AIM

To construct a miniature automatic car parking system

(using arduino and some basic electronic components)

Made By : CHIRAG JAIN

OVERVIEW

The main purpose of this project is to optimize the parking facilities and decrease the time spent manually searching for the optimal parking floor, lane and even lot.

- There is a LCD display to show the number of remaining spaces in the parking lot. (The system will also preserve this value, in case of any short time power failure, in EEPROM)

- When a car wants to enter or exit the lot, the barrier gate would automatically open and the figures on LCD would be updated accordingly.

- If there is no space left in the parking lot then, a 'SORRY' message would be displayed and the barrier gate wouldn't open.

MATERIALS REQUIRED

1. LCD DISPLAY (16×2)
2. 2 INFRARED SENSOR MODULES
3. BREADBOARD
4. MICROCONTROLLER
5. SERVO MOTOR
6. MALE TO MALE WIRES
7. FEMALE TO FEMALE WIRES
8. 5V DC SUPPLY

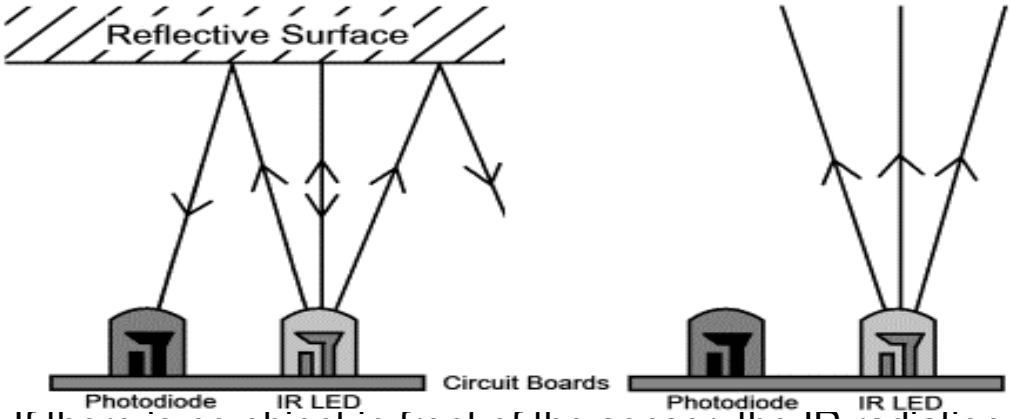
COMPONENTS DESCRIPTION

1. Digital Proximity IR Sensor:

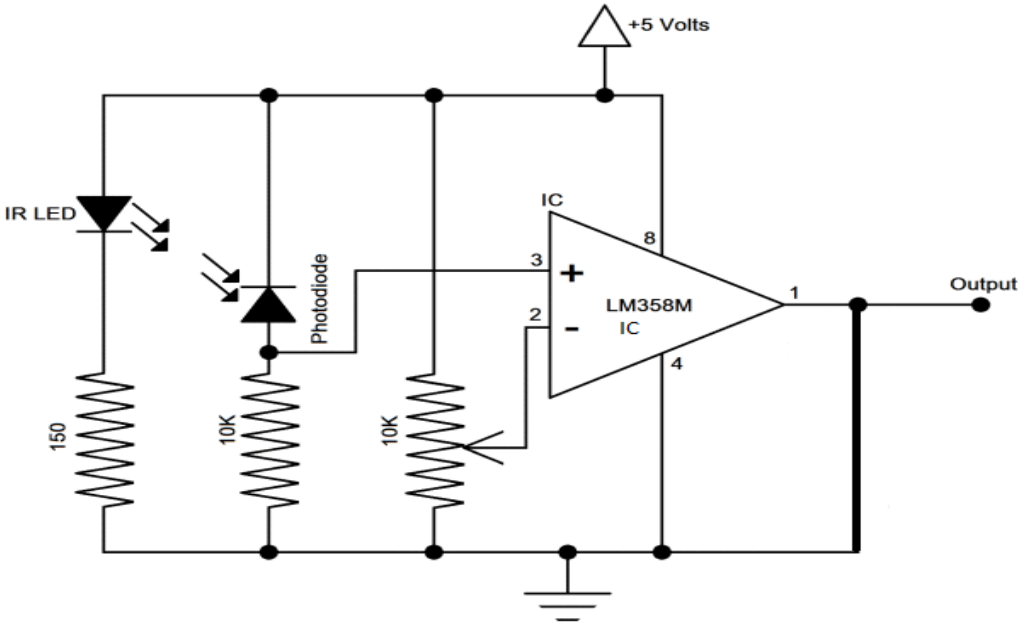
- It is a device used to detect objects and obstacles in front of sensor.
- It consists of-

