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IoT Based Infant Security Systems in Hospitals using RFID and Arduino

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A.ABSTRACT

Baby lifting has been prevalent in our state hospitals for years. With sprawling buildings and hundreds of people walking in and out every day, these hospitals face crime even though CCTV cameras have been installed. Identification of theft can be achieved through proper use of Radio Frequency Identification (RFID) technology. This work is an attempt to investigate and subsequently use RFID technology in healthcare to protect newborns in hospitals from abductions and confusion. This work characterizes the RFID system in terms of various elements that make up readers, tags, software and security programs. The RFID system is very effective in protecting newborns in such hospitals. A specially designed RFID tag attached to the child and its mother along with a tag reader and an automated system can handle the above problems. The RFID tag is placed on the newborn's ankle/wrist. The RFID reader in the mother's hand is used to read information about all the tags inside the room. If the tag signal is lost (which is automatically verified after one minute), the system will announce the absence of the tag, an alarm sound will be activated, and the information will be updated o the cloud via IoT using the ESP8266 Wi-fi module. The Arduino controller triggers the encoder and the RF transmitter module to transmit the RF signal to the gate unit, which is used to receive the transmitted RF signal from the mother unit to close the gate and is used to prevent the theft of the newborn.

Keywords — Baby lifting, RFID, Arduino, IoT, ESP Module, RF Signal, Cloud, Wi-fi, Encoder.

B.INTRODUCTION

Public hospitals in developing countries are generally very overcrowded and therefore more prone to cot-switching and cot-kidnapping. Even in developed countries like the United States, changing the Cradle is one of the major problems. Each year in the United States, approximately 1,00,000 to 5,00,000 newborns are mistakenly switched (switched), or one in eight babies born in American hospitals are sent home with the wrong parents. According to a study of 34 newborns admitted to a neonatal intensive care unit, there is a 50% chance of misidentifying a newborn in just one day. Security systems play a vital role in blocking unknown users from entering a secure area, which may contain both physical and intellectual property without being detected. Various automatic identification technologies such as barcode, magnetic stripe and radio frequency identification (RFID) are used in the security system. RFID is a growing technology and one of the fastest growing segments of automated data collection today. RFID technology offers admirable performance over other automatic recognition systems. We designed a system using an RFID tag that includes an Arduino, which is used for the accumulation, preparation of unique information, modulation and demodulation of the transmitted high-frequency signal. The RFID-based security system allows access to the secured area only to recognized persons. RFID uses a wireless contactless system. This type of system uses high-frequency electromagnetic fields to transmit data from a tag attached to an object. The system designed in this project is implemented around Arduino, which can help to avoid the human requirement for tracking and holding when entering a secure area. This system implements secure access control and maintenance. A missing child safety system is used here where the gate is automatically closed using the correct RFID tag and updated to the cloud. Then the motor closes the gate automatically by programming. If we miss any child, we can access the gate unit with encoder and decoder within a certain time period by showing the exact cause. The hospital gate will close automatically.

C. SECURING CHILDREN USING RFID TECHNOLOGY

Arduino UNO

Arduino is a development board where we connect sensors and WSN modules to create a completely successful project. The ATMEGA 328 P controller is known as the heart of the whole system which will control the input and control the output accordingly. It also checks the reception of serial data through the serial ports and sends the data through the serial port to the necessary peripherals. It checks the values of the sensors connected to it and takes the necessary measures if the values occur abnormally. Such as heart rate temperature and also reducing and stopping engine speed according to sleepiness level. Arduino consists of both a piece of software or an IDE (Integrated Development Environment) and a physical programmable circuit board (often referred to as a microcontroller). Codes can be written and uploaded to a physical bulletin board. Interactive objects can be developed

using inputs from sensors and can be used to control a range of lights, motors and other outputs. These projects can be standalone, or they can interact with software running on your computer. The ATmega328 is the microcontroller board that the Arduino Uno is based on. Of the 14 digital input/output pins, there are 6 pins that can be used as PWM outputs, 16MHz ceramic resonator, 6 analog inputs, USB connection, Reset button, Power jack and ICSP Header. Everything needed to support the microcontroller is present in it. To run it, just plug it into a USB and AC-DC adapter.

