

Security Tag for Infants

Kokil M

Department of Electronics and
Communication Engineering
Marian Engineering College
Trivandrum, Kerala

Lingesh Siva S

Department of Electronics and
Communication Engineering
Marian Engineering College
Trivandrum, Kerala

Ruma S R

Department of Electronics and
Communication Engineering
Marian Engineering College
Trivandrum, Kerala

Sreelakshmi I H.

Department of Electronics and
Communication Engineering
Marian Engineering College
Trivandrum, Kerala

Vinitha. B. Elza, (Asso, Prof)

Department of Electronics and
Communication Engineering
Marian Engineering College
Trivandrum, Kerala

Abstract- Babies are the most sensitive patients in the hospital. They need more care than adults. So it is important to provide 24/7 security from abduction attempt. The best step is to provide an electronic tag which measures some of the essential parameters of the infants and also alert the hospital in case of any abduction attempt. Our system has added an extra dimension to the existing security measures. It's the lightest, smallest and most comfortable baby tag, it provides seamless integration with existing systems and it prevents unauthorized removal of tag.

Keywords: Arduino Nano, LM35, ESP8266

I. INTRODUCTION

Newborn infants face security and safety risks. Infant abductions and mother/infant mismatches are habitual risks at hospitals. The purely manual system that is now available can lead to human error.

This project is meant to provide security for infants in the hospital. The protection is provided by wearing a small tag on infants wrist. If an intruder attempt to break the tag or abduct the infant the system will alert the hospital by means of an alarm. The tag offers tamper detection to prevent abduction. In addition to the security purpose we also measures some essential parameters of infant by using few sensors. The data retrieved from these sensors are sent to a database through an IOT platform.

II. RELATED WORKS

An idea related to Child Safety Wearable Device. This section discusses the architecture and the design methodologies chosen for the development of the Child Safety wearable device. – The paper discusses the concept of a smart wearable device for little children. The biggest advantage of this device over other devices is that they can be accessed by cellphone. The aim of the device is to track

infant easily. Currently there are many wearable devices in the market which help to monitor every activities of children and also helps to track the child, if he/she is abducted using wifi/Bluetooth services present in the device. Since Bluetooth and wifi are undesirable mode of communication. Here, they are focused to have an SMS text of communication instead of wifi and Bluetooth between child and parent. It is chosen because GSM mobile communication is popular now-a-days.

The device will reply to the text sent by parent which contain keyword such as location, temperature etc. Also it sent the accurate location of the child through google map applications and also it sends the detail of surrounding temperature and UV so that parents can decide whether it is suitable for baby or not. The Figure 1 shows the system overview of the wearable device.

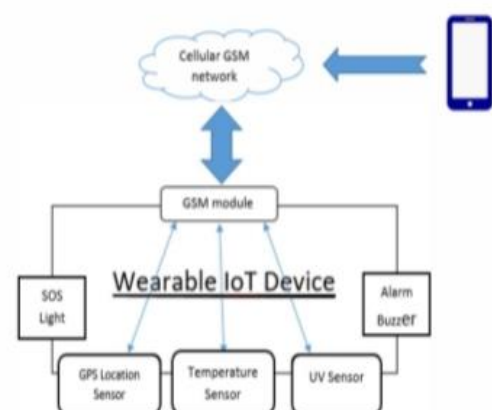


Fig 1. System overview of the wearable device

The secondary aim of the project is to alert the people around the child, so that we can help the child from abductor and this could help parents to locate their child. This idea is implemented using a bright SOS and an alarm source

on the device. Parents will be activating them via SMS text to brightly display SOS signal and to alert the bystander.

