Smart Baby Cradle System

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ABSTRACT

In this 21st century, both men and women share equal rights, they both work hard equally to maintain the social status and run in this fast-growing world. Day by day the technology also grows very fast and the human makes it. So, it is very important to take care of the next generation, a special care should be shown to them especially babies. This paper deals with design and implementation of smart baby cradle system which is special gift to parents in this century. The objective of this paper is to design a smart baby cradle with multiple features which helps in monitoring the babies and updates the baby's status to parents. This design encloses the different features like camera monitoring, automatic swinging of cradle when baby cries, sensing the wetness of baby's bed, monitoring presence of baby in the cradle, all these features encloses a SMS module where message about baby's cry, wetness in bed and absence of baby in the cradle are sent to parent's mobile number to intimate them about their baby. This system was designed using raspberry pi 3, wet sensor, PIR sensor, sound sensor, DC motor, SMS module and camera. Camera is used for monitoring babies which could be seen by parents at any time and also this is to watch baby when parents was engaged with work. Implementation of this system was done using raspberry pi 3 which helps in enclosing many features in a single system. This system helps parents in taking care of their babies in a special way. Hence this paper clearly explains about the smart baby cradle design and its desired features.

*Key Words: Automatic swinging, Raspberry pi 3, Sensors, SMS module.*

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INTRODUCTION

Embedded system is the combination of bath hardware and software which is used in today's technology to implement desired function. The technology using embedded system is seen everywhere now a days. Today's parents could not spend much of their time in monitoring their babies because of their busy work and lack of time. They always need a care taker as a safe guard for their babies but now technology helps them by providing a smart baby cradle with which they can monitor their babies anytime. This system of baby cradle with applications clearly bears a note that 24 hours security is the most important concern in this design by providing camera. It is a purpose-built design with the aspect of providing wellbeing for babies. Our design is based on embedded system which encompass monitoring in the ways like when the baby starts to cry then the cradle starts to swing automatically, if the cry lasts for more than 2 minutes then message will be sent to parent's (number which has been added in program during design) mobile number. And also, another special feature is that when the baby's bed was wet then the message will be sent to parent's mobile, and also the presence of baby in the cradle also sensed using PIR sensor. And with these features camera has been connected to watch baby and its activities.

2. BLOCK DIAGRAM OF PROPOSED SYSTEM

Figure 2.1: Block diagram of proposed system
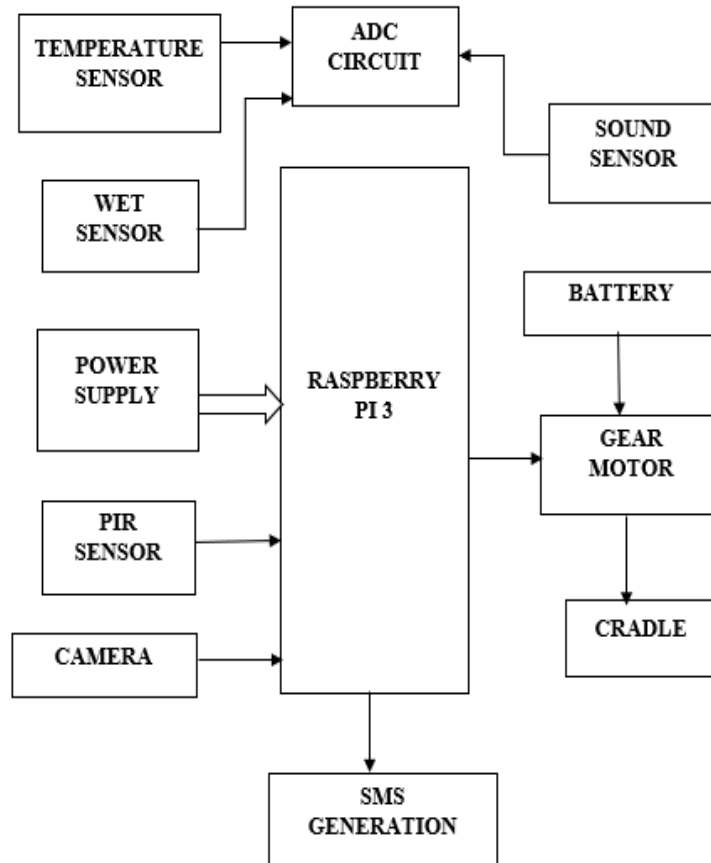
3. WORKING PRINCIPLE

