CHILD SAFETY DOOR SECURITY SYSTEM

AS2019961
U.N.S.Udawaththa

ICT 305 2.0
Embedded System
Project Final Report

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01. Introduction

Nowadays, parents with small children have to face a big problem. That is, in houses with small children, especially by leaving the front door or the back door of the house open, the small child tries to get out. If the house is near a road with a lot of traffic, it is very dangerous. Because, when the small child goes out of the house, he goes to the road first. Then very dangerous accidents are likely to happen. Also, there is a high chance of accidents happening to the small child who goes out of the house. There are many chances of accidents happening due to their ignorance from animals as well as the environment.

With this project, when the small child tries to go out the front door or the back door of the house, the sensor detects it and closes the door at that moment. Also, when going out of the house, it is possible to prevent accidents that may happen to the child outdoors. Not only the front and back doors of the house, but if there is a room with chemicals or a storage room or an area with dangerous things for small children in the house, this security door can be operated so that it is not possible to enter that area. When entering the unsecured area, the door closes. Along with a warning sound, the system also sends a notification to the mobile phone.

1.1 System overview

At present time, very big problem for parents with small children is that they should always be on the lookout for the child (especially in homes near a road where vehicles often travel). Sometimes you don't want your little kids to go outside of your house by themselves or get into a room which has potential danger like your work area without your knowledge. There are many road accidents caused by children in such homes going on the road unknowingly. As a solution to this problem, this project can be submitted. Here, this project can help to alert you. How does it work? When a target, who is a kid approaching a safeguarded area then, the alarm will go on because a kid is shorter than an adult (height is measuring by IR sensor). The buzzer will go on if the system is activated. Then the door closes without harming the baby. Also, a notification alert will send to the mobile phone by the system.

1.2 Objectives

- The main objective of this project is to create a system that will help parents who have small kids, to solve their problems such as losing their child and collision kids to vehicles.

- A child safety door is a special-purpose door for kitchen, rooms, infront door, behind door in home. that is designed to help prevent children from getting at any dangerous things or contents, avoid going out of the house and to avoid by various accidents. Young children are naturally curious about their surroundings and will always explore, but as they may be unaware of dangerous substances or situations, the results can be fatal.

  Therefore, I introduce this project to overcome these issues.

02. Purpose

Child safety door security system is a security door for the small child. The main purpose of this project is considering the safety of the small child. The concept of Child Safety Door Security System (CSDSS) is come up to overcome above mentioned problems. CSDSS also consists with emergency alerting system. When child pass the warning area, IR sensors will automatically detect and turn on the buzzer. Also an emergency alert will send to the user's mobile. This device can be designed for a low-cost using Arduino.