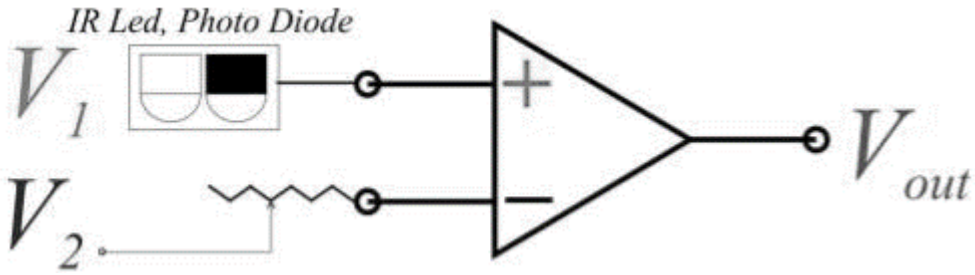
(i) IR LED (transmitter) (ii) Photodiode (receiver)

(iii) LM-358M IC (comparator and amplifier) (iv) Potentiometer



- If there is no object in front of the sensor, the IR radiation would be emitted in a straight direction and wouldn't be detected by the photodiode.
- If an object is placed in front of the sensor, a part of the IR radiation would be reflected and detected by the photodiode.
- To send the output in the digital form to our microcontroller, we require a LM-358 IC (integrated circuit).
- This IC compares the voltage drop V_1across the 10 k resistor (in series with photodiode) and that across variable resistor (10k potentiometer) called Threshold voltage V_2.





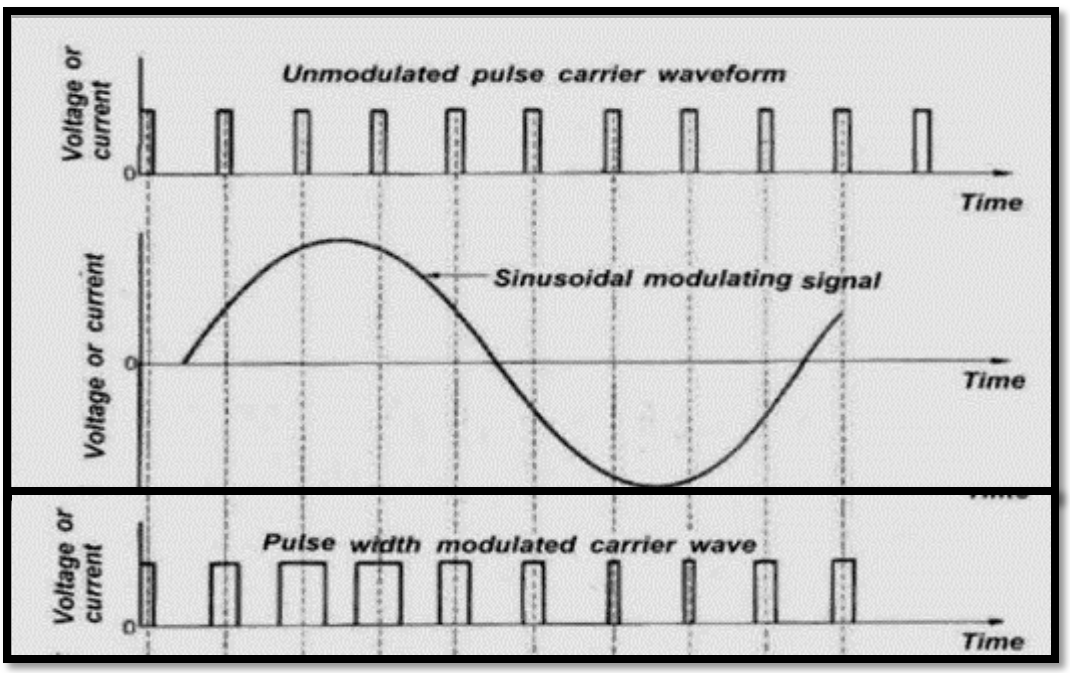
$$V_{out} = \begin{cases} V_{cc}\,(+5V) & V_1 > V_2 \\ GND\,(0\ V) & V_1 < V_2 \end{cases}$$

