Assignment 5

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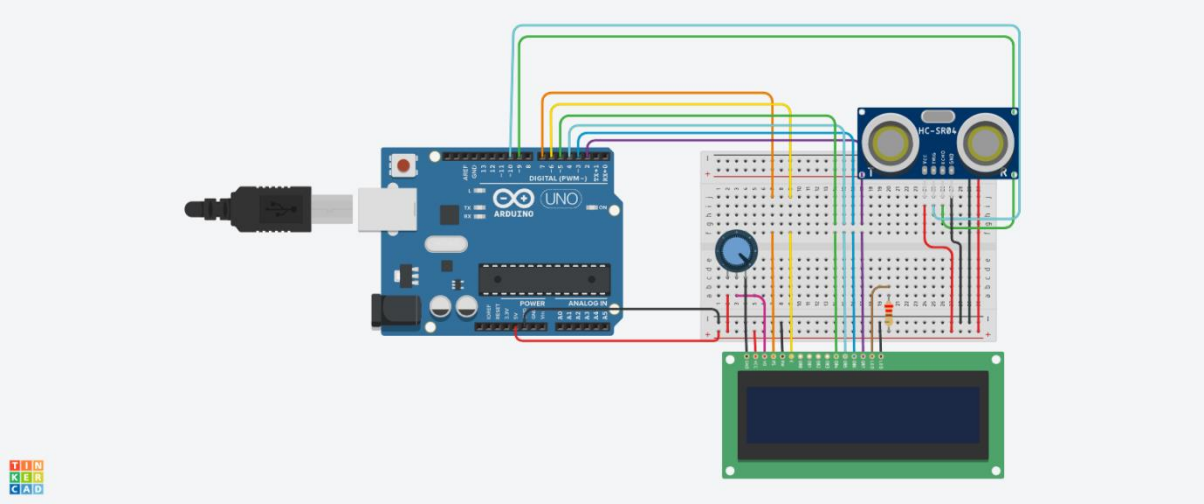
1. Use an ultrasonic sensor to calculate the distance of the obstacle and display the distance on the LCD Display.

https://www.tinkercad.com/things/dIbwugyvbJq-tremendous-snaget-fulffy/editel?sharecode=2vZf86hfhawl2FxcO3jryCG6ZC9xWgWNjbvUY7Hlv3c



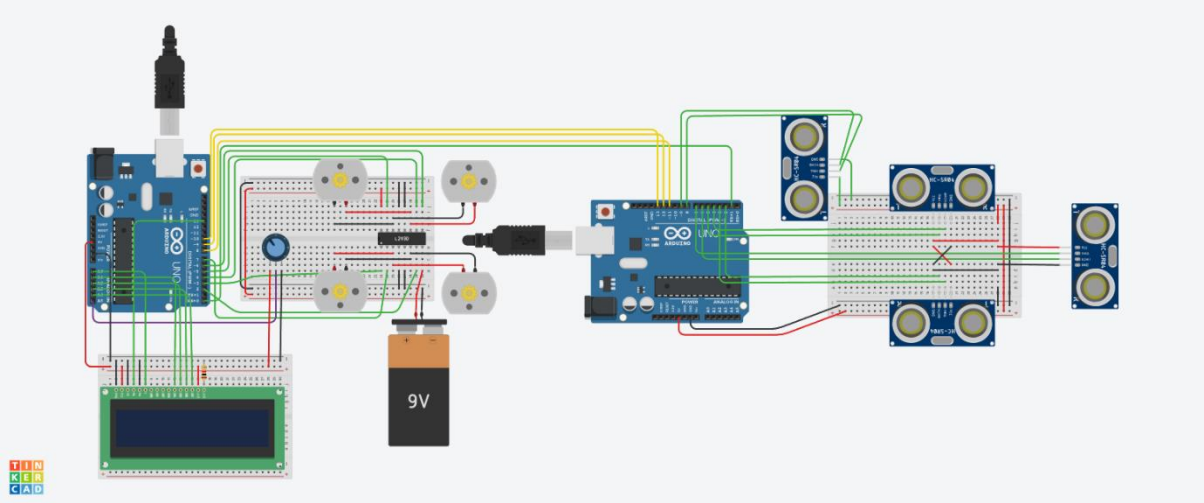
Code:

```
#include <LiquidCrystal.h>

#define ECHO 9

#define TRIGGER 10

#define del 1000

int DURATION;

float DISTANCE;

LiquidCrystal lcd(7, 6, 5, 4, 3, 2);

int num=1;

void setup() {

  pinMode(TRIGGER, OUTPUT);

  pinMode(ECHO, INPUT);
```

```
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.print("Distance : ");
}
void loop() {
  digitalWrite(TRIGGER, HIGH);
  digitalWrite(TRIGGER, LOW);
  DURATION= pulseIn(ECHO,HIGH);
  DISTANCE = 0.01716*DURATION;
  lcd.setCursor(11, 0);
  lcd.print(int(DISTANCE));
  delay(del);
  lcd.setCursor(13,0);
  lcd.print(" cm ");
}
```