03. System Models

3.1 System Requirements

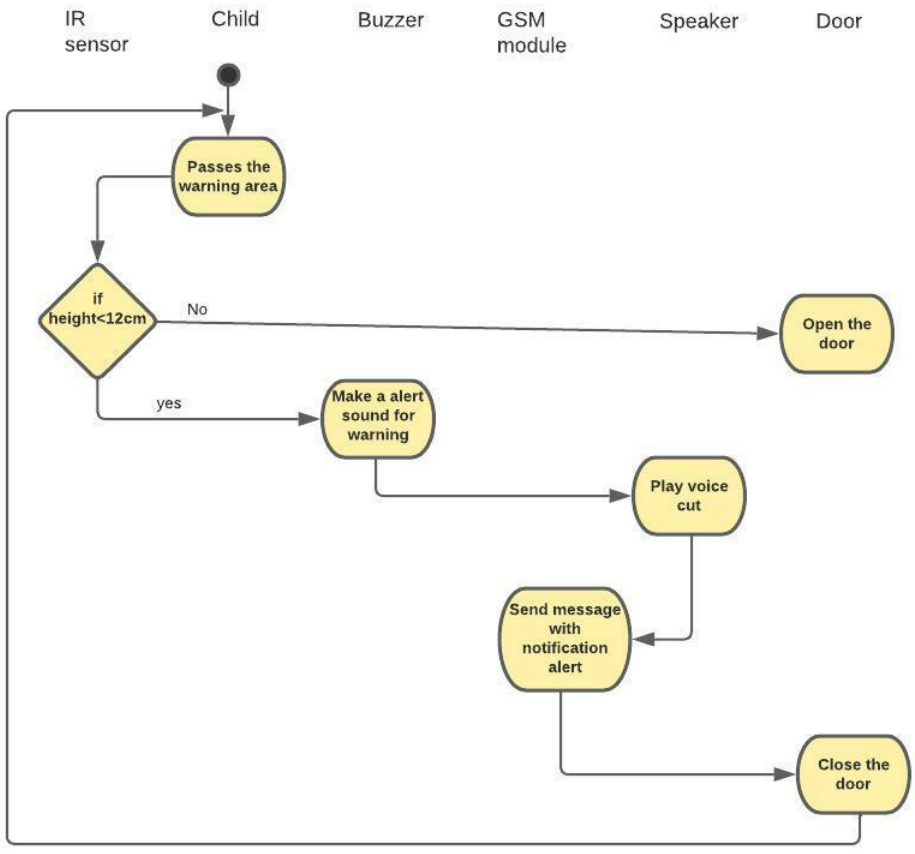
3.1.1 Proposed System

Actually, I have many reasons to design Child Safety Door Security System (CSDSS), These are some of reasons, Why I am selected this project.

1. Easy to use (It is familiar and affordable)
2. All information can be appeared.
3. Able to protect small child from accidents.

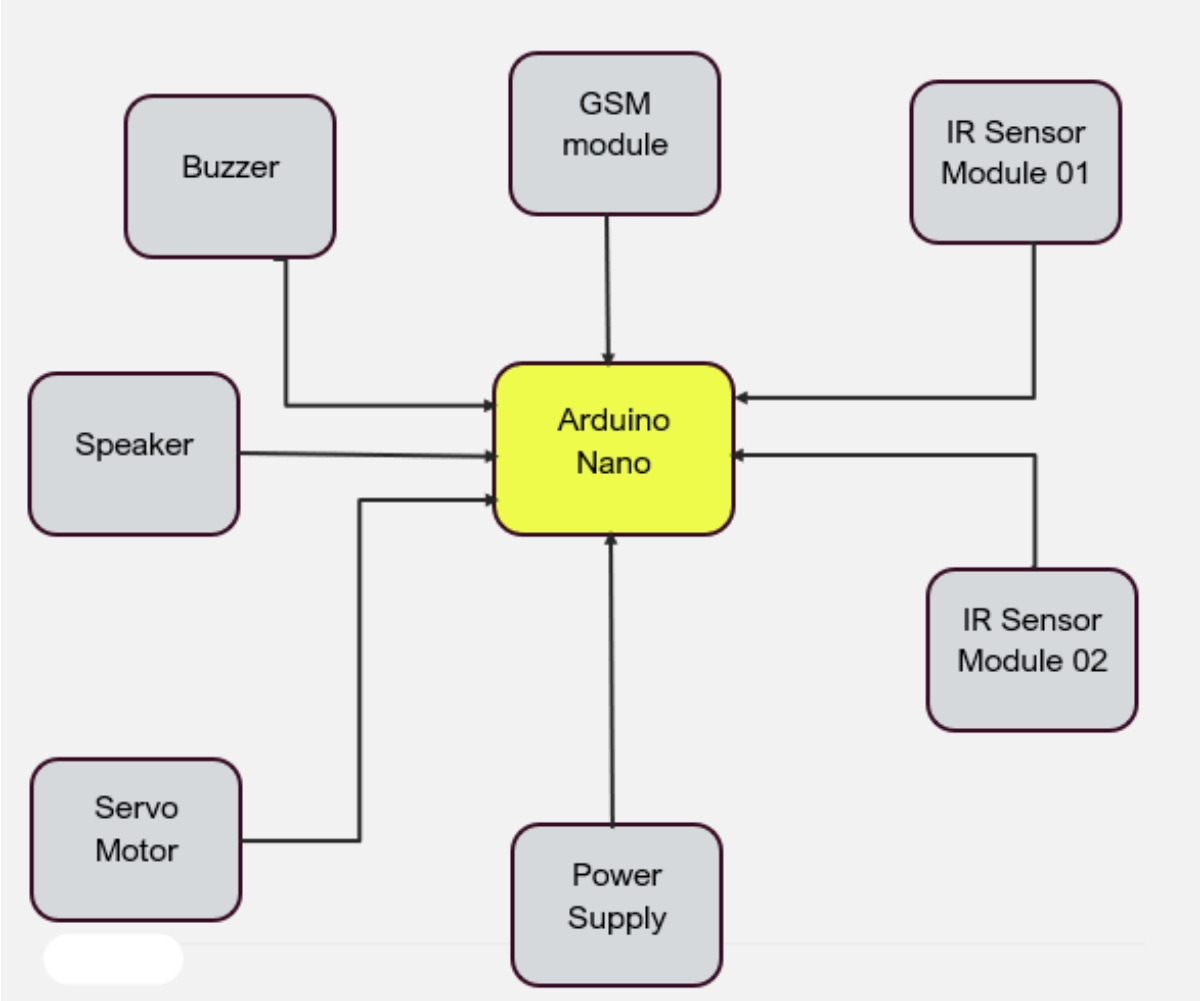
By example, system can detect small child and if child passes the warning area, then buzzer will alert with voice and send the warning message to user's mobile. My proposed project first uses IR sensors to detect height of the child and send the message using GSM module to alert user.

