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IOT BASED AUTOMATED CRADLE SYSTEM FOR BABY MONITORING

Deepak T[1], H. M. Shamita[2]

[1]M. Tech. Student, Dept. of Electronics and Communication Engineering, PDIT, Hospet, Karnataka, India
[2]Associate Professor, Dept. of Electronics and Communication Engineering, PDIT, Hospet, Karnataka, India

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Abstract - *Due to increase in the number of current working mothers for many families baby care has become a challenging task. Babies are usually sent to grandparent's home or some baby caring centers. Monitoring of babies in normal or abnormal conditions is not possible by parents when babies are at the baby care centers. Therefore we have proposed an efficient IOT Based Automated Cradle System for Baby Monitoring to monitor babies in real-time which provides better care for the babies. While parents are away they can still monitor and get real-time updates with video surveillance for perfect care of their children at anytime from anywhere. The proposed method is built using node MCU with other sensors and camera to meet its application. A prototype of the proposed system is designed and tested for effective monitoring of the baby surroundings as well as baby conditions in real time, which has proven to be successful as expected for the applications it is designed.*

Key Words: **Temperature Sensor, Moisture Sensor, Sound Sensor, Motion Sensor, GSM Module, Automated Cradle.**

1. INTRODUCTION

Nowadays, in the developing countries maximum females are involved in jobs/professions. Many mothers are working which creates problem in taking care of their babies. Both mother and father are busy in working to lead the present expensive life in this busy world. In any case, they are actually required to take care of their infants, consequently expanding responsibility and stress, particularly on the mother. Working guardians/parents can't generally focus on their children. They either send their infants to their folks or recruit an infant guardian while they are working. A few parents stress over the well-being of their children being taken care by others. Along these lines, they return home to keep an eye on their infants during their leisure time, for example, lunch break or coffee break. An infant checking framework that can screen the children's condition progressively is proposed to take care of these issues.

A child observing framework comprising of a video camera and amplifier is designed for the purpose. It sends information and quickly advises the guardians about necessary circumstances, in this manner shortening the time expected to deal with such situations. For the most part, children cry since they are eager, drained, ill, or need their diaper changed. SIDS, Unexpected Sudden Infant Death Syndrome is otherwise called den demise, in light of the fact that numerous children who kick the bucket of SIDS, are found in their bunks. It happens to new born children more youthful than a year old. Most SIDS deaths happen in babies more youthful than a half year old [1]. Experts actually don't have the foggiest idea about the reasons for SIDS; however hazard can be decreased by allowing the child to rest on a surface (den bedding). The analysts don't have a clue why dozing on these surfaces increment the risk of SIDS, yet analysts caution that it very well may be perilous. For example, in 2003, an examination shows that putting a new born child to rest on delicate sheet material as opposed to hard sheet material seemed to represent the danger of SIDS.

Also, overheating ought to be stayed away from during rest. Infants ought to be kept in warm temperature during rest; however the temperature ought not to be amazingly warm. In winters or chilly climate, the danger of SIDS maximizes, on the grounds that the guardians granny dress their children or spot them under heavier cover, in turn overheating them.

1.1 PROBLEM STATEMENT

- Integration of electronics with the device.
- 27% of mothers struggled more with baby cry.
- Exhausted parents: 71% of mothers said lack of sleep is the hardest of having a new born.
- Baby's up a lot at night.
- Stressed baby: Baby stress increased if instant care is not taken.
- Disturbance during cooking and office work.

2. LITERATURE SURVEY

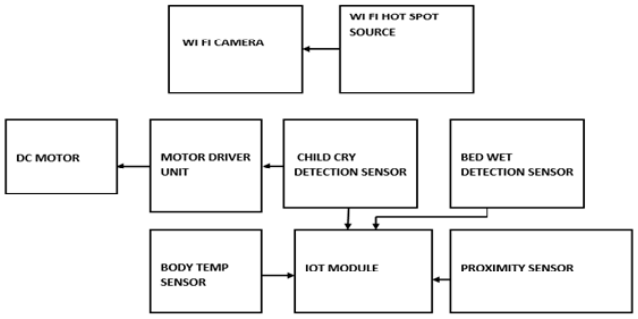
E-baby cradle is introduced by Goyal and Kumar [1] if baby is crying or noise is found cradle starts rocking and when baby stops crying cradle too ceases rocking. Depending on the user's necessity swinging speed can be controlled. In two cases users get noticed by the alarm which is embedded in the system. First, when mattress of the cradle is wet the alarm stops and indicates to change the mattress of cradle. Second, alarm notifies the parent when baby does not conclude crying after certain time so that parent should present to their baby to take care. This system only utilizes a buzzer alarm. The buzzing sound may worry the baby. And even this system is useful only when the parent is near to the cradle. The main drawback of this system is parents are not able to take care of the infant when they are off from the home. Like when they are in travelling or at working places.