Encoder

The HT12E encoder is a CMOS IC designed specifically for remote control system applications. It is capable of encoding 8 bits of address (A0-A7) and 4 bits of data (AD8-AD11) information. Each address/data input can be set to one of two logic states, 0 or 1. Grounding the pins is considered 0, while high can be given by applying +5 V or leaving the pins open (no connection). After receiving a transmit enable (TE-active low), the programmed address/data is transmitted along with the header bits over the RF medium.

Decoder

The HT12D is a decoder IC made specifically to pair with the HT12E encoder. This is a CMOS IC made for remote control system applications. The decoder is capable of decoding 8 bits of address information (A0-A7) and 4 bits of data (AD8-AD11). For proper operation, a pair of encoders/decoders with the same number of addresses and data format should be selected. Decoders receive serial addresses and data from programmed encoders that are transmitted over the carrier using an RF or IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or mismatch codes are found, the input data codes are decoded

Voltage Regulator

Voltage regulator ICs are available with fixed (typically 5, 12, and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies.

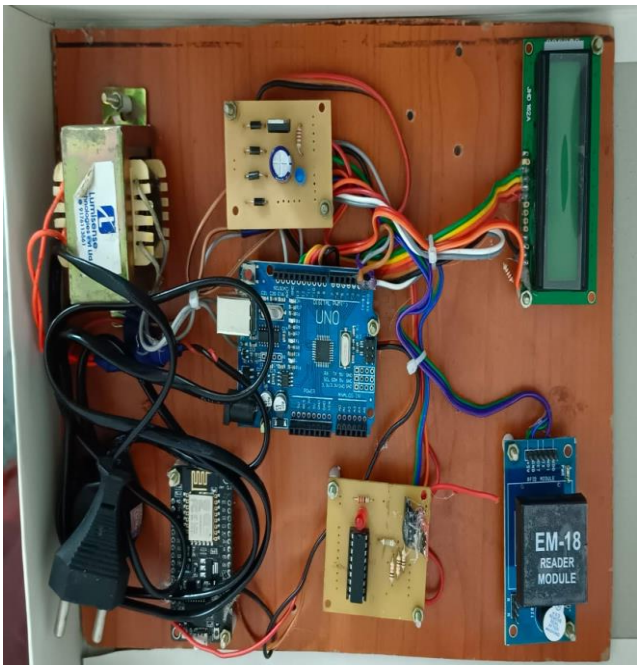
RFID Reader

The RFID reader is used to read the data from tags and sends the read data to the microcontroller. A Radio Frequency Identification Reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio Frequency waves are used to transfer data from the tag to a reader. The RFID tag must be within the range of an RFID reader, in order to be read. RFID technology allows several items to be quickly scanned and enables fast identification of a particular product, even when it is surrounded by several other items.

ESP MODULE

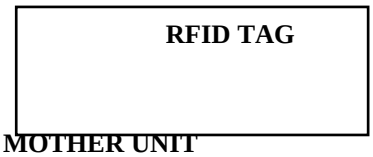
The ESP8266 ESP-01 is a Wi-Fi module that allows microcontrollers access to a Wi-Fi network. This module is a self-contained SOC (System on a Chip) that doesn't necessarily need a microcontroller to manipulate inputs and outputs as you would normally do with an Arduino, for example, because the ESP-01 acts as a small computer. Depending on the version of the ESP8266, it is possible to have up to 9 GPIOs (General Purpose Input Output). Thus, we can give a microcontroller internet access like the Wi-Fi shield does to the Arduino, or we can simply program the ESP8266 to not only have access to a Wi-Fi network but to act as a microcontroller as well. The ESP8266 Wi-Fi module is a powerful, yet cost-effective, surface-mountable Wi-Fi module with an embedded ESP8266 system on chip (SoC). It's one of the most popular low-cost ($4.00 to $10.00) Wi-Fi modules for controlling devices over the internet. The module has a wireless Wi-Fi transceiver operating in an unlicensed frequency range of 2400-2484 MHz in the IEEE 802.11 b/g/n standard, with support for TCP/IP communication protocol stack and Wi-Fi security including WAP3. It can work with firmware to provide Wi-Fi connectivity to external host MCUs like the Arduino or as self-sufficient programmable MCUs with an RTOS-based SDK that can run applications. The ESP8266 Wi-Fi module is a popular choice for IoT projects, as it provides Wi-Fi connectivity to embedded devices.

