):

- This sensor is used to detect the sound of a baby crying.
- It works similar to our ears. The sound sensor has a thin piece of material called a diaphragm that vibrates when hit by sound waves. The vibration of the diaphragm is converted by the sensor into an electrical signal.
- Frequency range: 50 Hz - 20KHz.
- Power supply voltage: 3.3 - 5V

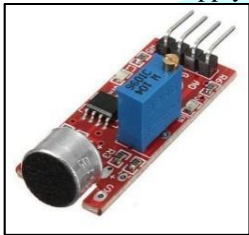


Fig. Sound sensor

2. Moisture sensor:

- This is used to detect wetness on bed.
- The fork-shaped probe with two exposed conductors, acts as a variable resistor whose resistance varies according to the water content on the bed. Resistance is inversely proportional to water content.
- Operating Voltage: 3.3V to 5V DC
- Operating Current: 15mA

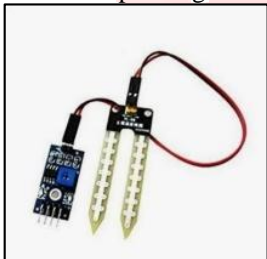


Fig. Moisture sensor

3. Methane sensor (MQ-4) :

- This sensor gets activated when a smelly diaper has been detected.
- When the methane gas exists, the sensor's conductivity gets higher along with the gas concentration rising.
- Power supply voltage : 5V
- Operating temperature: -10 to 50°C



Fig. Methane sensor

4. Contactless temperature sensor (MLX90614) :

- This sensor is used to detect both body and room temperature.
- Although invisible to the human eye, all objects emit infrared light, and the concentration varies with temperature. This sensor transforms the infrared radiation signal collected from objects and bodies into electrical signals.
- Room temperature range: -40°C to 85°C
- Object temperature range: -70 to 382.2°C
- Distance range: 2cm - 5cm.
- Power supply voltage: 5V

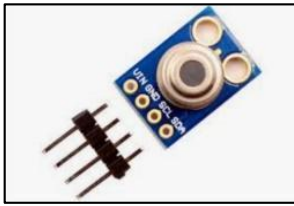


Fig. Contactless temperature sensor

5. Arduino Uno:

Arduino Uno is one of the most commonly used hardware in the Arduino series. It is low cost, easily available and is quite compact. It has an on-board USB to serial chip so we can easily load code into the on-board atmega328 controller. It takes the signal from the GSM module and sends the data to the Blynk cloud. The Blynk Cloud sends the data of the sensors to the mobile application.



Fig. Arduino Uno microcontroller

6. GSM module:

A GSM module is used to connect the sensors of the cradle system to the cloud services via Arduino. This GSM modem has a SIM800A chip and RS232 interface while enabling easy connection with the computer or laptop using the USB to Serial connector. SMS can be sent and received using the AT command.



Fig. GSM Module

7. ESP 32 Camera module:

The parent will be able to watch the child live through the mobile application which is connected to the cradle.



Fig. ESP 32 Camera Module

Algorithms

1. Algorithm for checking diaper conditions

Step I: start

Step II: Check if wetness on bed is more than 70% and smelly diaper detected

Step III: If yes, activate the alarm for 10 sec and notify parents.

Step IV: If no, stop [1]

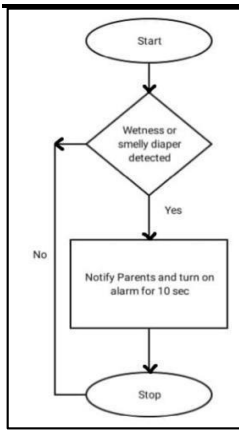


Fig. Algorithm for checking diaper conditions

2. Algorithm for detecting body temperature

Step I: start

Step II: Check if body temperature of baby is greater than 37°C

Step III: If yes, activate the alarm for 10 sec and notify parents.