One such same type of automatic infant monitoring system was introduced in [2]. The developer develops a minimum budget system, here when baby's crying sound is found it starts to oscillate the cradle and when the baby ceases crying it stops rocking. This system is developed with built-in alarm method here it starts alarming in any one of these two cases: When baby cries continuously and do not stop after some time or when it is found the mattress of the cradle is wet. For the purpose of monitoring the baby a video camera is fixed above the cradle. Parents can only get MESSAGE or notifying information and can't control the system so. Thus, in the present analysis the introduced system is highly effective; the present technique uses an IoT application so that both controlling and monitoring the smart cradle is achieved in real time anytime and anywhere.

In [3] introduced an Arduino-dependent resonant cradle with infant cry identification. With no power cradle swing freely and to minimize the system damping ball bearing technic is utilized. And also status of the cradle swing and angle found by some sensors. Parents can collect infant cries because of pain or hunger on a SD card in SD module and author tells that their system is power saving. This system does not support when parents are away from their baby data is not updated into the Internet of Things server controlling the crib automatically.

In [4] introduced a system for infant monitoring dependent on Pi camera and Raspberry Pi. This introduced technique notices the crying condition and motion of the infant. This system uses PIR motion sensor and MIC to identify the infant movements in cradle and crying condition of the infant with help of Pi camera. When the condenser MIC finds the infant crying sound then this camera switches on and transfers the message to Raspberry Pi. The main drawback of this system is parents can only see the information in few devices within a particular region and system output showed only in monitor display.

3. SYSTEM DESIGN



Block diagram of prototype model is as shown in the figure which represents all the units of the proposed system. Sound sensor continuously hears the frequency, when infant starts to cry cradle will start swinging. Also, parent will be intimated by message alert through the IOT module if the baby is crying for more than 2 minute. Wet sensor is used to check mattress of the cradle. If the baby had wet the mattress of the cradle, with the help of IOT module parent receives the alert message. Temperature sensor is utilized for checking the baby's body temperature, by comparing with the surrounding environment, if the body temperature of the baby varies quickly then through IOT module parents will get alarm notification. To identify the movement PIR sensor is utilized. If any kind of movement or baby is moving in the cradle is identified by the PIR sensor, an alert message is sent to the parent/guardian via the IOT module. Wi-Fi dependent live camera monitoring is designed which can be accessed by parents anytime.

4. ALGORITHMS

4.1 ALGORITHM FOR AUTOMATIC CRADLE SWING

If baby starts crying, cradle will start swinging to stop baby's cry. Parents will get the MESSAGE when baby does not stop crying for more than two minutes.

1st Step: Begin
2nd Step: Keep monitoring the baby's cry
3rd Step: MESSAGE alarm sent to parent and cradle rocks by IOT module, if the noise is identified.
4th Step: Ends if no noise identified.

4.2 ALGORITHM FOR AUTOMATIC BODY TEMPERATURE VARIATION DETECTION

Body temperature of the baby is observed with the help of Temperature sensor. When temperature falls below or rises higher than the normal body temperature range 97.8°F to 99.5°F, it sends MESSAGE to parents. It follows below steps to send message to parents.

1st Step: Begin
2nd Step: Analyze the variation in baby body temperature
3rd Step: If change in temperature is identified and the temperature is not in the range of normalcy, then MESSAGE alarm is sent to the parent via the IOT module.
4th Step: Ends if no change in temperature is identified.