- When IR radiation is detected by photodiode, voltage drop V_1 increases (in accordance with Ohm's law, V= IR) and $V_1 > V_2$, so the IC gives a "HIGH" output (here, +5V).
- When no IR radiation is detected by photodiode, voltage drop $V_1 < V_2$, so the IC gives a "LOW" output (0V).
- The voltage drop V_2 at the potentiometer can be adjusted by rotating its knob. Higher the value of V_2 , less sensitive the sensor is and vice-verca

2. Servo motor:

- It is a DC motor that allows for precise control of angular position rather than rotating continuously.
- It receives a control signal that represents a desired output position of the servo shaft and applies power to the motor until its shaft turns to that position.
- The position of a servo motor is controlled using the PWM (Pulse Width Modulation) technique in which the width of the pulse applied to the motor is varied and sent for a fixed amount of time.
- The pulse width determines the angular position of the servo motor.

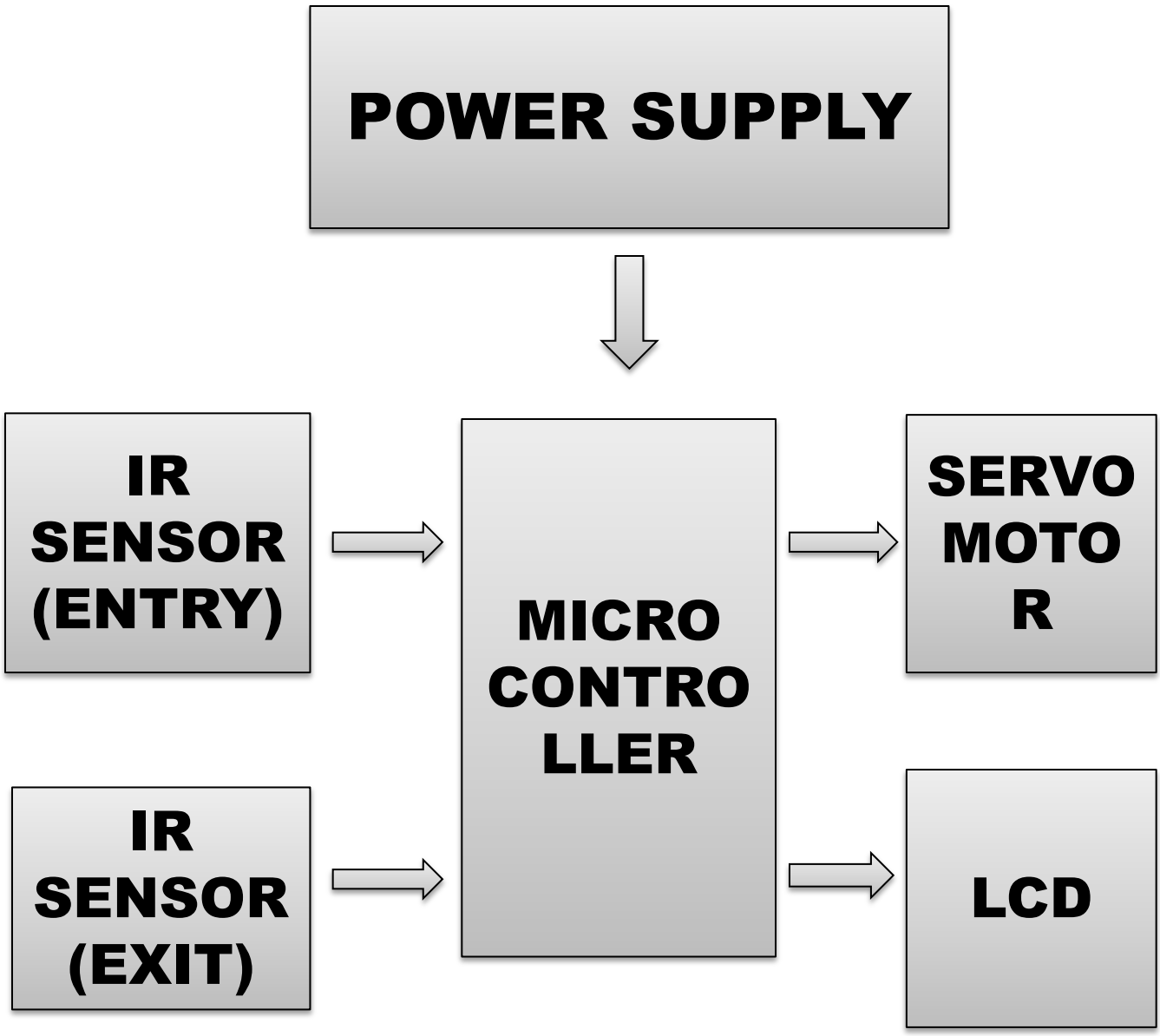
For example, a pulse width of 1 ms causes an angular position of 0 degree and that of 2 ms causes an angular position of 180 degrees.



