CAR PARKING SYSTEM

Joldeș George, group 2031, semi-group 1

Supervisor: Mircea Giurgiu

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1. The theme

I have chosen my project from the "Hardware and Software Based Project" section. It is indexed with the number 17 and its name is "Microprocessor-based application to control the access of the cars in a parking area".

2. Introduction

In the last few years, a large number of registered vehicles were reported compared to the previous years. The current infrastructure seems unable to deal with the huge influx of cars on the roads.

Therefore, problems such as traffic congestion insufficient parking space inevitably crops up. In Asia, the situation is made worse by the fact that the roads are significantly narrower compared to the West.

Various measures have been taken in the attempt to overcome the traffic problems. One of them is the smart parking area system.

The smart parking system implemented mainly in the Europe, United States and Japan is developed with the incorporation of advanced technologies and researches from various academic disciplines. With its deployment in the car park, it is hoped that it would solve the aforementioned problems faced by the patrons within the car park.

My project is supposed to be a miniature example of a smart parking system, which comes in help of the new area problems, such as infernal traffic and chaotic parking. For this, when the parking area is full, the system shouldn't allow any other car in, to avoid unpleasant situations between the drivers. It also should give the driver enough time to enter the area, by also considering some inconvenient situations.

My circuit incorporates two IR (infrared) sensors. The car has to pass both for the barrier to close. This solves the problem with the time. No matter the time needed for the driver to pass the barrier, it won't close until the sensor transmit to the system that the driver succeeded to enter the area.

Also, my code is made in such a way that the system knows when the parking area is full, so it won't let any other car when this case is meet.

3. Implementation

My circuit uses an LCD 1602 with a I2C adaptor, an Arduino board, two IR sensors, an SG90 Servo Motor and a breadboard.

The LCD is used to display the number of available places. It receives power from the Arduino, and it is controlled through the I2C adaptor. The SDA and SCL pins of the adaptor are connected to the A4 and respectively A5 analog inputs of the Arduino.

Figure 1. 1602 LCD with I2C adaptor

There are two IR sensors, an INPUT one and an OUTPUT one. Those are connected to the 2 and 3 digital inputs of the Arduino. They send signal to the servo, telling it when to open or close, respectively to the triggers that is received from the medium.
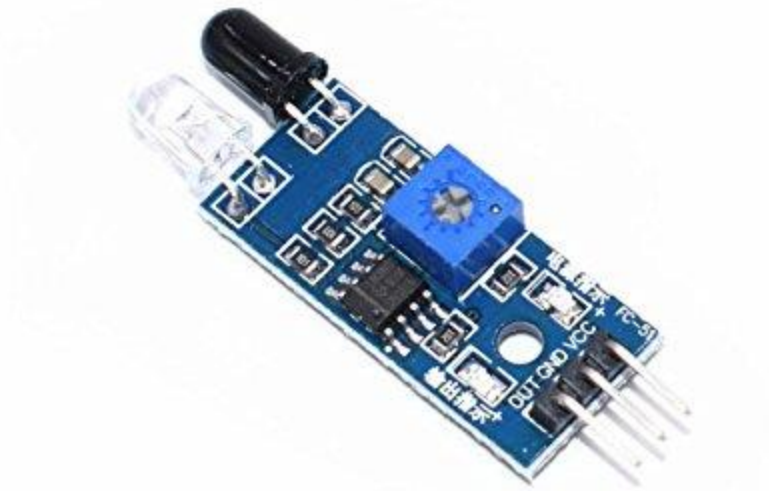
Figure 2. IR sensor module

Figure 3. SG90 Servo Motor

Below you can see the code that I used to control the components.

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27, 2, 1, 0, 4, 5, 6, 7, 3, POSITIVE);

#include <Servo.h> //includes the servo library
```

```
Servo myservo1;

int ir_s1 = 2;//pin for infrared sensor placed at the entry of the parking area (
IR_IN sensor)
int ir_s2 = 4;//pin for infrared sensor placed after the entry of the parking are
a (IR_OUT sensor)

int Total = 5;//in the parking area is enough space only for 5 cars
int Space;//the total space available in the parking area

//setting the flags for the sensors
//i am going to use them to know when a car succeeded to enter the parking area
int flag1 = 0;
int flag2 = 0;

void setup() {
  // put your setup code here, to run once:

pinMode(ir_s1, INPUT);//setting the IR_IN sensor pin as input
pinMode(ir_s2, INPUT);//setting the IR_OUT sensor pin as input

myservo1.attach(3);//specifying the pin for the servo
myservo1.write(100);//the write() funtion places the shaft of the servo at the sp
eified angle

lcd.begin(16, 2);
lcd.backlight();

lcd.setCursor (0,0);//setting the cursor on the first row of the lcd
lcd.print("  Car  Parking  ");//printing the specified text on the first row of t
he lcd
lcd.setCursor (0,1);//setting the cursor on the second row of the lcd
lcd.print("     System     ");//printing the specified text on the second row of
the lcd
delay (2000);//2 seconds delay
lcd.clear();//cleaning the display and setting the cursor in the upper-
left corner

Space = Total;//the current space available is 5 places
}

void loop() {
  // put your main code here, to run repeatedly:
```

```arduino
if(digitalRead(ir_s1) == LOW && flag1 == 0)//in case someone tries to enter the p
arking area
{
  if(Space>0)//in case there is space available
  {
    flag1=1;//setting the flag to 1 to know that someone tries to enter
    if(flag2==0)//condition to know that nobody passed the second sensor
    {
      myservo1.write(0);//opening the gate
      Space = Space-1;//decrementing the total space available
    }
  }
  else//in case the there is no more space available
  {
    lcd.setCursor (0,0);//setting the cursor on the first row of the lcd
    lcd.print(" Sorry not Space ");//printing the specified text on the first row
 of the lcd
    lcd.setCursor (0,1);//setting the cursor on the second row of the lcd
    lcd.print("    Available    ");//printing the specified text on the second ro
w of the lcd
    delay (1000);//1 second delay
    lcd.clear();//cleaning the display and setting the cursor in the upper-
left corner
  }
}

if(digitalRead(ir_s2) == LOW && flag2 == 0)//condition to knot if someone tries t
o exit the parking area
{
  flag2=1;
  if(flag1==0)
  {
    myservo1.write(0);
    Space = Space+1;//incrementing the total space available
  }
}

if(flag1==1 && flag2==1)//if to reset the values of the flags
{
  delay (1000);
  myservo1.write(100);
  flag1=0, flag2=0;
}

lcd.setCursor (0,0);//setting the cursor on the first row of the lcd
```

```
lcd.print("Total Space: ");//printing the specified text on the first row of the
lcd
lcd.print(Total);//displaying the total space available

lcd.setCursor (0,1);//setting the cursor on the second row of the lcd
lcd.print("Have  Space: ");//printing the specified text on the second row of the
 lcd
lcd.print(Space);//displaying the available space in the parking area

}
```

4. Conclusion

In conclusion, I succeeded in making a smart parking system, so I succeeded in making the world a better place=)). Parking systems like this one are used all over the world to solve traffic issues. I had a very good time implementing the circuit and I learned how to use new types of sensors (new for me).

To sum it up, I believe that this project was all to my benefit, and that I developed some new skills which are going to help me in the next projects. I also learned how to sold components and pins (I had to sold myself the pins for the LCD), which is an essential skill as an engineer.

5. Bibliography

[1] researchgate.net

https://www.researchgate.net/publication/320356747_Design_and_Implementation_of_Smart_Car_Parking_System

[2] project hub

https://create.arduino.cc/projecthub/embeddedlab786/car-parking-system-ef9fc1