Ahsanullah University of Science & Technology
Department of Computer Science & Engineering Semester
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CSE 3216
Microcontroller Based System Design Lab

Project Report

Project Name: FLOOD PROTECTOR

Submitted By

- **Ashiqul Islam** **170204070**
- **Shweta Bhattacharjee** **170204111**
- **Umma Salma Anika** **170204113**
- **Sadman Jahin** **170204115**

Submitted To

AFSANA AHMED MUNIA
Lecturer, AUST

NIBIR CHANDRA MANDAL
Lecturer, AUST

OBJECTIVE

We try to build a microcontroller based system named "***Flood Protector***" which can measure water level by **using sensor probes** to indicate water levels in a drain, estuary etc ; There are 3 levels of water. One is Safe zone, another level is unsafe zone finally danger zone. During high tide the water came from river to drain and in drain the water level increases and sometimes the city submerged by these water. So we try to make a system which can measures the water level and when the water level cross the unsafe zone the orange light shown and buzzers will started beeping and when the water level ups to the danger zone the gate will be closed and water can't come to the town. For our project we use ultrasonic sensor, level by **using sensor probes** to indicate water levels. These probes send information back to the control panel to trigger an alarm or indicator. As mentioned above, the control panel can be programmed to automatically ,if the water level cross the danger zone gate will be closed and if the water level again comes down to safe zone the gate will open. We have extra three sensors one is for measuring Temperature of the environment using LM35 sensor, another sensor is used to measure wind speed for this we use Anemometer and finally we use Humidity sensor DHT22 to measure humidity. Because to protect people from upcoming flood, Water level measured is not sufficient. We have to track wind speed and temperature and humidity also.

SOCIAL VALUES

- Our ***Flood Protector*** can be used in Drain which is connected to river, in Dam, in making drainage system of a town, for the farmers to ensure the safety of their golden crops from flood water etc.
- Flood Protector will automatically open the gate when water flows in the safe zone. When the water level increase and water flow in the unsafe zone our system automatically beeping and warn people about upcoming flood. When water flows in danger zone the gate will be closed and extra water will not come.
- In Dam to protect the village from flood.
- In the ship compartment , if there is some leakage under the ship and water comes into the ship, our system help to closed the gate and doesn't allow water to enter, this can keep other compartment safe and also protects the ship from drowning.

REQUIRED COMPONENTS

These following parts and tools are required for building this project

- Arduino Mega 1280 x 1: It is a micro controller. In our project it is main controller that handles all the thing.
- Arduino UNO R3 x 1 :The Micro Controller we are using in this project is Arduino R3 which will help us to handle logical problems easily. Mainly it work as a sub controller in our project. Arduino R3 provides 13 Digital Pins and 5 Analogue Pins for various inputs and Outputs.
- Ultrasonic Sensor x 2:An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. We will use ultrasonic sensor to check if the water of river , drain is full continuously.
- 5V Buzzers x 1: Buzzer is used to give any alarm/signal.In our projectAs we have mentioned we are keeping three zones for security purposes. Buzzer will be needed when water level reaches to the unsafe zone.
- LCD Display (16 x 3):It will show distance and will show message if water level increase or normal or warn before rising. Others will show temperature and humidity.
- Resistors with different Resistance: Resistor will be connected between LED and Arduino for keeping safe current limit which will refrain LED from burning.
- LED(Green ,Red ,Orange) x 9 :LEDs are commonly used for indicator lights . As we have mentioned we are keeping three zones for security purposes. We will be use LED for indicate three stages to be mentioned Green LED for safe zone, Orange LED for unsafe zone and RED LED for danger zone.

Two Blinking Red LED will indicate Critical situation.

- Berg Strip Female x 2
- Connecting wire (male , female):Connecting wires provide a medium to an electrical current so that they can travel from one point on a circuit to another. In the case of computers, wires are embedded into circuit boards to carry pulses of electricity.
- Bread Board(6.5”x2.125”):A Bread Board, is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate.

- 2x Servo motor: It is used to rotate something at a particular angle.In our project it is used to open and close the door

- Metal Sheet: Metal sheets are generally categorized as thin sheet and heavy plate . We are going to use long 6 inch and width 3 inch metal sheet. We will use metal sheet as gate.

