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GSM Based Baby Monitoring and Automatic Swing System

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Abstract: ***The number of working parents has greatly increased. Subsequently, baby care has become a daily challenge for many families. However, the parents cannot continuously monitor their babies' conditions. Therefore, GSM based baby monitoring and automatic swing system is proposed as an efficient system for monitoring the baby in real time. This system monitors wetness in the mattress, baby's cry and orientation. These sensed values are processed by the microprocessor board i.e., Raspberry Pi 3b+. To notify the condition of the baby to parent via SMS GSM module is used for communication. The system also performs actuations by using motors to swing the cradle when baby cries, video is played with the help of monitor to entertain the baby and also the system has safety cushions which will prevent baby from getting hurt if falls. Webcam is used to monitor the baby. Hence all these sensing, monitoring and actuations help parent monitor babies and take precautions.***
Keywords: Baby, monitoring, automatic, real time, safety, SMS

I. INTRODUCTION

At present, both parents are required to work due to high cost of living. However, they still need to look after their babies, thereby increasing workload and stress. Working parents cannot always care for their babies. They either send their babies to their parents or hire a caretaker while they are working. Some parents do not want to hire a caretaker because of safety issues and expenses. So, GSM based baby monitoring and automatic swing system that can monitor the babies' condition in real time is proposed to solve these problems. With respect to the paper [1] cradle is used to put babies to sleep. Cradle has a side- to-side rocking motion that eases the baby and put it to sleep. It takes lot of efforts from parent to physically rock the cradle to generate swinging motion. When baby is kept inside the cradle need to be constant monitoring parent to keep the track of baby's activity. The proposed idea in this prototype of smart cradle will allow the cradle to efficiently integrate itself with a smartphone typically android device. An Arduino 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 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. Also with some additional features such as watching the baby live through Arduino camera. Use of various sensors such as PIR (passive infrared) sensor to detect light level inside the cradle, and PCB for sensing wet conditions etc. will only add to the efficiency of the cradle. 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 look after the baby. According to paper [2] The customary Automatic child cradle frameworks are excessively lavish and they additionally don't offer much usefulness. Baby cuddle bed / cuddle nest is a concept originated in Sweden. Baby cuddle bed makes a cozy sleeping place for the baby and protects baby at night because of stable bumper. Intends to help those moms who are excessively occupied and don't have a cleaning specialist or sitter to deal with their infants. This paper portrays the configuration of a programmed cradle which fundamentally chips away at location of infant development with the assistance of a PIR sensor. PIR sensor detects the movement of infant. Another important feature is the automated swing of the bed by means of voice command which will work through an app. The cuddle will also swing when the baby will start crying inside the bed. The cradle additionally incorporates a wet sensor which will caution the folks or the Attendant/sitter for bunk wetting of the infant. It will help to keep the infant in a hygienic environment. The framework is kept negligible as far as fittings as greatest measure of usefulness of the cradle is performed through Arduino. The cradle is vitality productive and obliges no physical consideration.

According to the paper [3] Availability of high-speed internet and wide use of mobile phones leads to gain the popularity to IoT. One such important concept of the same is the use of mobile phones by working parents to watch the activities of baby while babysitting. This paper presents the design of Smart Cradle which supports such video monitoring. This cradle swings automatically on detection of baby cry sound. The system mentioned in the paper [4] monitor parameters such as baby cry, environment temperature, moisture condition, and using cloud this information is accessed by parents to initiate the proper control actions.

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The system architecture consists of sensors for monitoring vital parameters, dc motor for cradle movement, cloud where data is stored and a sound buzzer all controlled by a single Arduino Mega microcontroller core. According to the paper [5] There is a need to develop a new less expensive indigenous electronic cradle because the existing cradles are imported and costly. This paper presents the design and implementation of a new indigenous less expensive E-Baby Cradle that 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 the condition - when baby does not stop crying with in a stipulated time, which intimated that baby needs attention. This system helps parents and nurses to take care of babies without physical attention by already recorded voice input to FNM16P model and at this same time Cradle also moves according to the user need.

According to the paper [6] the current range of operating mothers has greatly risen. Afterwards, baby care has become a daily challenge to several families. Thus, most folks send their babies to their grandparents' house or to baby care homes. However, the fogeys cannot endlessly monitor their babies' conditions either in traditional or abnormal things. Therefore, an online of Things based good Baby Cradle is planned as Associate in Nursing economical and cheap IoT-based system for watching in real time. This paper presents the look and implementation of good baby cradle that swings mechanically once the baby cries and rotates the toy as per parent order. For this, it's a cry analysis system that detects the baby cry voice and consequently the cradle swing until the parent stop the swing of the cradle. This method additionally senses the temperature and wet condition. Mistreatment this method, we are able to see baby live and if we would like to play a song then we are able to play the song.

