SMART CAR PARKING SYSTEM USING ARDUINO

MINI PROJECT REPORT

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In partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

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BONAFIDE RECORD OF WORK DONE BY

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Faculty guide	Head of the Department
Mr.G ARUN FRANCIS M.E.,(Ph.D)	**Dr.P KARTHIGAIKUMAR M.E.,Ph.D.**

Certified that the candidate was examined in the viva-voce examination held on ……………………………......

……………………………......

(Internal Examiner)

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ABSTRACT

Smart car parking project aims at providing a confusion free and easy parking. This project helps the drivers of the cars to park their vehicles with minimum wastage of time with accurate information of the availability of the space to park It includes an Arduino Uno as the microcontroller unit to which the servo motors, LCD display ultrasonic sensors (HC-05) are interfaced. The LCD displays the availability of the space, the ultrasonic sensors keeps the check of the number of cars entering and exiting the parking space. The ultrasonic sensors detect the availability of the parking space. An automated car parking system is a process through which car parking can be done more efficiently and easily than manual method. The system will provide the user better services. The system counts the number of cars in the garage and checks if there's any vacancy. There's an entry and exit path. When vehicle enters, the display shows the number of cars inside. When any vehicle leaves, the count decreases and shown on display. If the garage is full. The display will show a message regarding that.

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CHAPTER 1

1.INTRODUCTION

This smart parking system project consists of Arduino, six IR sensors, one servo motor, and one LCD display. Where the Arduino is the main microcontroller that controls the whole system. Two IR sensors are used at the entry and exit gates to detect vehicle entry and exit in the parking area. And other four IR sensors are used to detect the parking slot availability. The servo motor is placed at the entry and exit gate that is used to open and close the gates. Also, an LCD display is placed at the entrance, which is used to show the availability of parking slots in the parking area

OBJECTIVE AND GOAL OF THE PROJECT

Our Parking Management System will ease people's task of finding safe parking spots in real time. The system helps an individual to pre-book the parking spot from the distant area, reducing traffic congestion and allowing a user to know the availability of parking space in advance.

Our parking management solution can significantly offer benefit to both the user and the parking lot owner as it helps in reducing traffic by enhancing user experience. This system supports various parking applications that can easily handle and organize the data of vehicles. To rectify the complications of parking security, our parking management system allows to recognize and validate the automobiles at both entry and exit points.

Since we believe that every parking management system is unique, one may require customized parking management systems in order to achieve optimal operation and we provide a custom parking management solution as per your requirements in designing entries and exits, traffic flow, payment systems, and access management.

1.1 OBJECTIVES

- The main objective of this work is to control the traffic jam.
- As well saving human’s life is major purpose.
- To save the life and reduce the accident.

1.2 PROBLEM STATEMENT

Knowing when and how much accident happen in daily life.The invention that is proposed offers us in all senses a clear advantage over the traditional parking system, which are located on our public roads with cement or derived substances, though it also permits the adaptation of these..

1.3 MOTIVATION

When a vehicle arrives at the gate of the parking area, the display continuously shows the number of empty slots. If there have any empty slots then the system opens the entry gate by the servo motor. After entering the car into the parking area, when it will occupy a slot, then the display shows this slot is full.If there is no empty parking slot then the system displays all slots are full and does not open the gate.

1.4 CHALLENGES

It allows Local Councils not to have their streets completely unused because there is a pedestrian crossing in them. If a Local Council with present-days parking is interested in having a sports event pass along that road (cycle race or any kind of vehicle race, etc.), then it either has to seek alternative routes, or make costly modifications, or simply not hold the race. With this product it is very easy to solve this problem for a street or avenue and, once the event has finished, the crossings are again installed so that they can carry on performing

2.REQUIRED COMPONENTS

To implement this project we are using an IR sensor,Servo, jumper wires and Arduino board as our main components. Details of various components is given below.

2.1ARDUINO BOARD

Arduino is an easy-to-use open platform to create electronics projects. Arduino boards play a vital role in creating different projects. It makes electronics accessible to non- engineers, hobbyists, etc.

The various components present on the Arduino boards are **Microcontroller, Digital**

Input/output pins, USB Interface and Connector, Analog Pins, Reset Button, Power button, LED's, Crystal Oscillator, and **Voltage Regulator**. Some components may differ depending on the type of board.

The most standard and popular board used over time is **Arduino UNO**. The ATmega328 Microcontroller present on the UNO board makes it rather powerful than other boards. There are various types of Arduino boards used for different purposes and projects. The Arduino Boards are organized using the Arduino (IDE), which can run on various platforms. Here, IDE stands for Integrated Development Environment. The Arduino is simple for beginners and makes it more flexible for advanced users. It can be easily executed on Linux, Mac, and Windows and it is budget-friendly, which is available as minimum price scientific components. Even the architects and designers have attractive and interactive prototypes and make the user easy to install and make their product more standard and better. Arduino is a fundamental tool to explore new things that have the ability to understand and obey the user’s concept through a simple set of instructions.

ARDUINO UNO

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-CircuitSerialProgramming) header.

It is the most used and of standard form from the list of all available Arduino Boards. It is also recommended for beginners as it is easy to use.