- Keypad: Keypads are used for user input. Mainly for passwords.
- 5V , 1A mobile charger as power supply
- Anemometer: Anemometer is used for measuring wind speed.
- DHT-22: Temperature and Humidity Measurement sensor.
- Pot-HG: Measuring distance for ultrasonic.
- SD Card: SD Card is used for storing data,
- Plastic glass x 1

Design

The circuit diagram is given below:

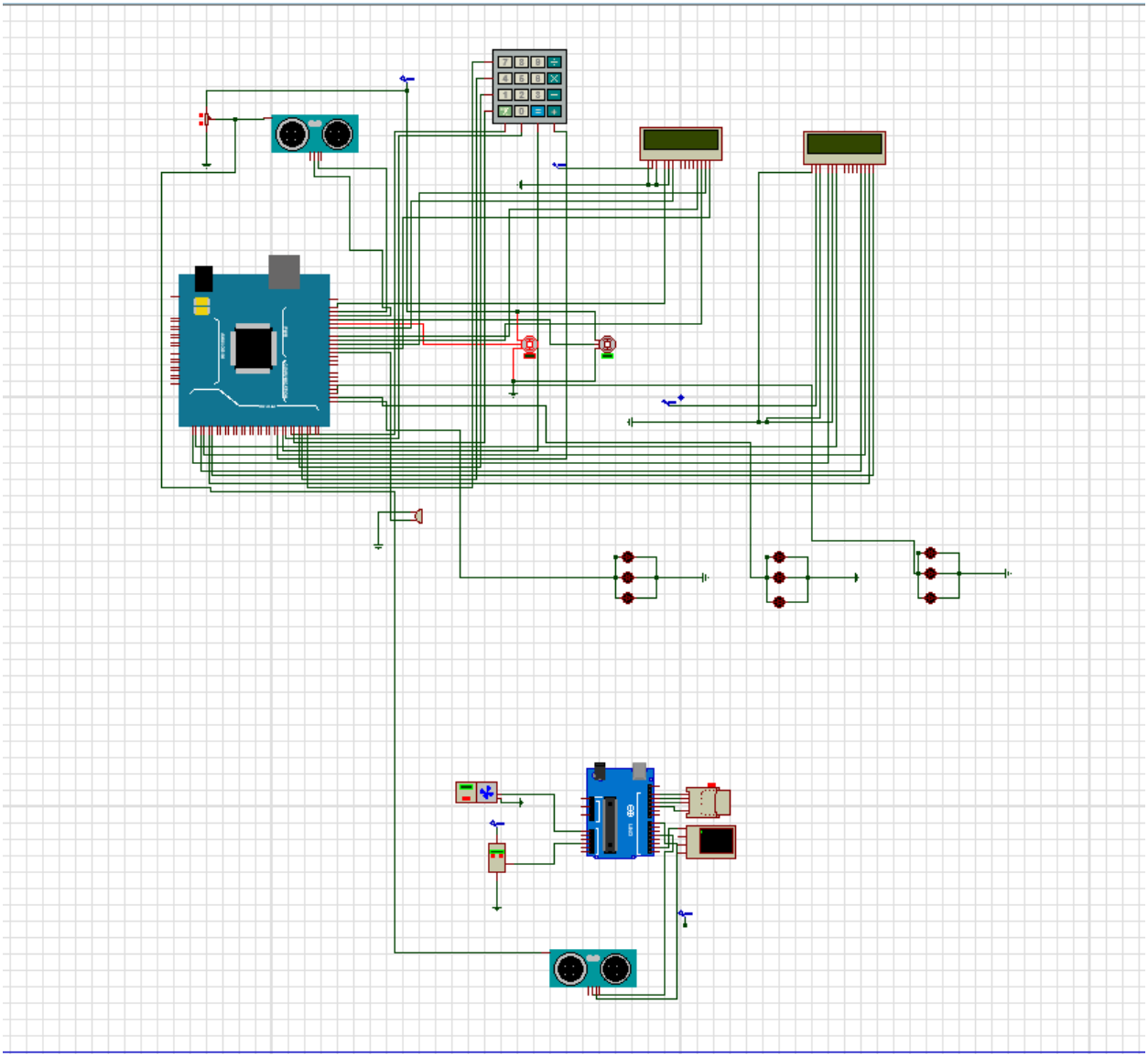

Figure 1: Diagram for Smart Flood Protector.

WORKING PROCEDURE

Procedure:

- Our system continuously needs to check the water level and make sure water level never cross the danger zone. To determine the water level we used Ultrasonic Sensor to measure the height of water from which we will calculate the level of water.

- When water level is in danger zone and the gate is closed or not our system will notify the management team and people will know all the information by visiting our Website.

- Ultrasonic sensor measures the distance between water and space. We provide three zones based on the measurement.

- When water flow in unsafe zone the buzzers will started to beeping.

  When water flow in the safe zone the gate will be open .