MOTHER UNIT



D.BLOCK DIAGRAM

BABY UNIT



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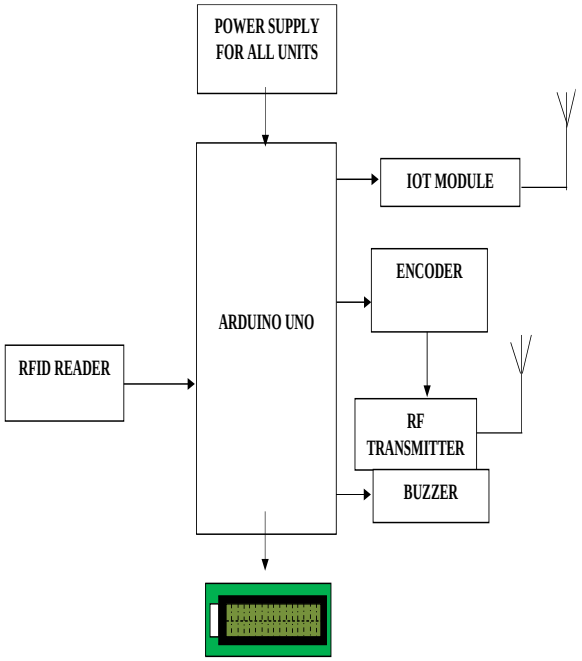
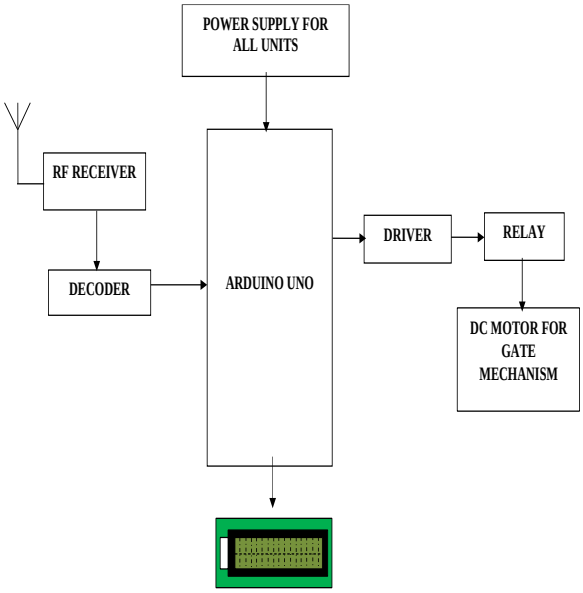