For internal functioning & processing Microcontroller, 8051 comes with integrated builti RAM. is prime memory and is employed for storing temporary data. It isan unpredictable memory i.e. its data can get be lost when the power supply to the Microcontroller switched OFF. This microcontroller is very simple to use, affordableless computing power, simple architecture & instruction set

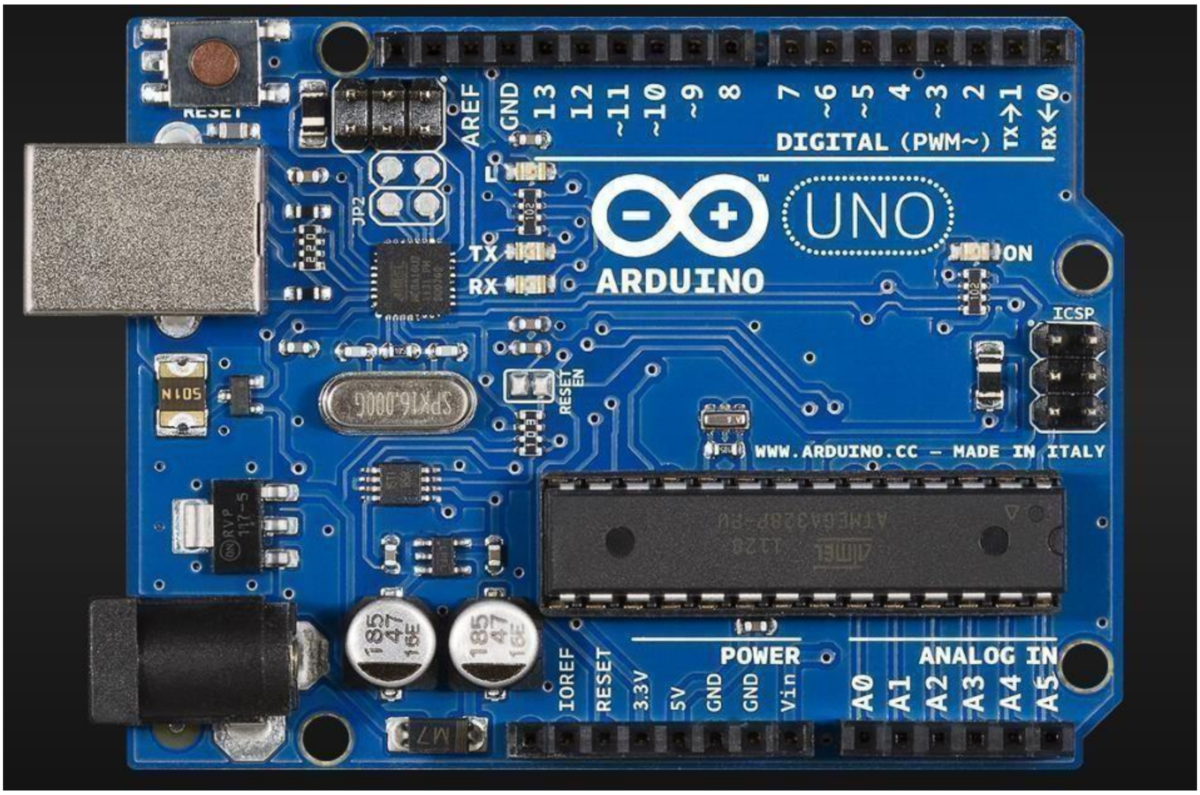


Fig 1 Arduino UNO

2.2 ARCHITECTURE OF ARDUINO BOARD

The Arduino uno architecture is shown below. Let’s have a closer look at the featuresofthe Arduino uno design It consists of 14-digital i/o pins. Wherein 6 pins are used as pulse width modulation o/ps and 6 analog i/ps, a USB connection, a power jack, a 16MHz crystal oscillator, a reset button, and an ICSP header. Arduino board can be powered either from the personal computer through a USB or external source like a battery or an adaptor. This board can operate with an external supply of 7-12V by giving voltage reference through the IORef pin or through the pin Vin.