3.1.2 Activity Diagram



3.2 System Design

3.2.1 System Architecture (Block Diagram)



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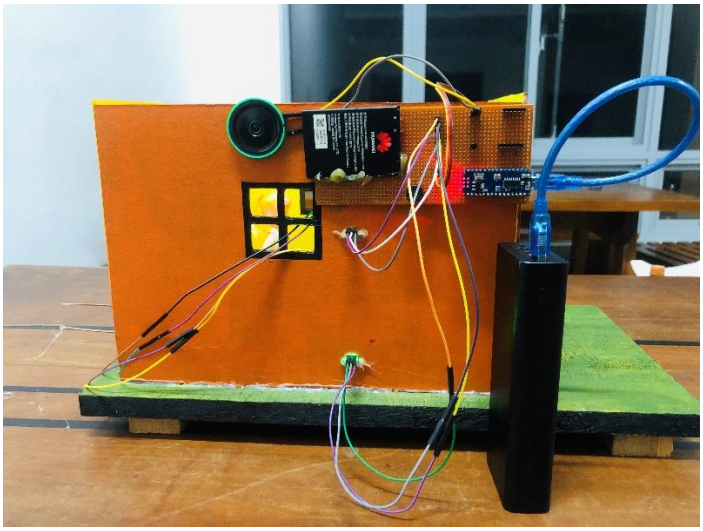