Step IV: If no, stop [1]

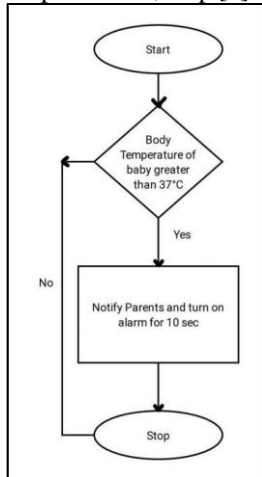


Fig. Algorithm for detecting body temperature

3. Algorithm for detecting room temperature

Step I: start

Step II: Check if room temperature exceeds 25°C

Step III: If yes, turn on mini fan

Step IV: If no, stop

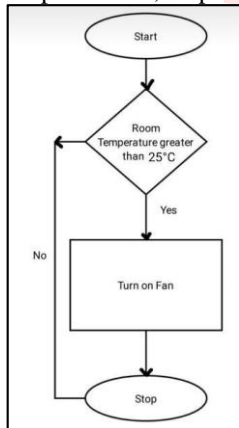


Fig. Algorithm for detecting room temperature

4. Algorithm for automatic cradle swinging mechanism

Step I: start

Step II: Check if sound detected is greater than 700 Hz.

Step III: If yes, start swinging cradle for 2 mins

Step IV: Check if baby has stopped crying

Step V: If yes, notify parents

Step VI: If no, stop [1]

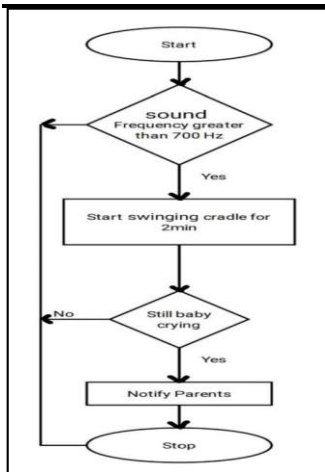


Fig. Algorithm for automatic cradle swinging mechanism

Conclusion

- Growth of technology has been rapidly increased. Since technology has been developed greatly it can contribute to society in various ways. One of its application is Smart Cradle System.
- Looking after babies is a hard problem worldwide. This system emphasizes the importance of child care. It is economical, user friendly and very useful for working mothers and nurses.
- They can manage their work efficiently.
- The present work reduces the human effort and particularly mother's stresses in working times. [1] [3]

Future Scope

- To enhance the security of the baby, apart from the basic requirement more modules can be added.
- One of the most important features that can be added to this device is that a trigger can be added in such a way that if the parents are very far away in a different city or they could not reach their baby then through the app they should be able to trigger an emergency call with the nearest police station.
- For this GPS services can be included. This ensures expert level safety for the child. [4]

References

1. Harshad Suresh Gare, Bhushan Kiran Shahane, Kavita Suresh Jori, Sweety G. Jachak "IoT Based Smart Cradle System for Baby Monitoring" IJCRT Volume 8, Issue 3 March 2020
2. Amol Srivastava, B. E. Yashaswini, Akshit Jagnani, Sindhu K "Smart Cradle System for Child Monitoring using IOT" (IJITEE) Volume-8 Issue-9, July 2019
3. Development of IoT Based Smart Baby Cradle Prof. A.B. Tupkar, Prajwal. Chahare, Shubham. Rade, Rushikesh. Wakade, Snehal. Bahirseth
4. A Smart Baby Cradle by Savathri Ramesh Associate Professor, Syed Abrar Associate Professor, Hanidia Misbah SS, D Padma Bhavani, Mamtha H.L & Madhushree, Volume 19 Issue 1 Version 1.0 Year 2019
5. IoT-BBMS: Internet of Things-Based Baby Monitoring System for Smart Cradle by Waheb A. Jabbar, Hiew Kuet Shang Saidatul N. I. S. Hamid, Akram A. Almohammed, Roshahliza M. Ramli, and Mohammed A. H. Ali , IEEE, July 2019