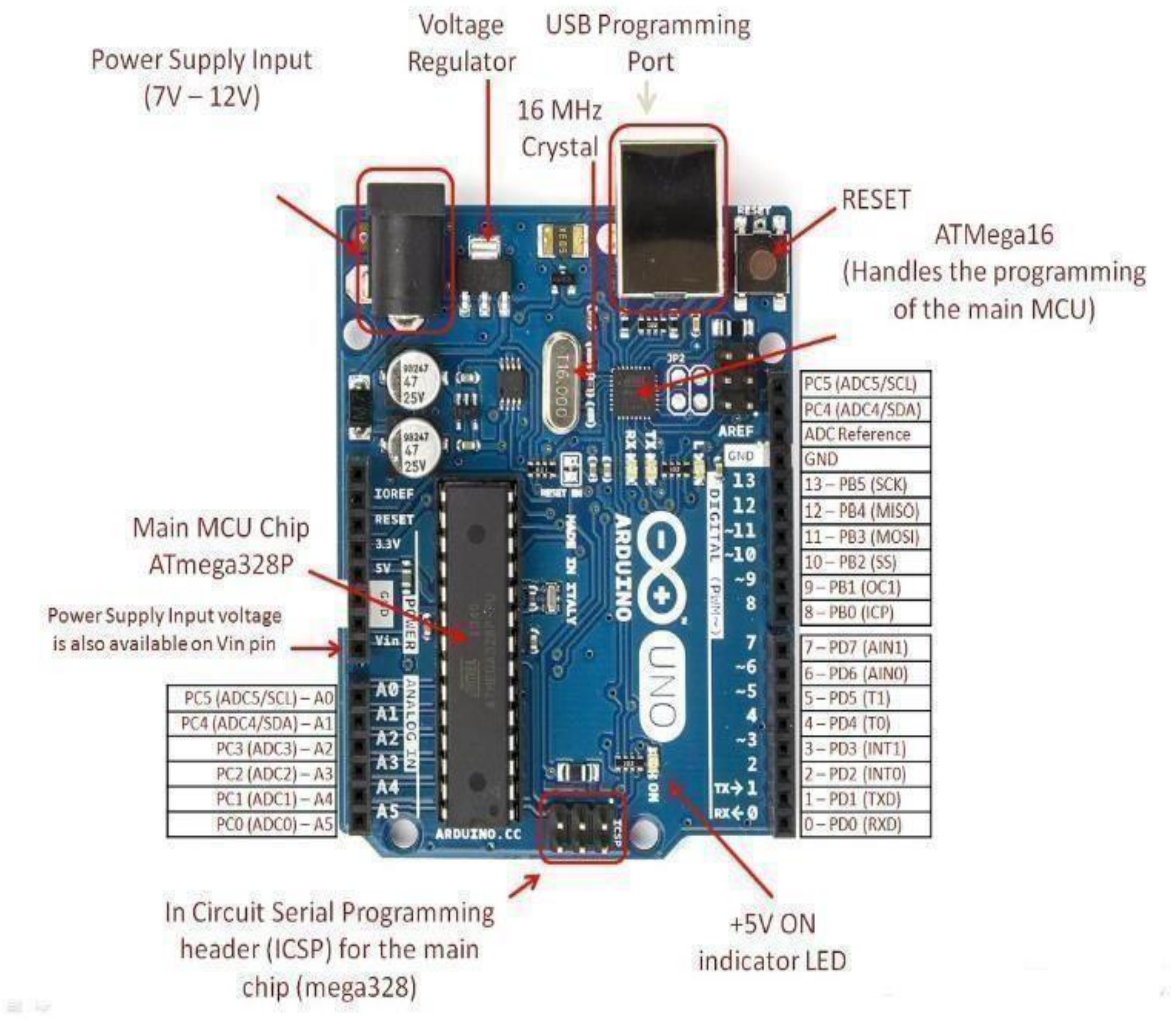


Fig 2 Architecture of Arduino board

COMPENTS OF ARDUNIO BOARD

- **ATmega328 Microcontroller**- It is a single chip Microcontroller of the ATmel family. The processor code inside it is of 8-bit. It combines **Memory , Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.**
- **ICSP pin -** The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- **Power LED Indicator**- The ON status of LED shows the power is activated. Whenthe power is OFF, the LED will not light up.
- **Digital I/O pins**- The digital pins have the value HIGH or LOW. The pins numbered fromD0 to D13 are digital pins.
- **TX and RX LED's-** The successful flow of data is represented by the lighting of these LED's.
- **AREF-** The Analog Reference (AREF) pin is used to feed a reference voltage to theArduino UNO board from the external power supply.
- **Reset button**- It is used to add a Reset button to the connection.
- **USB**- It allows the board to connect to the computer. It is essential for theprogrammingof the Arduino UNO board.
- **Crystal Oscillator**- The Crystal oscillator has a frequency of 16MHz, whichmakes theArduino UNO a powerful board.
- **Voltage Regulator**- The voltage regulator converts the input voltage to 5V.
- **GND**- Ground pins. The ground pin acts as a pin with zero voltage.
- **Vin**- It is the input voltage.
- **Analog Pins**- The pins numbered from A0 to A5 are analog pins. The function of Analogpins is to read the analog sensor used in the connection. It can also act as **GPIO (GeneralPurpose Input Output) pins.**

Technical Specifications of Arduino UNO

The technical specifications of the Arduino UNO are listed below:

- There are 20 Input/Output pins present on the Arduino UNO board. These 20 pinsinclude 6 PWM pins, 6 analog pins, and 8 digital I/O pins.
- The PWM pins are Pulse Width Modulation capable pins.
- The crystal oscillator present in Arduino UNO comes with a frequency of 16MHz.
- It also has a Arduino integrated WiFi module. Such Arduino UNO board is basedonthe Integrated WiFi ESP8266 Module and ATmega328P microcontroller.
- The input voltage of the UNO board varies from 7V to 20V.
- Arduino UNO automatically draws power from the external power supply. It canalso draw power from the USB.

Arduino UNO starting progress

Arduino UNO can be program using the Arduino IDE. The Arduino IDE is theIntegral Development program, which is common to all the boards.

Use Arduino Web Editor, which allows to upload sketches and write the code from our web browser (Google Chrome recommended) to any Arduino Board. This is an online platform.

The USB connection is essential to connect the computer with the board. After the connection,the PWR pins will light in green. It is a green power LED.