II. PROPOSED SYSTEM

The proposed system aims to monitor babies from potential dangers occurring in everyday situations when parents are not around. The system provides automatic swing when baby cries and swings till baby stops crying. A video is played to distract the baby from crying. A moisture sensor is placed on the mattress which helps in checking the wetness of the mattress an alert is sent to parents via GSM to inform about the wetness of the mattress. Accelerometer is implemented in the system to detect the baby's orientation. The buzzer activates if the orientation of baby is dangerous. A cushion also falls around the cradle to ensure the safety of the baby if it falls. In addition to all these features a webcam is implemented to help parents monitor the baby from a system.

III. REQUIREMENTS

A. Raspberry Pi 3b+ is an embedded computer to which all the other components are connected. Can be powered by micro-USB cable or with the help of 9V battery.
B. Programming language used on the Raspberry Pi is Python.
C. GSM SIM-900A is used to enable communication between a microcontroller and the GSM Network. GSM module is powered by 12V power supply.
D. Webcam is used to take high-definition video. It is used to monitor the baby in real time.
E. LM393 sound detection sensor module consists of a sensitive capacitance microphone for detecting sound.
F. Moisture sensor is used to detect the wetness in the mattress.
G. Adxl335 accelerometer is used to track the orientation of the baby.
H. Two NEMA 17 Stepper motors are used, one to swing the cradle and the other is attached to the safety cushion. Using two L293D stepper motor drivers to power and control the stepper motors. Stepper motor drivers are powered by 12V power supply.
I. Buzzer is used as a notification factor.
J. Monitor to display videos for baby's entertainment.

IV. METHODOLOGY

The system is mainly designed to monitor babies due to their vulnerabilities to get into dangers. The methodology of proposed system is as follows:

1) Moisture sensor will be placed in the mattress whenever it senses the wetness an alert message will be sent to parent, if there is no change in the sensed moisture level even after stipulated time buzzer activates.
2) Baby's crying sound will be saved priorly in the sound detection sensor. This sensor will be detecting the sound around it whenever the surrounding sound's frequency matches with the saved baby's crying sound cradle starts to swing and a video is played. An SMS is sent to alert parents.

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3) Accelerometer will be placed on baby's cloth. Its sensing axes are x, y and z. Threshold value is the range of values detected by the accelerometer at which the baby's position is dangerous and chances are that the baby may fall at this position. Threshold values will be set while programming. Whenever accelerometer's value reaches the threshold value buzzer activates and the safety cushion falls around the cradle.

4) Webcam will be attached to the cradle to help parents monitor the baby from a distance.

5) Raspberry Pi is powered by micro USB cable.

6) GSM module and the stepper motor drivers are powered by 12v power supply in turn stepper motor driver powers the stepper motor.

Hence all these sensing, monitoring and actuations help us monitor baby and takes precaution.

V. RESULT

The designed system will be a great help for parents. Various sensors and actuators are used to ensure baby's safety. This system can also be implemented in hospitals. This is an user-friendly system. Baby can get better attention with this system. It can help improve the quality of infant care system. GSM based baby monitoring and automatic swing system is inexpensive and simple to use. This system emphasizes the importance of kid care.



Fig. 1 Top view of the model



Fig. 2 Side view of the model

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Fig. 3 SMS received by parents from the system

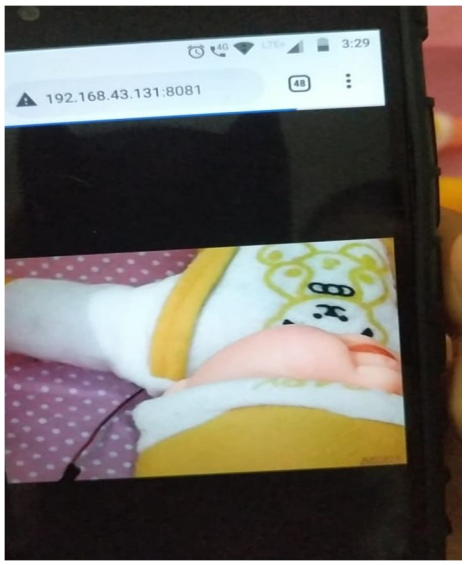


Fig. 4 Live monitoring from parent's mobile phone

VI. CONCLUSION

This project aims to monitor babies from potential dangers occurring in everyday situations when parents are not around. Various sensors and actuators are used to measure every activity of the baby and notify the same to parent via SMS. Parents can monitor baby from a distance. GSM based baby monitoring and automatic swing system is inexpensive and simple to use. This system emphasizes the importance of baby's care.