The working of smart baby cradle is designed like there are four modules which features corresponding work in the design like PIR sensor, sound sensor, temperature sensor and wet sensor are about to be described with features and the method of working. Camera will be in ON condition always. The SMS generation method is done using the web server, way to SMS server has been used and the way that SMS is sent is explained using the block diagram.
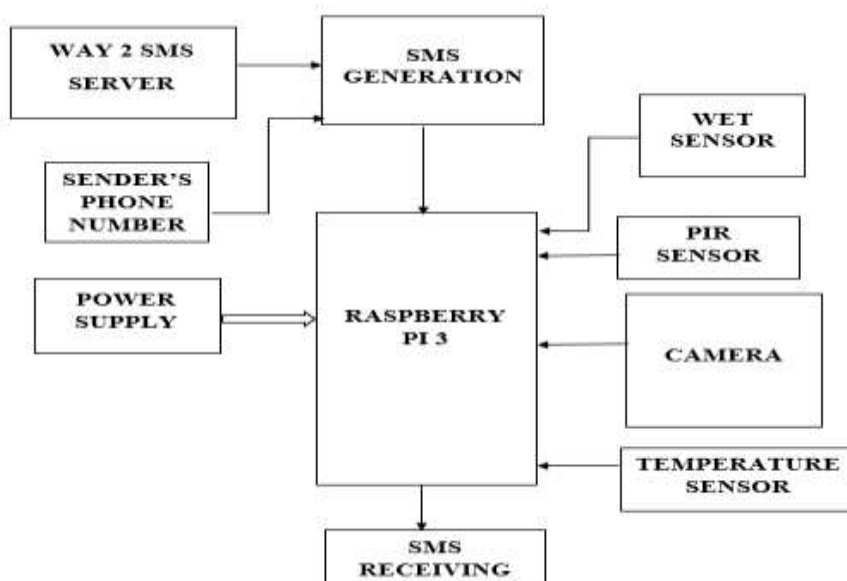

Figure 3.1: Block diagram for SMS Generation

3.1 Automatic Swinging of Cradle

The cradle is designed like it starts to swing automatically when the baby starts crying. Here we have used sound sensor which senses crying sound of the baby and give information to raspberry pi, then the gear motor starts to rotate thus the cradle swings. When the baby cries the sound is absorbed by the sound sensor and it makes the motor to swing. This system emphasizes the importance of child care.
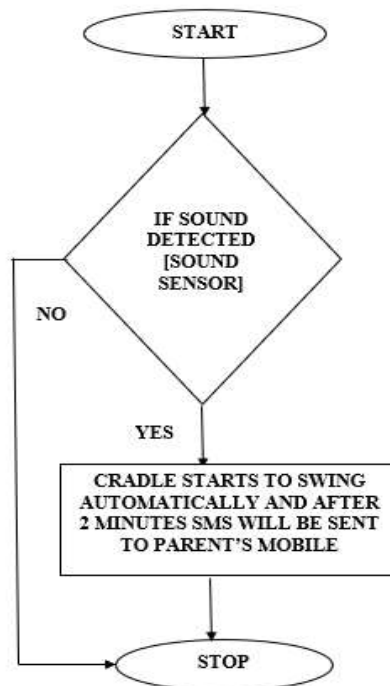