The steps to get started with Arduino UNO are listed below:

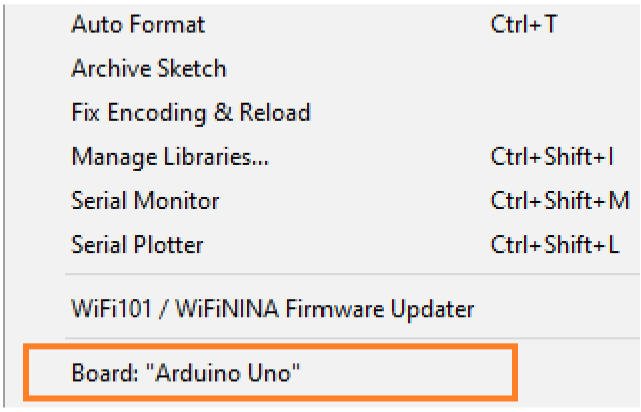
Install the **drivers** of the board.

As soon we connect the board to the computer, Windows from XP to 10 willautomaticallyinstall the board drivers.

But, if you have expanded or downloaded the zip package, follow the below steps:

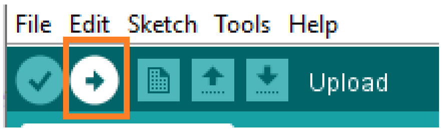
1. Click on **Start** -> **Control Panel** -> **System and Security**.
2. Click on **System** -> **Device Manager** -> **Ports (COM &LPT)** -> **Arduino UNO(COMxx)**. If the COM &LPT is absent, look **Other Devices** -> **UnknownDevice**.
3. Right-click to **Arduino UNO (COmxx)** -> **Update Driver Software** -> **Browsemycomputer for driver software.**
4. Select the file "**inf**" to navigate else, select "**ArduinoUNO.inf**" .
5. Installation Finished.

- Open the code or sketch written in the Arduino software.


Auto Format Ctrl+T
Archive Sketch
Fix Encoding & Reload
Manage Libraries... Ctrl+Shift+I
Serial Monitor Ctrl+Shift+M
Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "Arduino Uno"

- Select the port. Click on the **Tools -> Port**.The port likely will be **COM3** or higher. For example, **COM6**, etc. The **COM1** and **COM2** portswill not appear, because these two ports are reserved for the hardware serial ports.
- Now, **upload** and **run** the written code or sketch.

To upload and run, click on the button present on the top panel of the Arduino display,asshown below:



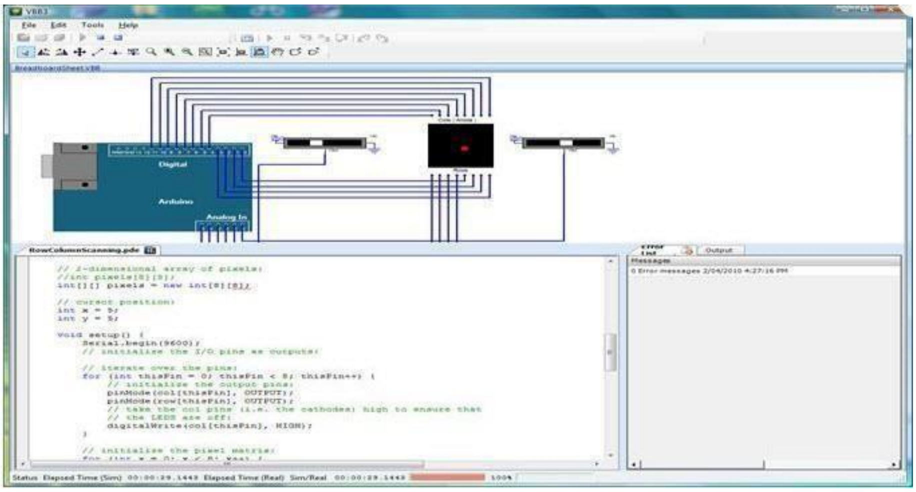
Within the few seconds after the compile and run of code or sketch, the RX and TX lightpresenton the Arduino board will flash.

The '**Done Uploading**' message will appear after the code is successfully uploaded.The message will be visible in the status bar.

PROCEDURE FOR PROGRAMMING ARDUINO

The main advantage of the Arduino technology is, you can directly load the programs intothe device without the need of a hardware programmer to burn the program. This is donebecause of the presence of the 0.5KB of boot loader, that allows the program tobe dumped into the circuit. The Arduino tool window contains a toolbar with a various buttons like new, open, verify, upload and serial monitor. And additionally it comprisesof a text editor(employed to write the code), a message space (displays the feedback) like showing the errors, the text console, that displays the o/p & a series of menus just like the file, tool menu & edit.