2. Assume you have an autonomous bot with 2 Arduino Uno. 1st Uno has 1 LCD Display to display direction and speed and controls 4 wheels using 4 motors controlled via motor driver. 2nd Uno has 4 ultrasonic sensors and a maze-solving algorithm deployed. 2nd Uno receives information about obstacle distance and based on it changes its path to solve the maze. 2nd Uno gives 3 digital and 1 analog output to 1st Uno. Deploy a maze-solving algorithm and simulate this bot. Try to solve as many scenarios as you can think of. The prime focus would be on the algorithms deployed and the approach to the problem.

https://www.tinkercad.com/things/jZHyQizAdZ0-maze-solver/editel?sharecode=QHVlr0k_r0xDrqrPzNWDQ-s9iCXpPCveEjIgjVLIYxQ



Code:

```
// for arduino 1

#include <LiquidCrystal.h>

LiquidCrystal lcd(13,A0,A1,A2,A3,A4);

#define in1 7

#define in2 2

#define in3 4

#define in4 5

#define enA 3

#define enB 6

#define S1 8 // Most Significant

#define S2 9

#define S3 10 // Least Significant
```

```
int s1state;
int s2state;
int s3state;
int potVal=255;
int speed;
void setup(){
Serial.begin(9600);
lcd.begin(16,2);
pinMode(S1, INPUT);
pinMode(S2, INPUT);
pinMode(S3, INPUT);
pinMode(A5, INPUT);
pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
pinMode(in3, OUTPUT);
pinMode(in4, OUTPUT);
pinMode(enA, OUTPUT);
pinMode(enB, OUTPUT);
}
void forward(){
potVal = analogRead(A5);
potVal = map(potVal,0,1023,0,255);
speed = (16530/255)*potVal;
analogWrite(enA, potVal);
analogWrite(enB, potVal);
digitalWrite(in1, HIGH);
digitalWrite(in2, LOW);
digitalWrite(in3, HIGH);
digitalWrite(in4, LOW);
}
void backward(){
```

```
potVal = analogRead(A5);
potVal = map(potVal,0,1023,0,255);
speed = (16530/255)*potVal;
analogWrite(enA, potVal);
analogWrite(enB, potVal);
digitalWrite(in1, LOW);
digitalWrite(in2, HIGH);
digitalWrite(in3, LOW);
digitalWrite(in4, HIGH);
}
void right(){
potVal = analogRead(A5);
potVal = map(potVal,0,1023,0,255);
speed = (16530/255)*potVal;
analogWrite(enA, potVal);
digitalWrite(in1, HIGH);
digitalWrite(in2, LOW);
digitalWrite(in3, LOW);
digitalWrite(in4, LOW);
}
void left(){
potVal = analogRead(A5);
potVal = map(potVal,0,1023,0,255);
speed = (16530/255)*potVal;
analogWrite(enB, potVal);
digitalWrite(in1, LOW);
digitalWrite(in2, LOW);
digitalWrite(in3, HIGH);
digitalWrite(in4, LOW);
}
void loop(){
```

```
delay(100);
s1state = digitalRead(S1);
s2state = digitalRead(S2);
s3state = digitalRead(S3);
if (s1state == 0 && s2state == 0 && s3state == 0){
lcd.setCursor(0,0);
lcd.print("speed(RPM):0 ");
lcd.setCursor(0,1);
lcd.print("STOP ");
analogWrite(enA, 0);
analogWrite(enB, 0);
digitalWrite(in1, LOW);
digitalWrite(in2, LOW);
digitalWrite(in3, LOW);
digitalWrite(in4, LOW);
}
else if (s1state == 0 && s2state == 0 && s3state == 1){
forward();
lcd.setCursor(0,0);
lcd.print("speed(RPM):");
lcd.setCursor(11,0);
lcd.print(" ");
lcd.setCursor(11,0);
lcd.print(speed);
lcd.setCursor(0,1);
lcd.print("Forward ");
}
else if (s1state == 0 && s2state == 1 && s3state == 0)
{
backward();
lcd.setCursor(0,0);
```

```
lcd.print("speed(RPM):");
lcd.setCursor(11,0);