4.3 ALGORITHM FOR AUTOMATIC BED WET DETECTION

Moisture sensor is used to check the mattress wetness of the cradle. This spontaneously keeps checking the mattress; if mattress is wet then parents receive a MESSAGE for diaper change. Hygienic environment for the baby is provided with the help of intimation MESSAGE sent through IOT module.

1st Step: Begin
2nd Step: Keep monitoring the wetness of mattress.
3rd Step: MESSAGE alarm will be sent to parents, if wetness is identified.
4th Step: Ends if no wetness detected.

4.4 ALGORITHM FOR AUTOMATIC MOVEMENT DETECTION

PIR sensor is utilized for detecting objects, especially people. For the purpose of security a motion detector is utilized. PIR sensor continuously monitors the existence of the infant in the cradle and movements around the cradle. When baby not visible in the cradle or any movements are detected around the cradle, IOT module alerts the parents via sending MESSAGE to parent/guardian.

1st Step: Start
2nd Step: Keep monitoring for the movement in the crib.
3rd Step: If movement recognized, send MESSAGE alarm to the parent/guardian.
4th Step: Ends if no movement is detected.

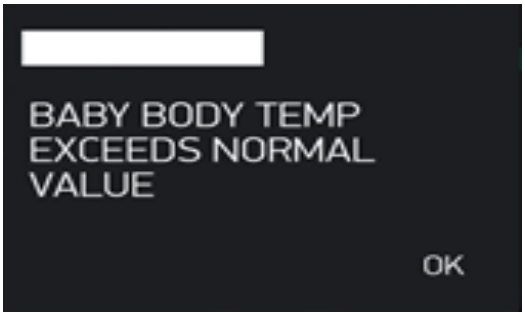
5. RESULTS

5.1 AUTOMATIC CRADLE SWING

If the baby starts crying, the cradle starts swinging, to soothe the baby and rock it back to sleep. If baby does not stop crying post two minutes an alert message will be sent to the parent on their Blynk app. The status of the cradle is regularly updated to the Blynk server from the Wi-Fi IOT module present at the cradle section.

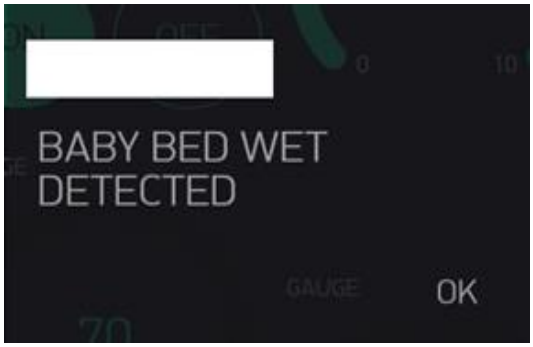
5.2 AUTOMATIC BODY TEMPERATURE VARIATION DETECTION ALERT MESSAGE

The temperature sensor placed in the cradle keeps monitoring the body temperature of the baby. When the body temperature of the baby falls below or rises higher than the normal temperature range, then an alert message will be sent to the parent for immediate action. The temperature values are regularly monitored and are stored in Blynk server. Necessary alert messages are routed to the parent on their Blynk app.



5.3 AUTOMATIC BED WET DETECTION ALERT MESSAGE

When the moisture sensor detects bed wet condition, an alert message will be sent to the parent for diaper change. The status and information of the cradle is stored into the Blynk server via the IOT module Node MCU. From this Blynk server, messages are routed to the parent on their Blynk app.



5.4 AUTOMATIC MOVEMENT DETECTION ALERT MESSAGE

When any movement or motion is detected inside and around the cradle, an immediate alert message will be routed to the parent.

6. CONCLUSIONS

Broadening of technology has been swiftly surged. As technology is being evolved largely it can have a bigger contribution to the society in numerous approaches. An automated crib can be used conveniently by the working parents/guardians who are occupied with lots of work load and along with that they have the responsibility of an infant to care of. Baby monitoring system persuades the baby's safety and security within the automated crib.

This baby monitoring system is cost effective and indulges in higher security along with different aspects. The health of the infant is the highest priority of the parents always. Hence this baby monitoring cradle system is designed with the intention of a healthy and secure infant/baby. Along with this the automatic baby cradle monitor will allow the professional parent/guardian to perform household chores alongside supervising the infant/baby hand in hand.

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