ARDUINO PROGRAM



```
// 2-dimensional array of pixels:
//int pixels[8][8];
int[][] pixels = new int[8][8];

// cursor position:
int x = 5;
int y = 5;

void setup() {
    Serial.begin(9600);
    // initialize the I/O pins as outputs:

    // iterate over the pins:
    for (int thisPin = 0; thisPin < 8; thisPin++) {
        // initialize the output pins:
        pinMode(col[thisPin], OUTPUT);
        pinMode(row[thisPin], OUTPUT);
        // take the col pins (i.e. the cathodes) high to ensure that
        // the LEDS are off:
        digitalWrite(col[thisPin], HIGH);
    }

    // initialize the pixel matrix:
    for (int x = 0; x < 8; x++) {
```

0 Error messages 2/04/2010 4:27:16 PM

Status Elapsed Time (Sim) 00:00:29.1443 Elapsed Time (Real) Sim/Real 00:00:29.1443 100%

Fig.3 Arduino Program

Programming into the Arduino board is called as sketches. Each sketch contains ofthree parts such as Variables Declaration, Initialization and Control code. Where, Initialization is written in the setup function and Control code is written in the loopfunction.

I’he sketch is saved and any operation like opening a sketch, verifying and saving can be done using the tool menu.

1’he sketch must be stored in the sketchbook directory.

Select the suitable board from the serial port numbers and tools menu.

Select the tools menu and click on the upload button, then the boot loader uploadsthe code on the microcontroller.

ADVANTAGES OF ARDUINO TECHNOLOGY

- It is cheap
- It comes with an open supply hardware feature that permits users to develop their own kit
- The software of the Arduino is well-suited with all kinds of in operationsystems like Linux, Windows, and Macintosh, etc.
- It also comes with open supply software system feature that permits tough software system developers to use the Arduino code to merge withthe prevailing programing language libraries and may be extended and changed.
- For beg
- inners, it is very simple to use.

2.3 IR SENSOR

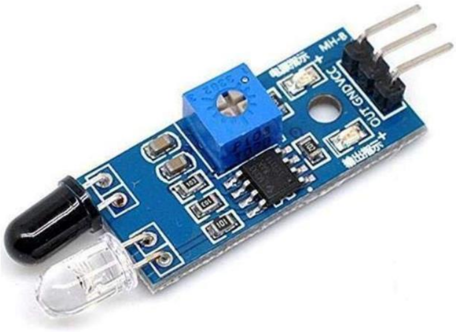


Fig.4 IR sensor

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).

PRINCIPLE OF OPERATION

An infrared sensor includes two parts namely the emitter & the receiver (transmitter & receiver), so this is jointly called an optocoupler or a photo-coupler. Here, IR LED is used as an emitter whereas the IR photodiode is used as a receiver. The photodiode used in this is very sensitive to the infrared light generated through an infrared LED. The resistance of photodiode & output voltage can be changed in proportion to the infrared light obtained. This is the fundamental IR sensor working principle.

2.4 SERVO MOTOR

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism. If motor is powered by a DC power supply then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor.