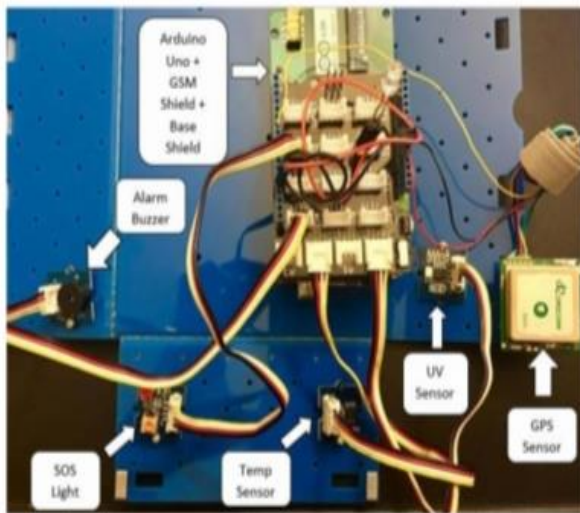


Fig 2. Proposed wearable IoT Device

III. PROBLEM DEFINITION

At present, there is only a tag containing mothers name and date of birth of the new born baby. The primary aim of the project is to provide security to the infant and also helps to prevent abduction. Here the security purpose is done by the flex sensor, when the tag breaks there will be a change in resistance, which shows variation from the threshold values. Here an alarm is used to alert the nursing station. During abduction process while wearing the tag, the RF transmitter goes out of the range of RF receiver and an alarm will alert the hospital indicating abduction has occurred. Other than abduction prevention other features of our project includes temperature and heart rate monitor of the infants.

Our project baby tag, packs a lot of security into its tiny size, activating as soon as it's attached to the infant's hand with a soft tamper detecting tag which offers tamper detection, exit detection and continual supervision, and is the only infant tag that monitors its environment for potential sources of interference.

The project consist of mainly 3 types of sensors namely; heart beat sensor for the continuous monitoring of heartbeat of infants, temperature sensor for continuous monitoring of temperature and flex sensor to provide continuous tamper protection to the baby. These values will be automatically updated in the database at regular periods. When RF transmitter and receiver come in range with the tag unremoved, an alarm set will prevent abduction. The data that are collected from the sensors are send to the database through Wi-Fi module. These data can be retrieved using display units in the nursing stations.

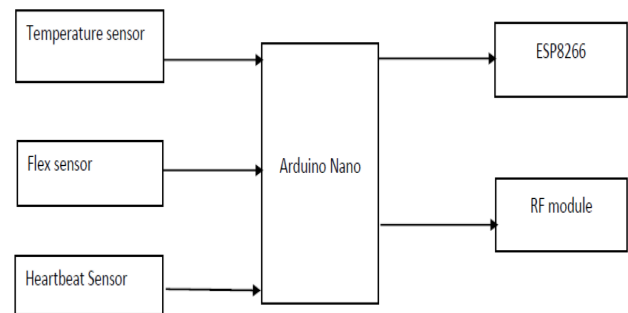


Fig 3. Detailed Block Diagram

The security tag consist of power supply, Arduino Nano, ESP8266, RF transmitter, heart rate sensor, flex sensor and temperature sensor. By using this tag we are measuring two parameters heart rate and temperature. Flex sensor and RF module is used for security purpose. Heart rate is measured by placing the sensor on the index finger to measure the pulse. Infrared led is used in this sensor. Temperature sensor measures the temperature as soon as it comes in contact with the skin. Flex sensor is used to know whether the band is properly tied on infant's hand. If the band breaks the resistance value changes and an alarm is used to alert the nursing staff that the baby is not safe and needs immediate attention. RF module is used here because it doesn't need line of sight. RF transmitter is on the tag and receiver will be placed somewhere near the door. When RF transmitter and receiver goes out of range, alarm will alert the hospital. The range here is 100 meter. So when it goes beyond 100 m, buzzer will produce sound.

Arduino Nano is set to interface all sensors. It is similar to Arduino Uno, but only difference is size of Nano is small than Arduino Uno. NODEMCU (ESP8266) provides Wi-Fi to Arduino board so that it can be connected to a PC. With help of Wi-Fi module the data from sensors are automatically send to a database. These data can be easily retrieved and analyzed by nursing staff using display units. The power supply used here is 240V AC to 5V DC.