- We dynamically store the real time data and show them on the website so all the people can be notified easily not only the hardware connected people.

- We used Anemometer to measure the wind speed so we can calculate future disaster and take preventive measures before the water level rise.

- People from local can access websites and get all the info.

ESTIMATED BUDGET

Equipment	Quantity	Budget(BDT)
Arduino Mega 1280	1	873
Arduino UNO R3	1	350
Ultrasonic Sensor HC-SR04	1	70
Wind Speed Sensor(Anemometer)	1	1450
Humidity Sensor(DHT22)	1	350
5V Buzzer	1	15
LCD Display (16 x 2)	2	316
Temperature Sensor(LM35)	1	125
Keypad(4 x 3)	1	95
SD Card	1	35
Led (RED + GREEN+ORANGE)	9	13.5
Berg Strip Female	2	40
Male , Female jumper wire	Est.	96.4
Bread Board(6.5”x2.125”)	5	470
5V/1A mobile charger as power supply	1	110
Plastic glass	1	100
6x3 inch metal sheet	1	80
Servo motor SG90	2	290
Total		**4878.9/=**

CODE FOR ARDUINO MEGA

```
#include <Servo.h>
#include <LiquidCrystal.h>
#include <Keypad.h>
#include <SPI.h>
#include <SD.h>

File myFile;
const byte ROWS = 4;
const byte COLS = 4;
// Define the Keymap
char keys[ROWS][COLS] = {
{'7','8','9','/'},
{'4','5','6','*'},
{'1','2','3','-'},
{'c','0','=','+'}
};
byte rowPins[ROWS] = { 25, 26, 27, 28 };
byte colPins[COLS] = { 29, 30, 31, 32 };
Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS );
LiquidCrystal lcd(13,8,7,6,5,4);
LiquidCrystal lcd2(53,52,51,50,49,48);

Servo servoMotor1;
Servo servoMotor2;
int servoPositon1=0,servoPositon2=0;
int trigger=11;
int echo=12;
int buzzer=3;
long duration;
int distance;
int greenled=21;
int yellowled=20;
int redled=19;
String password="1234";
String text="";
int count=0;
int i=0;
void setup() {
pinMode(trigger,OUTPUT);
pinMode(echo,INPUT);
pinMode(greenled,OUTPUT);
pinMode(yellowled,OUTPUT);
pinMode(redled,OUTPUT);
```

```
servoMotor1.attach(9);
servoMotor2.attach(10);
lcd.begin(16,2);
lcd.print("Enter Code");
myFile = SD.open("test.txt", FILE_WRITE);
if (myFile) {
Serial.print("Writing to test.txt...");
myFile.println("Test New");
// close the file:
myFile.close();
Serial.println("done.");
}
}
int alertShown=0;
void loop() {

char key=keypad.getKey();
if(key)
{
count++;
text+=key;
if(count>4)
{
lcd.clear();
lcd.print("Wrong Password");
delay(100);
lcd.clear();
text="";
count=0;
}

lcd.clear();
lcd.print(text);
delay(100);
}
if(text==password)
{
if(alertShown==0)
{
lcd.clear();
lcd.print("System  Started!");
delay(1500);
lcd.print("System Has Started!");
alertShown=1;
```

```
lcd.clear();
}

digitalWrite(trigger,LOW);
delayMicroseconds(2);
digitalWrite(trigger,HIGH);
delayMicroseconds(10);
digitalWrite(trigger,LOW);
duration=pulseIn(echo,HIGH);
distance=duration*0.034/2;

if(distance>=530)
{
digitalWrite(greenled,HIGH);
delay(500);
digitalWrite(greenled,LOW);
delay(200);
}
else if(distance>=500 && distance<=530)
{
digitalWrite(yellowled,HIGH);
delay(500);
digitalWrite(yellowled,LOW);
delay(200);

}
else{
digitalWrite(redled,HIGH);
delay(500);
digitalWrite(redled,LOW);
delay(200);
}
lcd.print("Distance ");
lcd.print(distance);
lcd.print("cm");
delay(500);
lcd.clear();


if(i==0 && distance <=500)
{

lcd2.print("Warning!");
delay(1000);
```

```
lcd2.clear();
lcd2.print("Water Level Risen!");
delay(2000);
lcd2.clear();
lcd2.print("Gate Is Closing");
servoTurnOn();
servoMotor1.write(180);
servoMotor2.write(0);
i=2;
lcd2.clear();
noTone(buzzer);
}
if(i==2 && distance >=510)
{
lcd2.print("Water Level Normal");
delay(2000);
lcd2.clear();
lcd2.print("Gate Is Opening");
servoTurnOff();
servoMotor1.write(0);
servoMotor2.write(180);
i=0;
lcd2.clear();
}
}
}
void servoTurnOn()
{
for(servoPositon1=0,servoPositon2=180;servoPositon1<=180,servoPositon2>=0;servoPositon1+
=5,servoPositon2-=5)
{
tone(buzzer,2000);
delay(50);
noTone(buzzer);
delay(150);
servoMotor1.write(servoPositon1);
servoMotor2.write(servoPositon2);

}
}
void servoTurnOff()
{
for(servoPositon1=0,servoPositon2=180;servoPositon1<=180,servoPositon2>=0;servoPositon1+
=1,servoPositon2-=1)
```

```
{
servoMotor1.write(servoPositon2);
servoMotor2.write(servoPositon1);
delay(50);
}
}
```