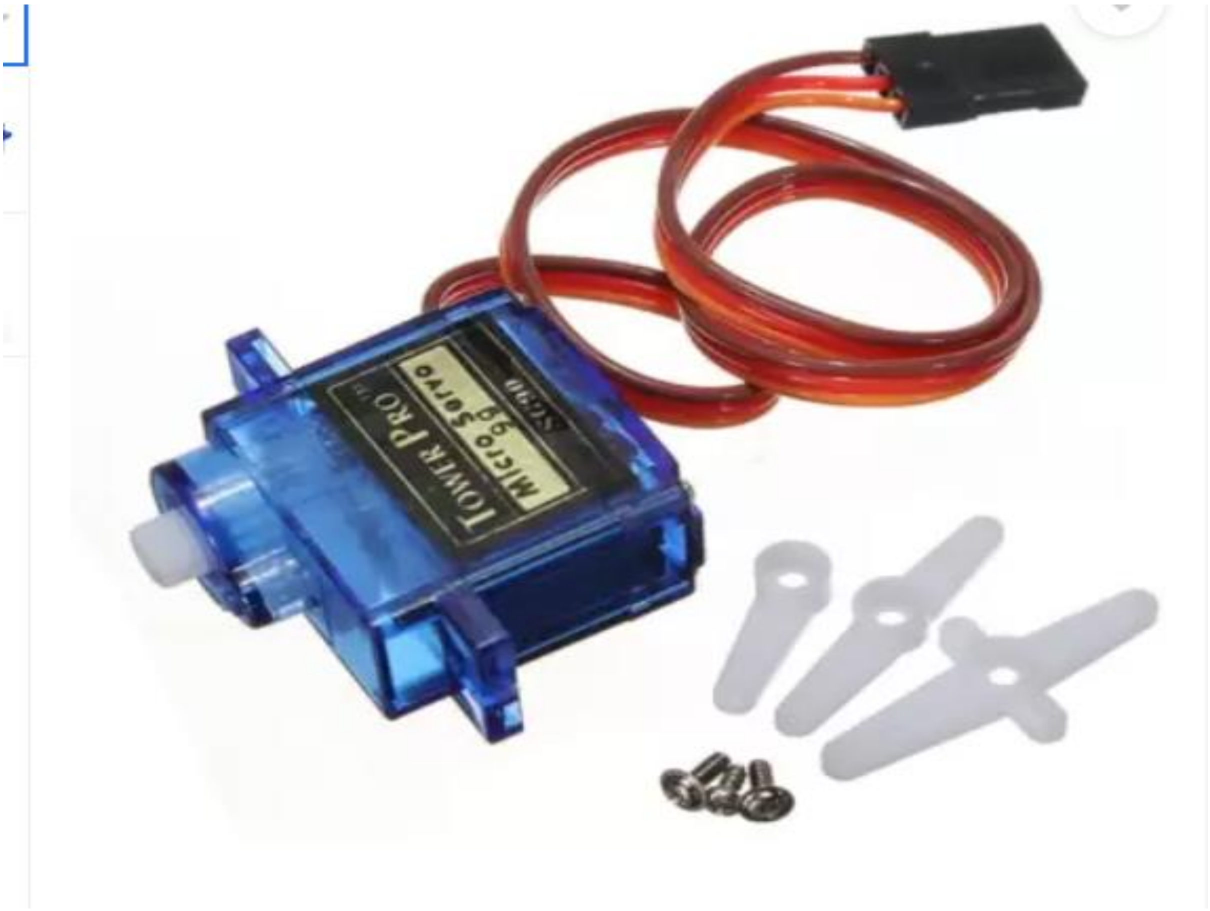


Fig.5 servomotor

JUMPER WIRES

Jumper wires are simply wires that have connector pins at each end, allowingthem to be used to connect two points to each other without soldering. Jumper wires are typically used with bread boards and other prototyping tools in order to make it easy to change a circuit as needed.

Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power.