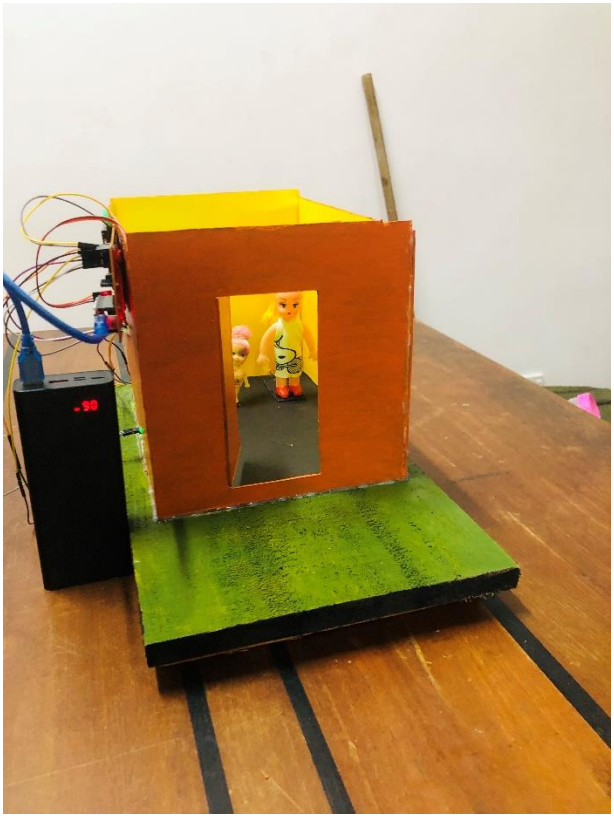

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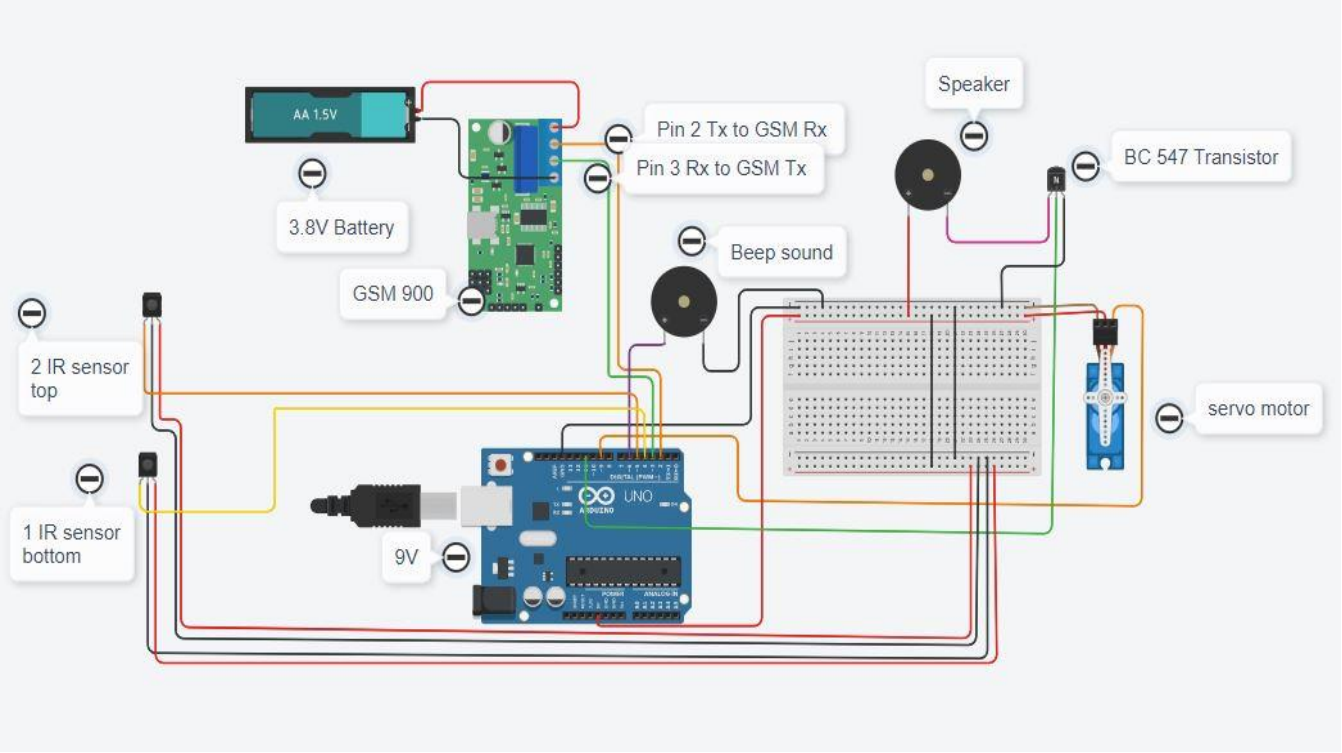