CODE FOR ARDUINO UNO

```
#include <SPI.h>
#include <SD.h>

File myFile;

int trigger=4;
int echo=7;
long duration;
int distance=0;
int windmeter=A0;
int windspeed=0;
int tempmeter=A3;
float tempValue=0;
void setup() {


pinMode(trigger,OUTPUT);
pinMode(echo,INPUT);
Serial.begin(9600);
while (!Serial) {
;
}

Serial.print("Initializing SD card...");

if (!SD.begin()) {
Serial.println("initialization failed!");
while (1);
}
Serial.println("initialization done.");


myFile = SD.open("test.txt", FILE_WRITE);
```

```
if (myFile) {
Serial.print("Writing to test.txt...");
myFile.println("measure");
// close the file:
myFile.close();
Serial.println("done.");
} else {

Serial.println("error opening test.txt");
}


myFile = SD.open("test.txt");
if (myFile) {
Serial.println("test.txt:");


while (myFile.available()) {
Serial.write(myFile.read());
}

myFile.close();
} else {

Serial.println("error opening test.txt");
}
}

void loop() {
windspeed=analogRead(windmeter);
windspeed=windspeed/25;
tempValue=analogRead(tempmeter);
float milivolt=(tempValue/1024)*5*1000;
float cel=milivolt/10;
cel=cel/20;


digitalWrite(trigger,LOW);
delayMicroseconds(2);
digitalWrite(trigger,HIGH);
delayMicroseconds(10);
digitalWrite(trigger,LOW);
duration=pulseIn(echo,HIGH);
```

```
distance=duration*0.034/2;
myFile = SD.open("test.txt", FILE_WRITE);
if (myFile) {
myFile.print(distance);
myFile.print(" ");
myFile.print(windspeed);
myFile.print(" ");
myFile.print(cel);
myFile.println();
myFile.close();
}
delay(1000);
}
```

MEMBER CONTRIBUTION:

We all are connected in zoom and doing this project. But we personally doing some work and then connect our work through zoom meeting. Here our contribution below-

170204070(Ashiqul Islam):

- Keypad(4 x 3)
- Password Handeling
- Ultrasonic Sensor
- Humidity Sensor(DHT 22)
- Connect Component with Arduino Mega 1280

170204111(Shweta Bhattacharjee):

- LED
- Zone Handling

170204113(Umma Salma Anika):

- Two LCD Display(16 x 2)
- Buzzer

170204115(Sadman Jahin):

- Temperature Sensor(LM35)

- Wind Sensor(Anemometer)
- Arduino UNO R3 Connection
- Two Servo Motor Connection and Coding
- Gate Open close condition handle
- SD Card
- Making Visual Studio Website for **Flood Protector** in ASP.NET MVC

DIFFICULTIES:

Since it is hardware lab and we built this project using Proteus Version 8.9 so, here we use pot to see the level of water in ultrasonic sensor. So, we cannot measure the exact water level . The Arduino Mega in proteus version has some bugs. The Analog pins don't work properly. So We have to bought to different Version of Arduino Modules which serves different options of features. If we had done this on real Arduino Mega then the problems could be handled in single Arduino.

FUTURE WORK:

In future we try to use more accurate sensor to measure the water level like Hydrostatic Pressure Level Sensor instead of Ultrasonic Sensor to measure the water level more accurately .

Furthermore, we try to implement our project in hardware to see the difficulties and problems to implement our flood protector in hardware. Solve all the problems and difficulties and makes our project more better and useful for protect people from upcoming flood.

CONCLUSION:

This is a sample model of *Flood Protector* which any one can be made at home. This project is the solution to help the flood effected people. In town, low area maximum time under water during high tide. We just try to resolve this problem in minimal cost . If our project is a success we try to resolve the difficulties we face first time.