GATE UNIT



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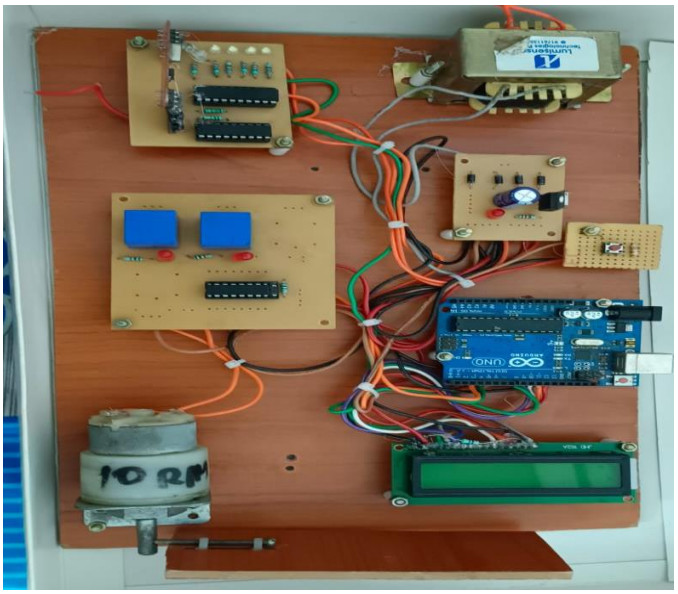
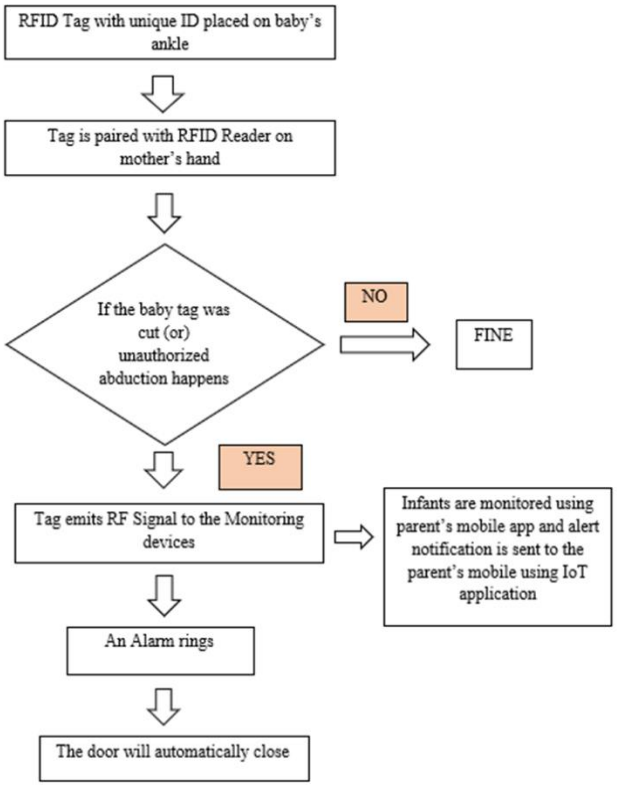


E.METHODOLOGY



This design is to cover newborns in hospitals using RFID Technology. A Wristband label can be used for this purpose. The Wristband is tied to the Child and his/ her Mother. RFID anthology in the newborn rooms may be used to read the signals and to track the conditioning of children. With proper Robotization, it will be insolvable to Switch and Hijacking of a newborn.

F.SOURCE CODE FOR MOTHER UNIT

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(8, 9, 10, 11, 12, 13);
String id;
int En_pin=5;
int Data_pin=4;
int Buzzer=2;
int count=0;
void setup()
{

  lcd.begin(16, 2);
  Serial.begin(9600);
  pinMode(Data_pin,OUTPUT);
  pinMode(En_pin,OUTPUT);
  pinMode(Buzzer,OUTPUT);
  digitalWrite(Data_pin,LOW);
  digitalWrite(En_pin,HIGH);
  digitalWrite(Buzzer,LOW);
  lcd.setCursor(0,0);
  lcd.print("Welcome to Baby ");
  lcd.setCursor(0,1);
  lcd.print("MonitoringSystem");
  delay(1000);
}
void loop()
{
  count++;
  delay(1000);
  if (Serial.available() > 0)
  {
    id = Serial.readString();
    delay(1000);
    count=0;
    digitalWrite(Data_pin,LOW);
    digitalWrite(En_pin,HIGH);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(id);
  lcd.setCursor(0,1);
  lcd.print("Data Received...");
  delay(1000);
   delay(5000);
  Serial.print('0');
  delay(1000);
  digitalWrite(Buzzer,LOW);

  }
  else
  if(count>25)
  {
    digitalWrite(Data_pin,HIGH);
    digitalWrite(En_pin,LOW);
    delay(500);
    digitalWrite(En_pin,HIGH);
     lcd.clear();
     lcd.setCursor(0,0);
  lcd.print("Please Check    ");
  lcd.setCursor(0,1);
  lcd.print("Infant Missing..");
  Serial.print('1');
  delay(1000);
  digitalWrite(Buzzer,HIGH);
  }
}
```

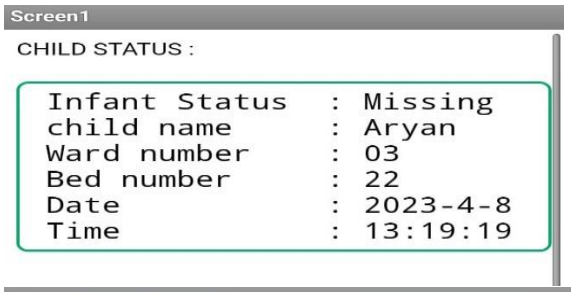
G.SOURCE CODE FOR GATE UNIT

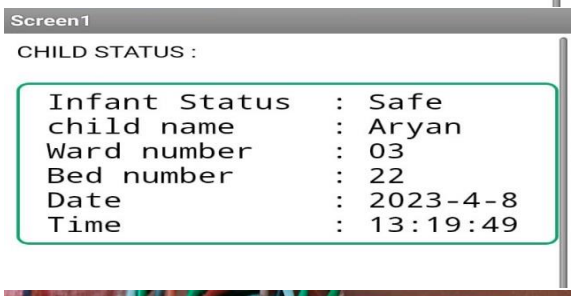
```
#include <LiquidCrystal.h>
LiquidCrystal lcd(8, 9, 10, 11, 12, 13);
int sw=6;
int En_pin=5;
```