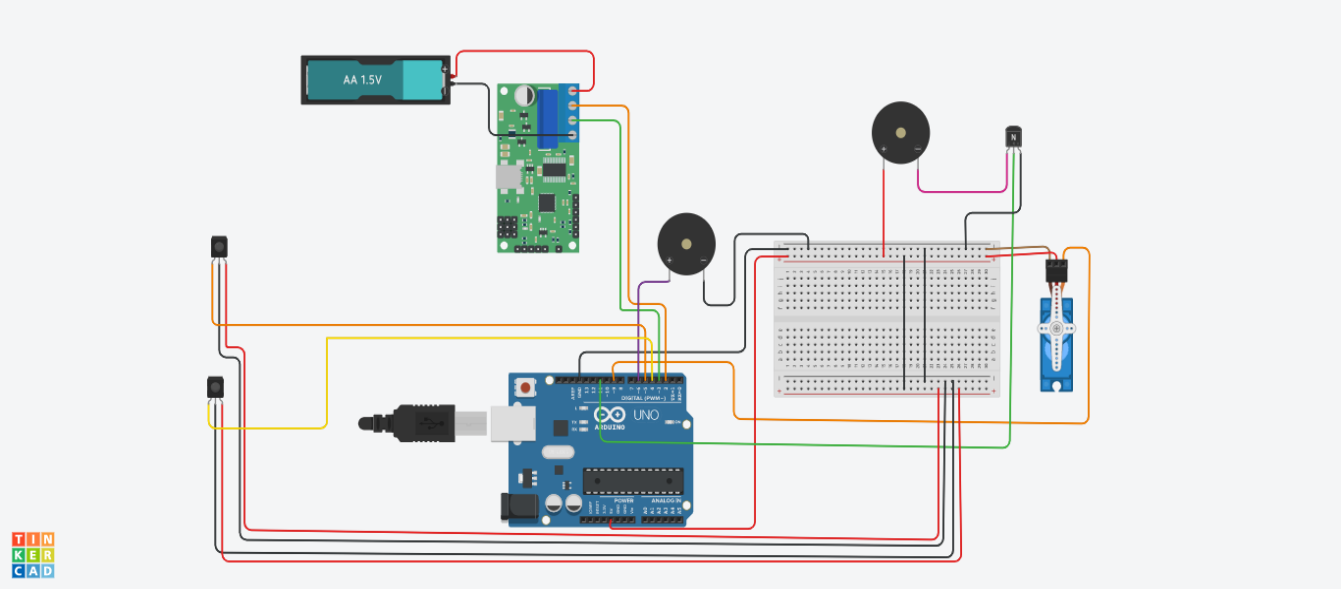

3.2.3 Code

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#define u 5
#define v 6
#include <FlagPCM.h>
#include <Servo.h>
#include <SoftwareSerial.h>
SoftwareSerial mySerial(3, 2);//Rx and Tx
Servo myservo;