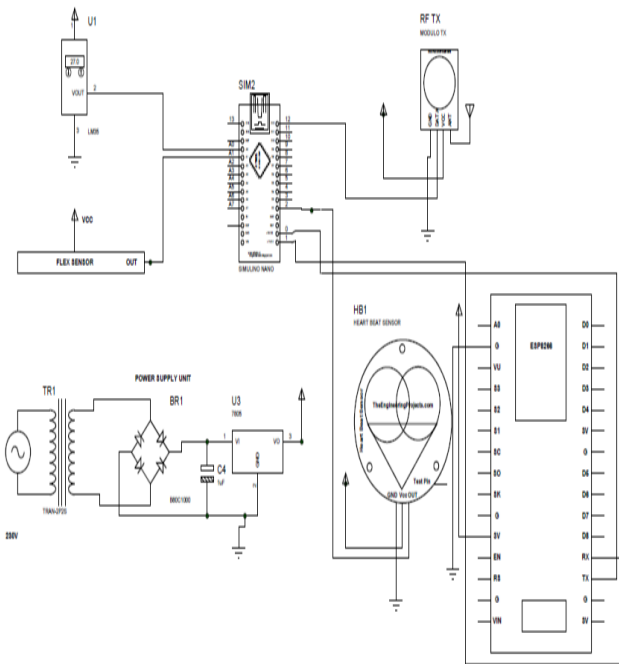


Fig.4. Circuit Diagram

This is the circuit diagram of our project. It consists of temperature sensor LM35, flex sensor, RF module, heart rate sensor, Wi-Fi module ESP8266 and the heart of our project Arduino Nano and an external power supply.

Arduino Nano is a small compatible flexible microcontroller. It is based on ATMEGA328p at an operation voltage of 5V, with a total of 30 pins, 14 digital pins, 8 analog pins, 2 reset pin and 6 power pins. It can function as both input as well as output pins based on how they are interfaced with the sensors.

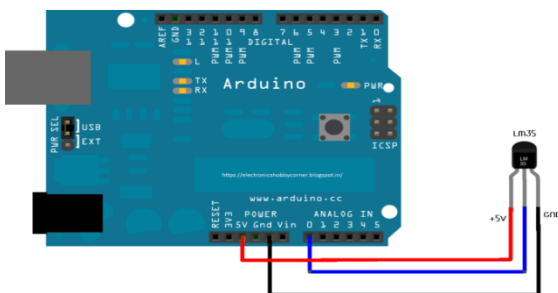


Fig.5. LM35 Interfacing

LM35 has 3 pins, Vcc, GND and output pin which are connected to the respective pins of Arduino Nano

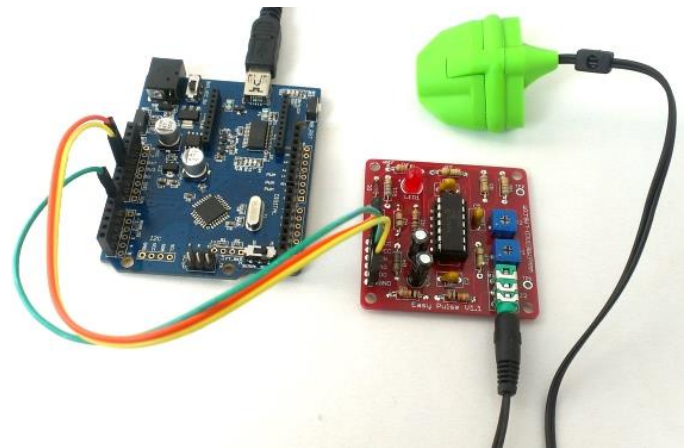


Fig.6. Heartrate Sensor Interfacing

Heart rate sensor is used to measure the heart rate of an infant. The Vcc, GND and output pins are connected to the respective pins of Arduino Nano.

To measure the heart rate, the index finger is placed over the sensor. Once the light becomes stable, connection between GND pin of Arduino Nano and 7th pin of Arduino Nano establishes a closed pull down connection. After 10 seconds, the index finger is replaced thereby opening the pull down connection.