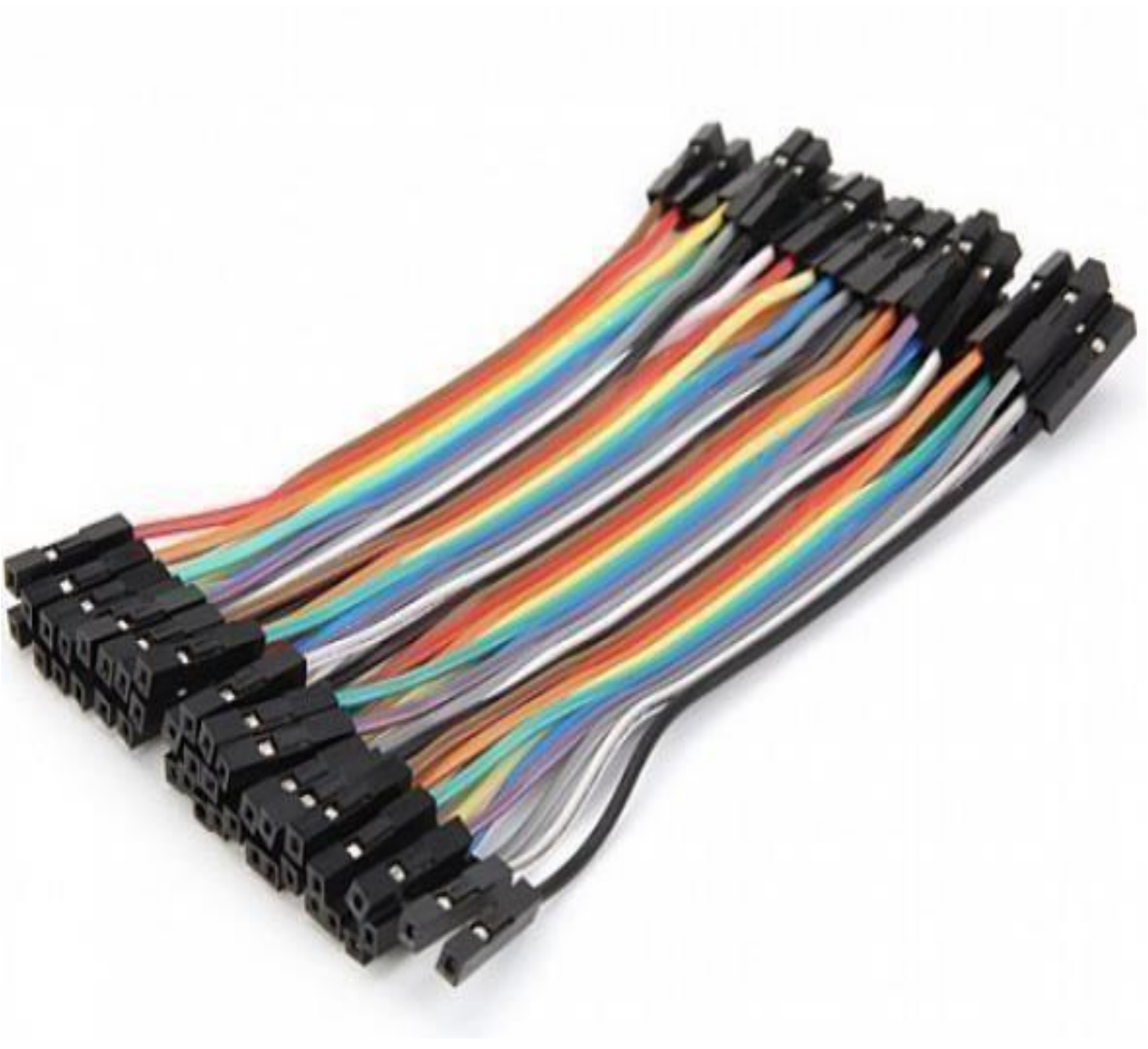


Fig.6 Jumper wires

3.BLOCK DIAGRAM

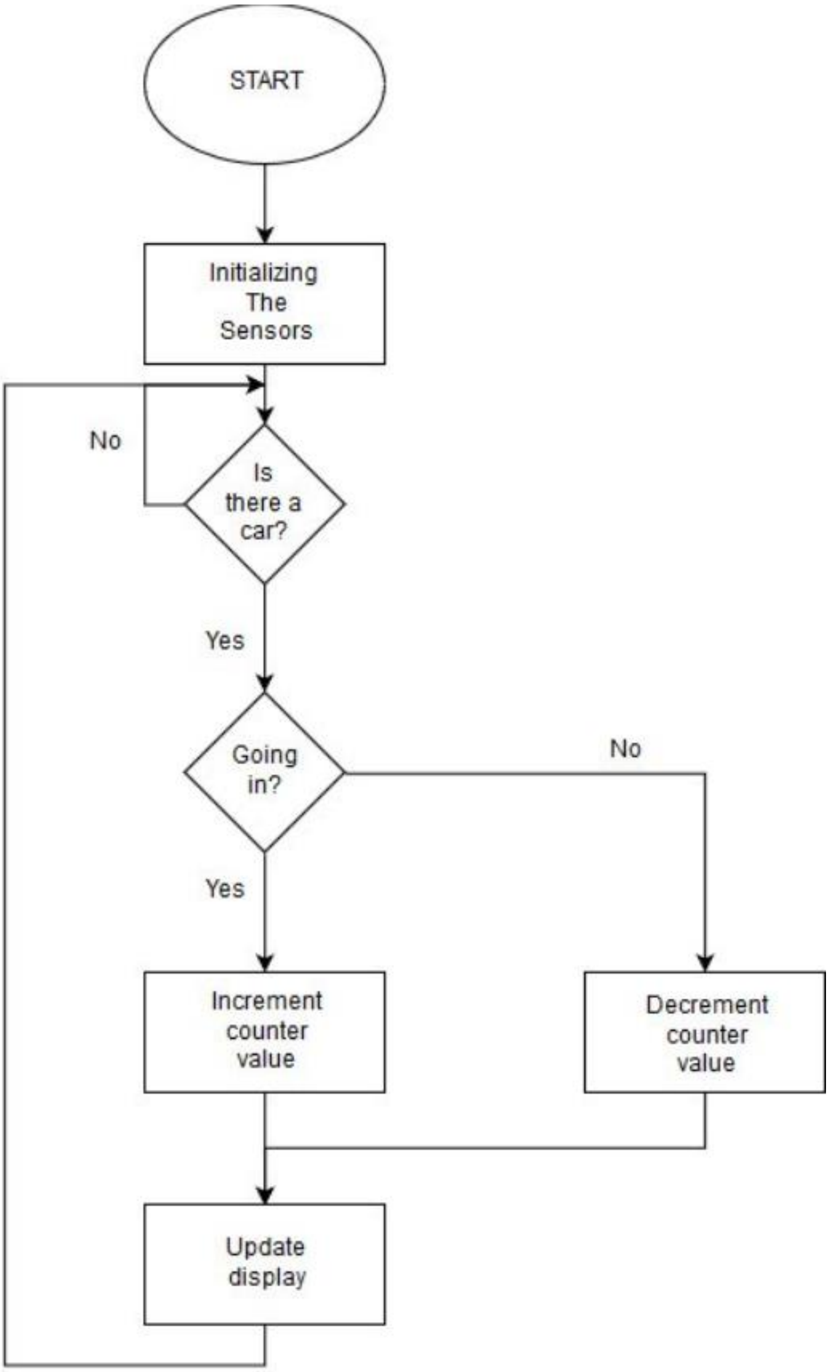


Fig.7 Block Diagram

4.ASSEMBLY LANGUAGE PROGRAM

```
#include <Servo.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);

Servo myservo;

#define ir_enter 2
#define ir_back  4

#define ir_car1 5
#define ir_car2 6
#define ir_car3 7
#define ir_car4 8



int S1 = 0, S2 = 0, S3 = 0, S4 = 0;
int flag1 = 0, flag2 = 0;
int slot = 4;

void setup() {
  Serial.begin(9600);

  pinMode(ir_car1, INPUT);
  pinMode(ir_car2, INPUT);
  pinMode(ir_car3, INPUT);
  pinMode(ir_car4, INPUT);

  pinMode(ir_enter, INPUT);
  pinMode(ir_back, INPUT);

  myservo.attach(3);
  myservo.write(90);



  lcd.init();
  lcd.backlight();
  lcd.setCursor (0, 1);
  lcd.print(" Hi Welcome To ");
  lcd.setCursor (0, 2);
  lcd.print(" JustDoElectronics");
  delay (5000);
  lcd.clear();
  lcd.setCursor (0, 0);
  lcd.print("   Today's Project  ");
  lcd.setCursor (0, 1);
  lcd.print("    Car  Parking  ");
  lcd.setCursor (0, 2);
  lcd.print("      System     ");
  delay (5000);
  lcd.clear();

  Read_Sensor();

  int total = S1 + S2 + S3 + S4;
  slot = slot - total;
}

void loop() {

  Read_Sensor();

  lcd.setCursor (0, 0);
  lcd.print(" Available Slot: ");
  lcd.print(slot);
  lcd.print("    ");

  lcd.setCursor (0, 1);
  if (S1 == 1) {
    lcd.print("S1:Full ");
  }
  else {
    lcd.print("S1:Empty");
  }

  lcd.setCursor (11, 1);
  if (S2 == 1) {
    lcd.print("S2:Full ");
  }
  else {
```

```
  lcd.print("S2:Empty");
}

lcd.setCursor (0, 2);
if (S3 == 1) {
  lcd.print("S3:Full ");
}
else {
  lcd.print("S3:Empty");
}

lcd.setCursor (11, 2);