```
int Data_pin=4;
boolean flag=0;
int R1=2;
int R2=3;
int count=0;
int Received_data;
int R_data;
void setup()
{
 lcd.begin(16, 2);
 Serial.begin(9600);
 pinMode(Data_pin,INPUT);
 pinMode(En_pin,INPUT);
 lcd.setCursor(0,0);
 lcd.print("Welcome to Baby ");
 lcd.setCursor(0,1);
 lcd.print("MonitoringSystem");
 delay(1000);
 pinMode(R1,OUTPUT);
 pinMode(R2,OUTPUT);
 digitalWrite(R1,LOW);
 digitalWrite(R2,LOW);
}
void loop()
{

 Received_data=digitalRead(En_pin);
 //count++;
 delay(1000);
 if(Received_data==1)
 {
  delay(500);
  R_data=digitalRead(Data_pin);
 if((R_data==1)&&(flag==0))
 {
 flag=1;
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("Please Check    ");
 lcd.setCursor(0,1);
 lcd.print("Infant Missing..");
 delay(1000);
 digitalWrite(R1,HIGH);
 delay(1000);
 digitalWrite(R1,LOW);
 }
 }
int SW=digitalRead(sw);
 if(SW==1)
 {
 flag=0;
 digitalWrite(R2,HIGH);
 delay(1000);
 digitalWrite(R2,LOW);
 lcd.clear();
 lcd.setCursor(0,0);
 lcd.print("Gate opened...  ");
 delay(2000);
 }

}
```

H.CONCLUSION

This RFID-based infant security system will be helpful in preventing the abduction of Infants and mismatching of infants from their parents in hospitals. This shows how an Infant security system using RFID can be achieved in the protection of infants. Arduino used is a simple prototype model which works more efficiently. Our Aim is to implement this system, especially in government hospitals because the percentage of abduction of infants takes place high in government hospitals. The complete setup of the project is low cost so that even common people can use this security system, also the components used in the system is low cost, and efficiency is more. It will be useful for common people. IoT technology has the potential to greatly enhance the safety and security of infants in various settings. By providing real-time monitoring and alerts, IoT devices can help caregivers respond quickly to potential risks and provide a safer environment for Infants.





REFERENCES

1. O.D. Lara and A.L. Miguel, “A check on mortal exertion recognition using wearable detectors”, IEEE Dispatches Checks and Tutorials, vol. 15, no. 3, pp. 1192-1209, 2013.
2. S.C. Mukhopadhyay, “Wearable detectors for mortal exertion covering A review”, IEEE Sensors Journal, vol. 15, no. 3, pp. 1321- 1330, 215.
3. L.A. Stilp, “RFID grounded security system”, U.S. Patent No. 3 May 2005.
4. Bacheldor, B. (2006, July 25). Medical distributor puts RFID markers on outfits and RFID journals.
5. BlueBean, (2007), The Benefits of RFID in the Healthcare Organization, RFID results for the Healthcare Industry, (Available Online) URL http//www.rfidhealthcare.com/.
6. Haley CK, Jacobsen LA, Robkin S., (2007), Radiofrequency Identification text for Librarians, Greenwood Publishing Group, Inc. Santa Barbara, CA.
7. Radiofrequency Identification Fundamentals and Applications, Design styles and results, Book edited by Cristina Turcu, ISBN 978-953-7619-72-5, pp. 324, February 2010.