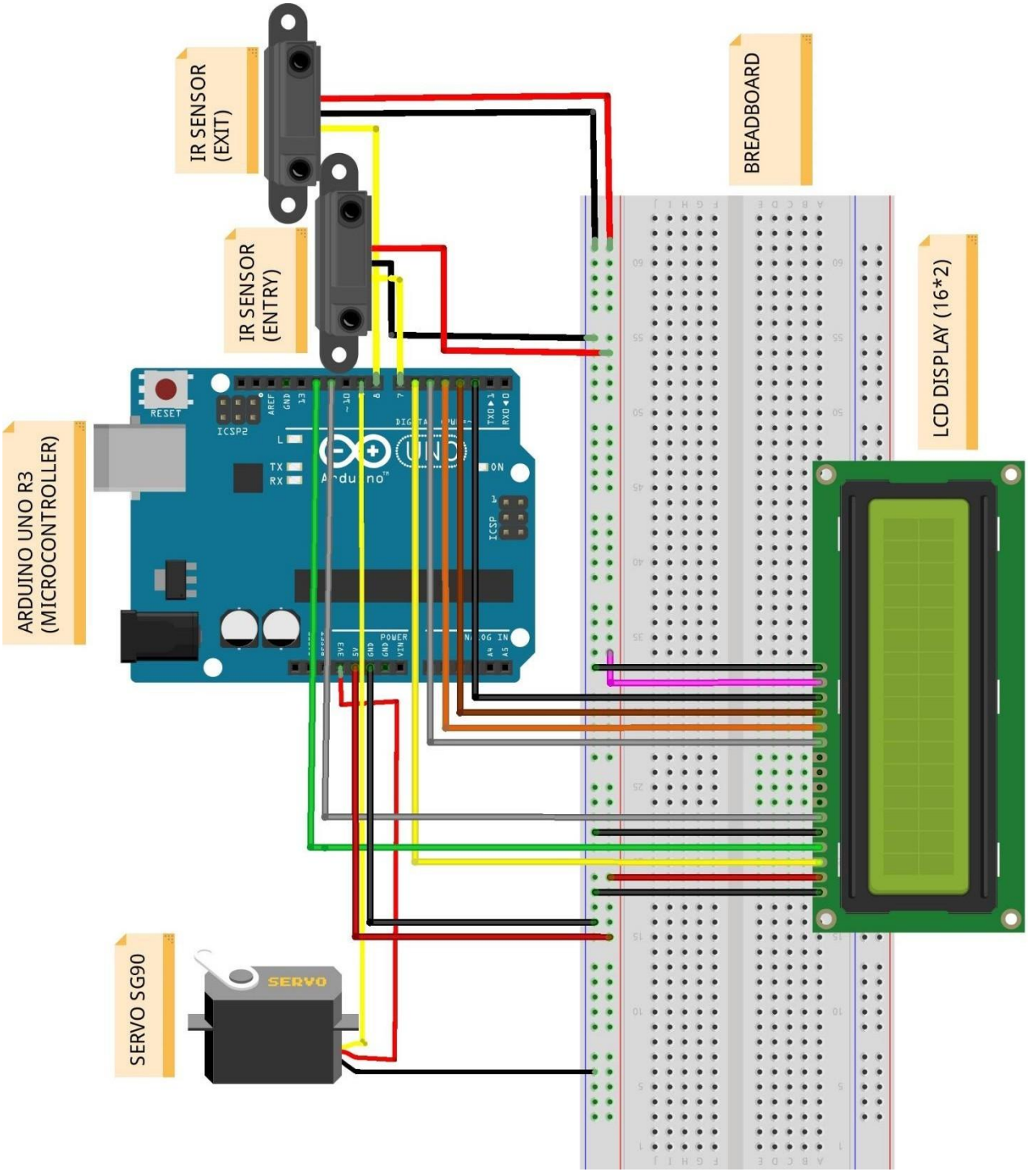
3. Microcontroller:

- It consists of a physical programmable circuit board with both digital and analogue input/output pins on a single IC (integrated circuit).

BLOCK DIAGRAM



CIRCUIT DIAGRAM



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WORKING

- The IR sensors continuously sense the presence of any obstacle (car in our case) and initially, the lot is empty i.e. has space left for 8 cars.

- If the entry sensor sense one car, it informs the controller so that it can decrement the space count by 1 and send pulse to Servo to rotate by 90 degrees, so as to open the barrier gate.
- At the same time, it gives a delay of 2.5 sec so that the car can cross the exit sensor and the count is maintained correctly.

- When a car exits, the exit sensor informs the controller to increment the space count by 1 and send pulse to the servo to open the barrier gate. Similarly, again a delay of 2.5 sec is given to maintain the count properly.

- The number of spaces left is continuously updated in EEPROM and also displayed by the LCD.

- If at an instance, there is no space left in the parking lot and a car is sensed by the entry sensor, then the barrier gate is not opened and instead, a 'SORRY' message is displayed on the LCD

PRECAUTIONS

- Connections should be neat, clean and tight.
- While making the connection of LED make sure that it is not connected in reverse bias otherwise, it may get damaged.
- The range of IR sensors must be adjusted properly using the potentiometer.
- While completing the circuit, different coloured cables shall be used for different connections so that connections are done accurately and any fault in the circuit can be easily identified.

CONCLUSION AND SCOPE

- As the global population continues to grow and urbanize, it is vital to implement a well-planned , convenient and efficient parking solution.

- The implementation of a smart parking solution would be surely a great investment for any city government or company.

- While implementing on a higher level, this system can be made more efficient by using sensors at every spot as this would help to display the exact empty location on the entrance LCD of every lane. Also, this will help to calculate the exact timing for which a car is parked and calculate the parking charges accordingly.

ADVANTAGES

- Increased Safety – This system reduces the spot-searching traffic on the streets and the accidents caused by distraction of searching for parking.

- Reduced Pollution – Searching for parking burns around million barrels of oil a day. So, such an automated parking system will significantly lower the amount of daily vehicle emissions and ultimately reduce pollution.
- Economic – This system uses low-cost sensors and servo. Also, more automation and less manual labour will save on labour cost.