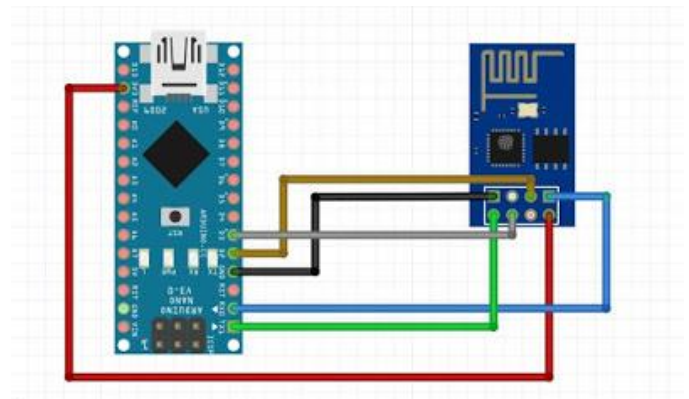


Fig.7. ESP8266 Interfacing

Wi-Fi module used here is NodeMCU ESP8266. Its operating voltage is 3.3V. There are 16 digital input pins and 1 analog input pin. Here the Rx and TX pins of Wi-Fi module is connected to the corresponding Rx0 and Tx1 pins of Arduino Nano. The data from the sensors are collected at the database through Wi-Fi module. These data can be retrieved using display units in the nursing stations.

IV. EXPERIMENTAL RESULTS

Fig 8, depicts the experimental setup. On wearing this tag on the hand and placing the heart rate sensor on the index finger, we are ready to analyze and measure the parameters. For entire setup we need a power supply. So here we are using a 240V AC to 5V DC power supply.



Fig 8. Experimental setup

Heart rate sensor checks detects a live pulse. If a live pulse is available, led will start to blink until we get a stable pulse without noise. LM35 placed in the tag will measure the temperature as soon as it comes in contact with the skin. Output of the flex sensor is resistance. Its resistance value changes when it is stable and bent. Stable means flex sensor is broken and it sends a status that the baby is not safe. On the other hand it sends a status that baby is safe. RF module is used to prevent unauthorized baby movement. If a baby is taken away from the area where they are supposed to stay, then an alarm will alert the nursing station about the same. Here we have kept the range of RF receiver and transmitter as 100 meters. If they go out of this range then buzzer will produce sound alerting the staff.

To view these parameters in a webpage we have used ESP8266, so that all the values will be send automatically to a database. For this, the technology named Internet of things is used here. So this is done to transmit data regarding the sensor output to database. Thus nursing staff can view and analyze them.

V. CONCLUSION

A successful method of preventing abduction of infants from the hospital along with some health monitoring features is presented. The project consist of heart rate sensor which is used for continuous monitoring of heart beat of infants and a temperature sensor which is used to measure the temperature of infants. The Wi-Fi module ESP8266 provides

open source wireless communication and it helps in providing Wi-Fi connection for Arduino Nano. Thus it helps in establishing an open source connection with the outside world.

The objective of the tagging system to prevent babies or infants from being removed from a ward without authorization is accomplished.

The best step a healthcare facility can take for newborns and their families is integrating a state-of-the-art baby tracking system. In Future, we can develop our project as a product which will change the current medical scenario.

VI. FUTURE SCOPE

By using advanced technology, all the wired connections can be replaced into a small chip, making it more small and compactible.

We can extend its use from infants to other patients by adding some more features in future. This can help the authority to pay more attention not only to the infants but also to other patients in the hospital.

Size can be made more compactible for the comfort of infant.

ACKNOWLEDGMENT

The project we had simulated on our academic life would be incomplete without the advice and help from certain peoples. Firstly, we are thankful to Mrs.Vinitha B Elza, *Head of the Department, Electronics and Communication Engineering, Marian Engineering College*, then our teacher Mrs.Ramola Joy, Assistant Professor for her constant encouragement in finishing the project. Lastly we would like to thank our friends and families enabling us with the right resource which lead a successful journey in completion.

REFERENCES

- [1] Akash Moodbidri, Hamid Shahnasser "Child Safety Wearable Device", Information Networking, International Conference on Information Networking.
- [2] F. A. Silva, "Industrial Wireless Sensor Networks: Applications, Protocols, and Standards [Book News]," in IEEE Industrial Electronics Magazine, vol. 8, no. 4, pp. 67-68, Dec. 2014..
- [3] H. Moustafa, H. Kenn, K. Sayrafian, W. Scanlon and Y. Zhang, "Mobile wearable communications [Guest Editorial]," in IEEE Wireless Communications, vol. 22, no. 1, pp. 10-11, February 2015.
- [4] Sena Agezo, et al., "Battery-Free RFID Heart Rate Monitoring System" IEEE 2016 Paper
- [5] Q. Lui, et al., "Wearable Technologies for Neonatal Monitoring", Design for Integrated solutions, pp.12-40