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int m1 =0;
int i=0;
int count1=0;
int count2=0;
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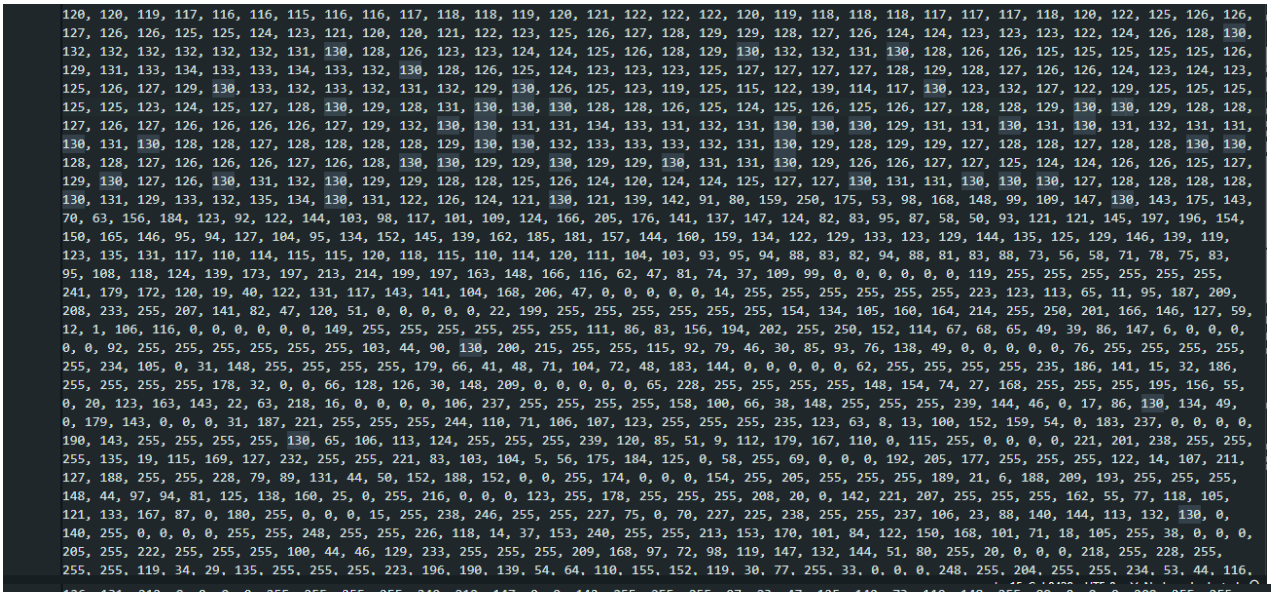
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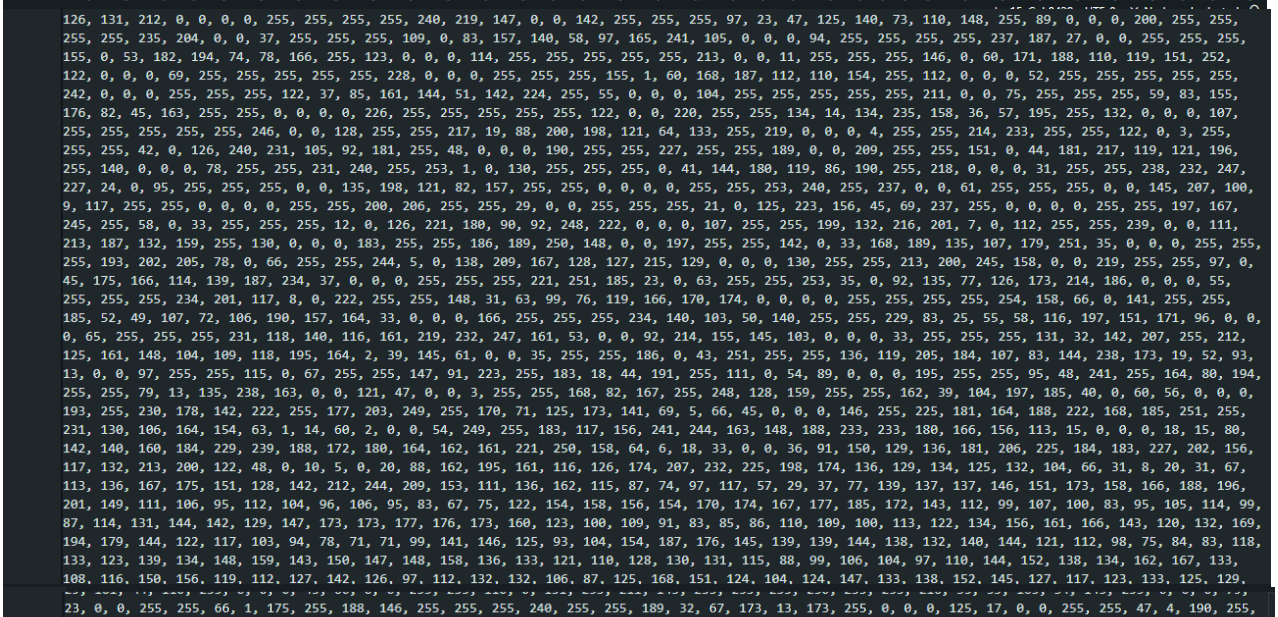