VII. ACKNOWLEDGEMENT

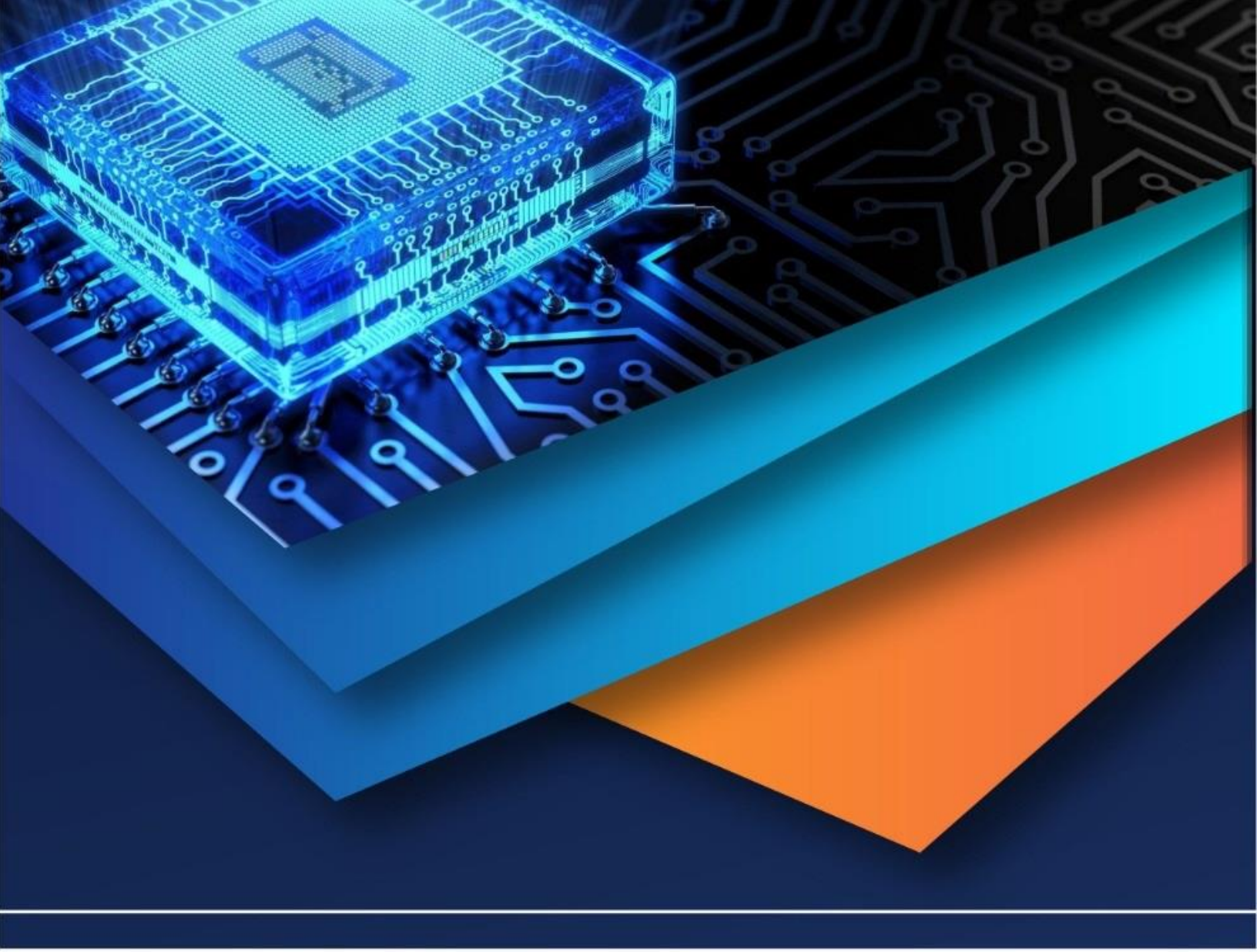
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