Figure 3.2: Flow Chart for Automatic swinging

3.2 Wet Sensing Identification

Baby's wetness can be identified by wet sensor. A wet sensor continuously keeps on checking whether the baby's mattress is wet or not. When the wetness is sensed then parents are intimated by sending SMS. This system helps in keeping the baby in a hygienic environment.
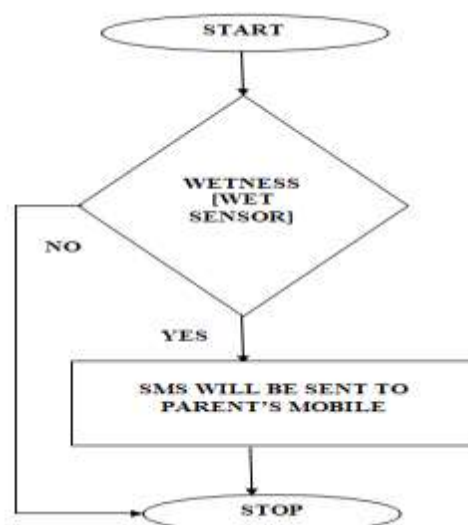

Figure 3.3: Flow Chart for Wet Sensing

3.3 Temperature Sensing

Temperature sensor helps in finding the body temperature of the baby. It checks the body temperature of the baby and sends SMS to parents when temperature increases.
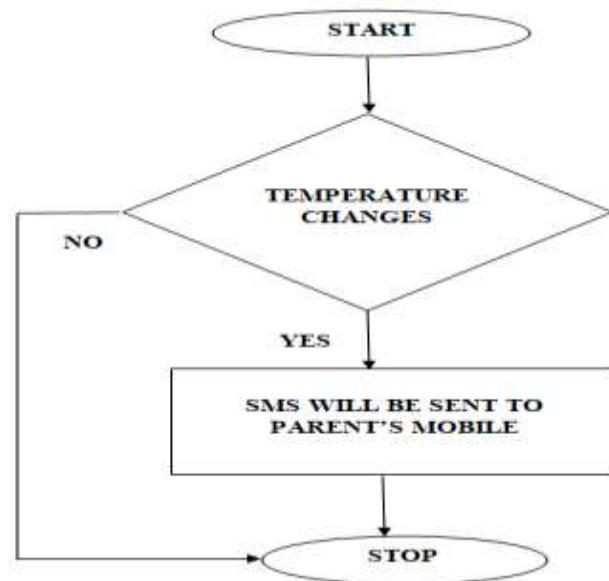

Figure 3.4: Flow Chart for Sensing Temperature

3.4 Motion Detector

A motion detection may detect moving objects, particularly people. For detecting an object PIR sensor is used. Here it performs a task like it checks the presence of baby in the cradle. The motion detector is mainly used for security purpose. It alerts the parents when baby is not found in the cradle, by sending SMS to parents.

4. HARDWARE DESIGN

4.1 Gear Motor

In this system the gear motor is used for swinging the cradle. Since gear motor converts the electrical power into mechanical power. The motor starts swinging when baby starts crying and swings until the baby stops crying. The gear motor receives electrical signal from the sound sensor when the baby cries then it converts the signal to mechanical power which results in swinging of cradle. To reduce the speed and maintain cradle swinging in required speed gear motor is used. If baby cries more than 2 minutes then the notification is sent to parents by SMS module.

Figure 4.1: Gear Motor

4.2 Wet Sensor

Wet sensor is used for finding wetness. If the baby wets the cradle then the sensor indicates it. The wet sensor can be used again by cleaning the sensor with dry cloth or towel. Do not submerge the sensor in water. The sensor should be cleaned immediately. It shows a better way to find the wetness in the cradle.

Figure 4.2: Wet Sensor

4.3 Sound Sensor

A sound sensor detects the audio intensity. The main component of the module is sound sensor, which isLM386. It takes analog input. Here it takes the crying sound of the baby. The sound intensity level is measured in decibel(dB).