lcd.print(" ");
lcd.setCursor(11,0);
lcd.print(speed);
lcd.setCursor(0,1);
lcd.print("Backward");
}
else if (s1state == 0 && s2state == 1 && s3state == 1){
lcd.setCursor(0,0);
lcd.print("speed(RPM):");
lcd.setCursor(11,0);
lcd.print(" ");
lcd.setCursor(11,0);
lcd.print(speed);
lcd.setCursor(0,1);
lcd.print("Right    ");
right();
}
else if (s1state == 1 && s2state == 0 && s3state == 0){
lcd.setCursor(0,0);
lcd.print("speed(RPM):");
lcd.setCursor(11,0);
lcd.print(" ");
lcd.setCursor(11,0);
lcd.print(speed);
lcd.setCursor(0,1);
lcd.print("Left    ");
left();
}
}
```

```
//for arduino 2
//for arduino 2

int cm;
int t;
int FrontSensor;
int LeftSensor;
int RightSensor;
int BackSensor;
int forwardTriggerPin = 7;
int forwardEchoPin = 6;
int RightTriggerPin = 3;
int RightEchoPin = 2;
int LeftTriggerPin = 5;
int LeftEchoPin = 4;
int BackEchoPin=9;
int BackTriggerPin=8;
void setup()
{
Serial.begin(9600);
pinMode(forwardTriggerPin , OUTPUT);
pinMode(forwardEchoPin, INPUT);
pinMode(RightTriggerPin, OUTPUT);
pinMode(RightEchoPin, INPUT);
pinMode(LeftTriggerPin, OUTPUT);
pinMode(LeftEchoPin, INPUT);
pinMode(BackTriggerPin, OUTPUT);
pinMode(BackEchoPin, INPUT);
for(int i=11; i<=13; i++){
pinMode(i,OUTPUT);
}
```

```
}
int distance(int tx, int rx){
digitalWrite(tx,LOW);
delayMicroseconds(2);
digitalWrite(tx,HIGH);
delayMicroseconds(10);
digitalWrite(tx,LOW);
t = pulseIn(rx,HIGH);
cm = t*0.034/2;
return cm;
}
void direct(){
if (FrontSensor > 300 && RightSensor > 300 && LeftSensor > 300){
forward();
}
else if (FrontSensor > 300 && RightSensor < 300 && LeftSensor < 300){
forward();
}
else if (FrontSensor < 300 && RightSensor < 300 && LeftSensor < 300){
if(BackSensor <300)
stop();
else{
reverse();
delay(500);
if ((LeftSensor) > (RightSensor))
turn_left();
else
turn_right();
}
}
else if (FrontSensor < 300 && RightSensor < 300 && LeftSensor > 300){
```

```
turn_left();
}
else if (FrontSensor < 300 && RightSensor > 300 && LeftSensor < 300){
turn_right();
}
else if (FrontSensor < 300 && RightSensor > 300 && LeftSensor > 300) {
turn_left();
delay(500);
forward();
}
else{
forward();
}
}
void forward(){
digitalWrite(11,LOW);
digitalWrite(12,LOW);
digitalWrite(13,HIGH);
}
void reverse(){
digitalWrite(11,LOW);
digitalWrite(12,HIGH);
digitalWrite(13,LOW);
}
void turn_right(){
digitalWrite(11,LOW);
digitalWrite(13,HIGH);
digitalWrite(12,HIGH);
}
void turn_left(){
digitalWrite(11,HIGH);
```

```
digitalWrite(12,LOW);
digitalWrite(13,LOW);
}
void stop(){
digitalWrite(11,LOW);
digitalWrite(12,LOW);
digitalWrite(13,LOW);
}
void loop(){
LeftSensor = distance(LeftTriggerPin , LeftEchoPin);
RightSensor = distance(RightTriggerPin , RightEchoPin);
FrontSensor = distance(forwardTriggerPin , forwardEchoPin);
BackSensor = distance(BackTriggerPin , BackEchoPin);
direct();
delay(10);
}
```

Approach:

I have used the assignment 4 circuit and integrated 4 ultrasonic Sensor to detect the 4 direction and move the motor accordingly. There are two Arduino Uno: one for motor working and second for the 4 Ultrasonic sensor. An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.