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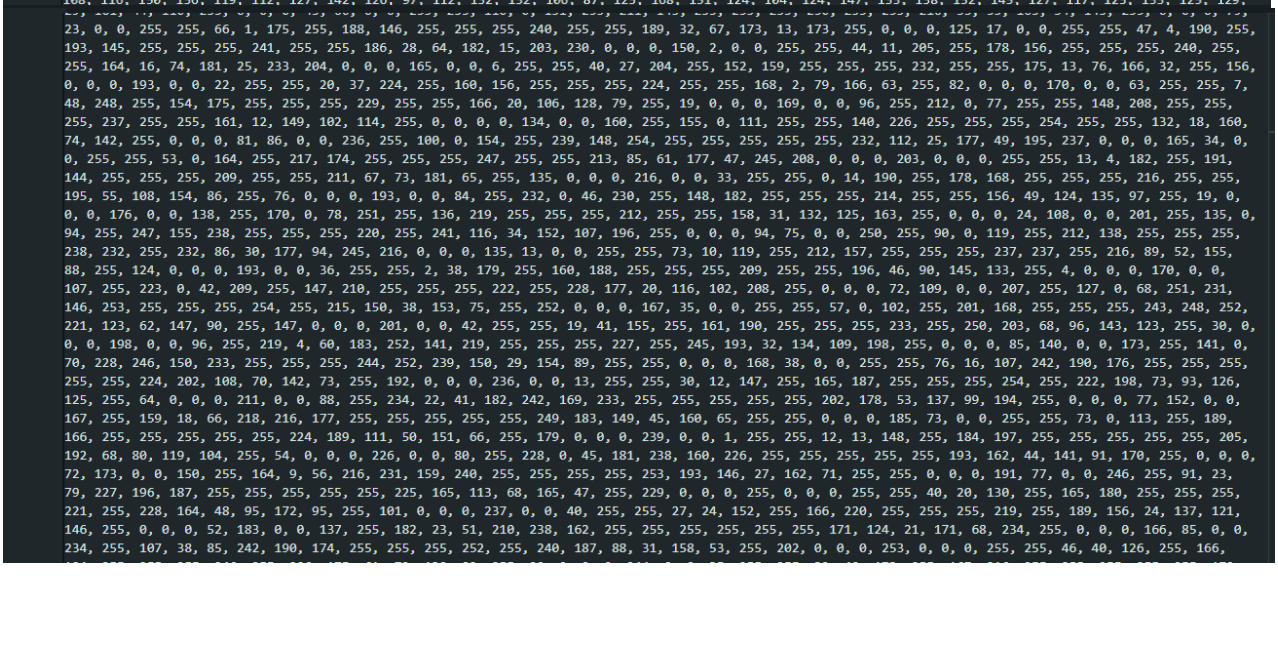
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void setup()
{
  pinMode(t, INPUT);
  pinMode(u, INPUT);
  pinMode(v, OUTPUT);
  Serial.begin(9600);
  myservo.attach(9);