Figure 4.3: Sound Sensor

4.4 PIR Sensor

The PIR sensor is used for motion detection. It is used to detect a moving object particularly people. In this system the PIR sensor is used to detect the baby in the cradle. Motion detection is very important, especially in protecting infants. It is mainly used for security purpose.

Figure 4.4: PIR Sensor

4.5 Temperature Sensor

Temperature sensor is used for measuring temperature of specific system. It measures the temperature and provides the accurate temperature measure. Temperature sensor used is LM35.Temperature sensor is used in this system to provide the data about baby's body temperature. This will help the parents to know about their baby's temperature periodically.

Figure 4.5: Temperature Sensor

4.6 Camera

Camera is placed in the cradle so that parents will get to know about the baby's movement and the happenings instantly. This will help them to know when their baby needs their care. The camera placed in cradle will records all the movements of the baby and transmits it to the parent's mobile. When the parent's wants to know about their baby then can watch it in their smartphones.

Figure 4.6: Camera

4.7 Relay

Relays are electrically operated switches. A relay is a five-terminal device which acts as an electronic switch. Sound sensor checks the baby's crying sound and sends the signal. The signal is sent to the relay which act as a switch. It automatically makes the cradle to swing.

Figure 4.7: Relay

4.8 ADC

ADC is expanded as analog to digital converter. In this system ADC receive analog signal from wet sensor, sound sensor and temperature sensor, then it converts the analog signal to digital signal. After converting the analog signal to digital form, it sends to raspberry pi. Then the raspberry pi receives the digital output from ADC as its input and performs its function.
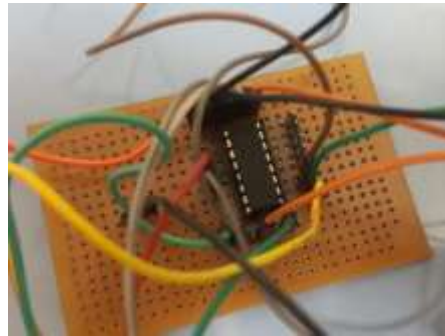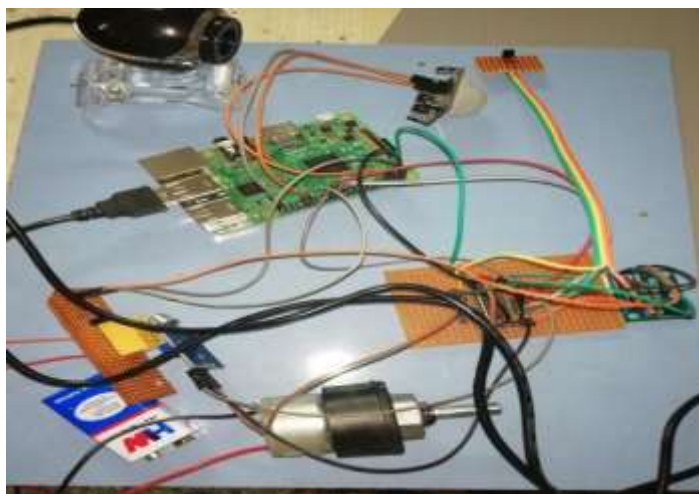
Figure 4.8: ADC