}

void loop()
{
Serial.println(digitalRead(t));
Serial.println(digitalRead(u));
Serial.println(count1);
while(count1<1){
 if(digitalRead(t)==0 && digitalRead(u)==1){
   count1 = count1+1;
   myservo.write(180);
   for(int k=0;k<5;k++){
     digitalWrite(v,HIGH);
     delay(500);
     digitalWrite(v,LOW);
     delay(500);

   }

   playback(sample, sizeof(sample));
   Serial.begin(9600);
   mySerial.begin(9600);
   Serial.println("Initializing...");
   delay(1000);
   mySerial.println("AT");
   delay(500);
  while (Serial.available())
  {
    mySerial.write(Serial.read());//Forward what Serial received to Software Serial Port
  }

  while(mySerial.available())
  {
    Serial.write(mySerial.read());//Forward what Software Serial received to Serial Port
  }

   mySerial.println("AT+CMGF=1");
   delay(500);

  while (Serial.available())
  {
    mySerial.write(Serial.read());//Forward what Serial received to Software Serial Port
  }

  while(mySerial.available())
  {
    Serial.write(mySerial.read());//Forward what Software Serial received to Serial Port
  }

   mySerial.println("AT+CMGS=\"+94768661852\""); // enter your phone number here (prefix country code)
   delay(500);
  while (Serial.available())
  {
    mySerial.write(Serial.read());//Forward what Serial received to Software Serial Port
  }
  while(mySerial.available())
  {
    Serial.write(mySerial.read());//Forward what Software Serial received to Serial Port
  }
   mySerial.print(" baby is crossing the door, please pick up"); // enter your message here
   delay(500);
  while (Serial.available())
  {
    mySerial.write(Serial.read());//Forward what Serial received to Software Serial Port
  }
  while(mySerial.available())
  {
    Serial.write(mySerial.read());//Forward what Software Serial received to Serial Port
  }
   mySerial.write(26);
   delay(10000);
  }
 }
 if(digitalRead(t)==0 && count1==1 && digitalRead(u)==1)
{
 myservo.write(90);
 delay(10000);
 count1=0;
}
}
```

04 System Implementation

4.1 Explanation of components

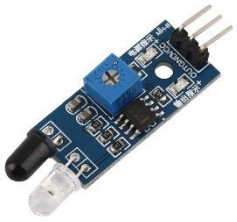
Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega 328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30 -like configuration, which can be programmed using the Arduino Software Integrated Development Environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B-Mini USB cable or from a 9 V battery. In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor and twice the RAM.

IR Sensor

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature above around five degrees kelvin) gives off infrared radiation.

In this project IR sensor is used to measure the height of child or man.



Amplifier Transistor

A transistor amplifier is an electronic circuit that uses a semi-conducting transistor instead of a tube or integrated circuit chip to amplify electrical signals. Typically used in audio applications, a transistor amplifier provides excellent performance in a relatively small package. It has largely replaced the vacuum tube signal amplifier and remains a strong competitor to the more modern integrated circuit (IC) amplifier. In this project, amplifier transistor is used to increase sound.

Buzzer

An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren. In this project, buzzer is used to alert parents.

Servo Motor

A **servomotor** (or **servo motor**) is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotors are not a specific class of motor, although the term *servomotor* is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery, and automated manufacturing. In this project, servo motor is used to open and close the door.

Speaker

In this project, speaker is used to listen a warning voice.

GSM Module

Global System for Mobile Communication (GSM) is a standard used in cellular communication networks. Amongst all cell technologies in use nowadays, GSM is one of the most widespread. GSM modules offer connectivity along with wireless data communication transfer. These devices are light and easy to use as well as having a surprisingly low power consumption for the amount of work they can do. They can be used for tracking communication projects, linking together a remote site monitoring system with your LAN, as well as many other applications. A GSM module is a specialized type of device which accepts a SIM card, and operates over a subscription to a mobile operator, just like a cell phone or pager. From the mobile operator perspective, a GSM modem looks just like a phone. The difference between a cell phone and a module being the flexibility in applications.

In this project, GSM module is used to send message to user's mobile when the baby across the IR sensor.

05 Budget

Component	Price(LKR)
1. Arduino nano	2500
2. Breadboard	340
3. Servo motor	600
4. Dot board	100
5. Male/Female bars	260
6. Jumper wires/Circuit wires	360
7. Buzzer	80
8. Speaker	100
9. Type B USB cable	160
10. IR sensor	440
11. LEDs	50
12. GSM module	2600
TOTAL	7590

06 Issues

- Even if a dog walks through the door, the warning alarm will sound on.

07 Discussion

- Servo motor was used to open and close the door when, the baby go towards the opened door. If desired to change to a door with a number lock, I can improve my code.
- The one IR sensor identify, if there is a baby in the area. If baby not in area, IR sensors didn't work.
- delay function pauses the program for the amount of time (in milliseconds) specified as a parameter. 500 ms after the beep sound, the beep sound will be heard again and it will ring five times.
- I used a 3.8V battery and connect it to dot board.
- Before I decided to use a uno board. after I changed to nano board. Because nano board is very small and I wanted for get input and outputs. It can manage easily.

08 Conclusion

The Child Safety Door Security System (CSDSS) acts as a basic flatform for the coming generation of more aiding devices to help for parents who have small children. It leads to good result in detecting baby and protecting the baby. Also GSM helps to find out alert message. This system offers a low cost, reliable, portable and low power consumption. Though the system is hard-wired with sensors and other components. I think I'm done this successfully.

8.1 Future Implementation

I wish to improve this project as a very secured system. So I can add a keypad system or finger print system for open the door.

09 References

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