5. RESULT

Figure 5.1: Complete Project Setup
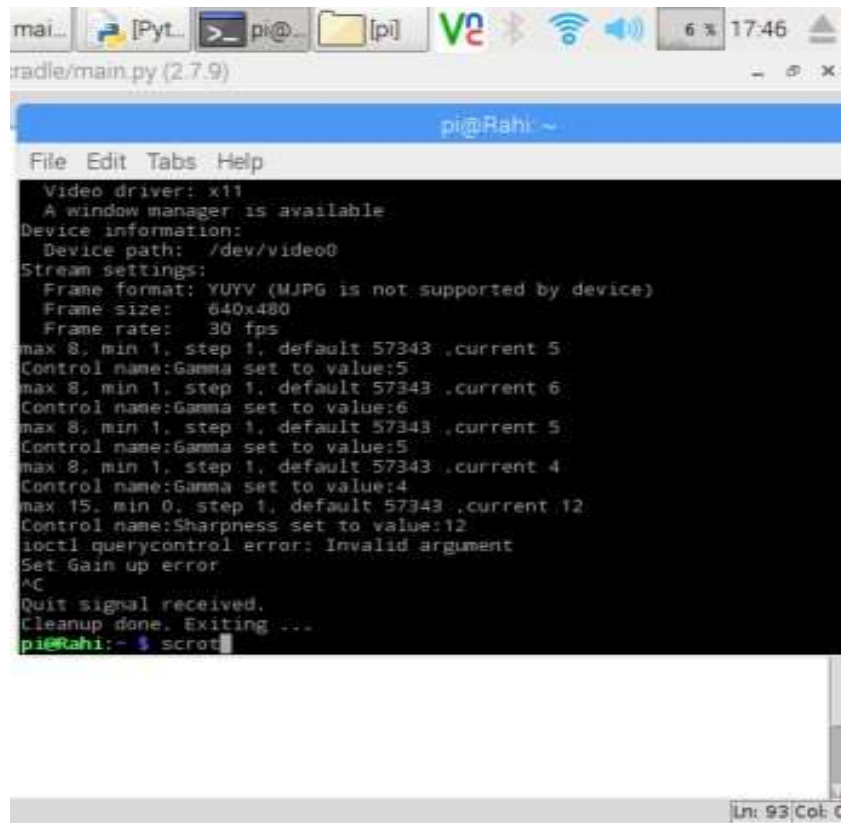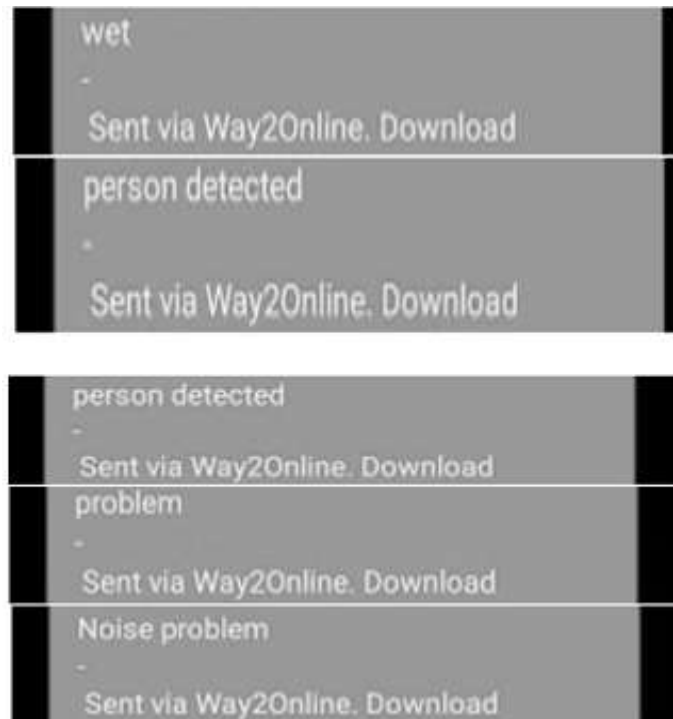

Figure 5.2: Sensor Output

Figure 5.3: Camera Module

Figure 5.4: Camera Output

Figure 5.5: SMS Module

6. CONCLUSION

Technology has been developed in a great way that it makes human work simpler. So, in that aspect to convenient the baby care smart baby cradle has been designed. The automatic electronic baby cradle is the finest solution for today's parents who cannot find the sufficient time for their babies. This automatic baby cradle would let the working mother to do household works besides taking care of baby at the same time. It is economical and user friendly. The automatic baby cradle can be used in hospitals and home. It is very useful for working parents and hospitals to take care of babies.

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