if (S4 == 1) {
  lcd.print("S4:Full ");
}
else {
  lcd.print("S4:Empty");
}

if (digitalRead (ir_enter) == 0 && flag1 == 0) {
  if (slot > 0) {
    flag1 = 1;
    if (flag2 == 0) {
      myservo.write(180);
      slot = slot - 1;
    }
  } else {
    lcd.setCursor (0, 0);
    lcd.print(" Sorry Parking Full ");
    delay(1500);
  }
}

if (digitalRead (ir_back) == 0 && flag2 == 0) {
  flag2 = 1;
  if (flag1 == 0) {
    myservo.write(180);
    slot = slot + 1;
  }
}

if (flag1 == 1 && flag2 == 1) {
    delay (1000);
    myservo.write(90);
    flag1 = 0, flag2 = 0;
  }

  delay(1);
}

void Read_Sensor() {
  S1 = 0, S2 = 0, S3 = 0, S4 = 0;

  if (digitalRead(ir_car1) == 0) {
    S1 = 1;
  }
  if (digitalRead(ir_car2) == 0) {
    S2 = 1;
  }
  if (digitalRead(ir_car3) == 0) {
    S3 = 1;
  }
  if (digitalRead(ir_car4) == 0) {
    S4 = 1;
  }

}
```

5.CIRCUIT IMPLEMENTATION

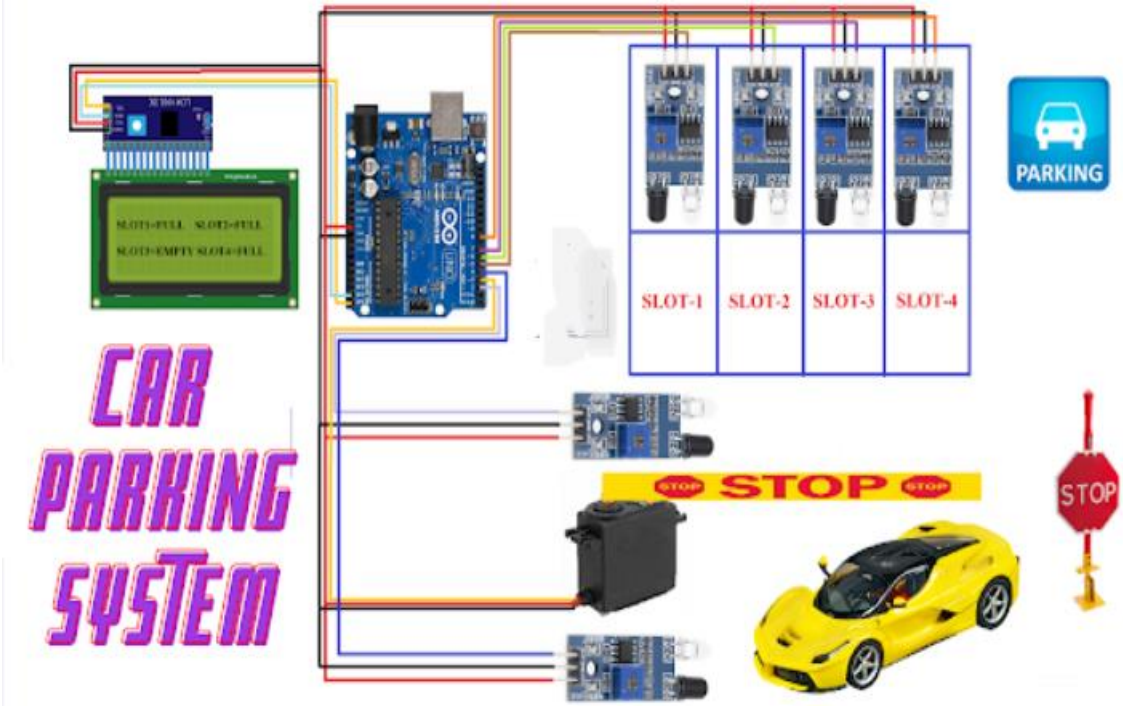


Fig.8 Circuit implementation

6.CONCLUSION

we will design a “Smart Parking System Project” to overcome this problem. This project helps the car’s driver to park their car with minimum wastage of time with accurate information of the availability of the space to park.

7.RESULT

We have experimented the system to gather some statistical results. After the experience, we have found the inner sonar and outer sonar works perfectly. As the result shows, the system is almost 100% correct. The whole experiment was done couple of times by us. Dummy cars were used. The prototype was not always correct due to the limitations of the use of low quality sensors. But the performance was satisfactory enough

SMART CAR PARKING SYSTEM USING ARDUINO

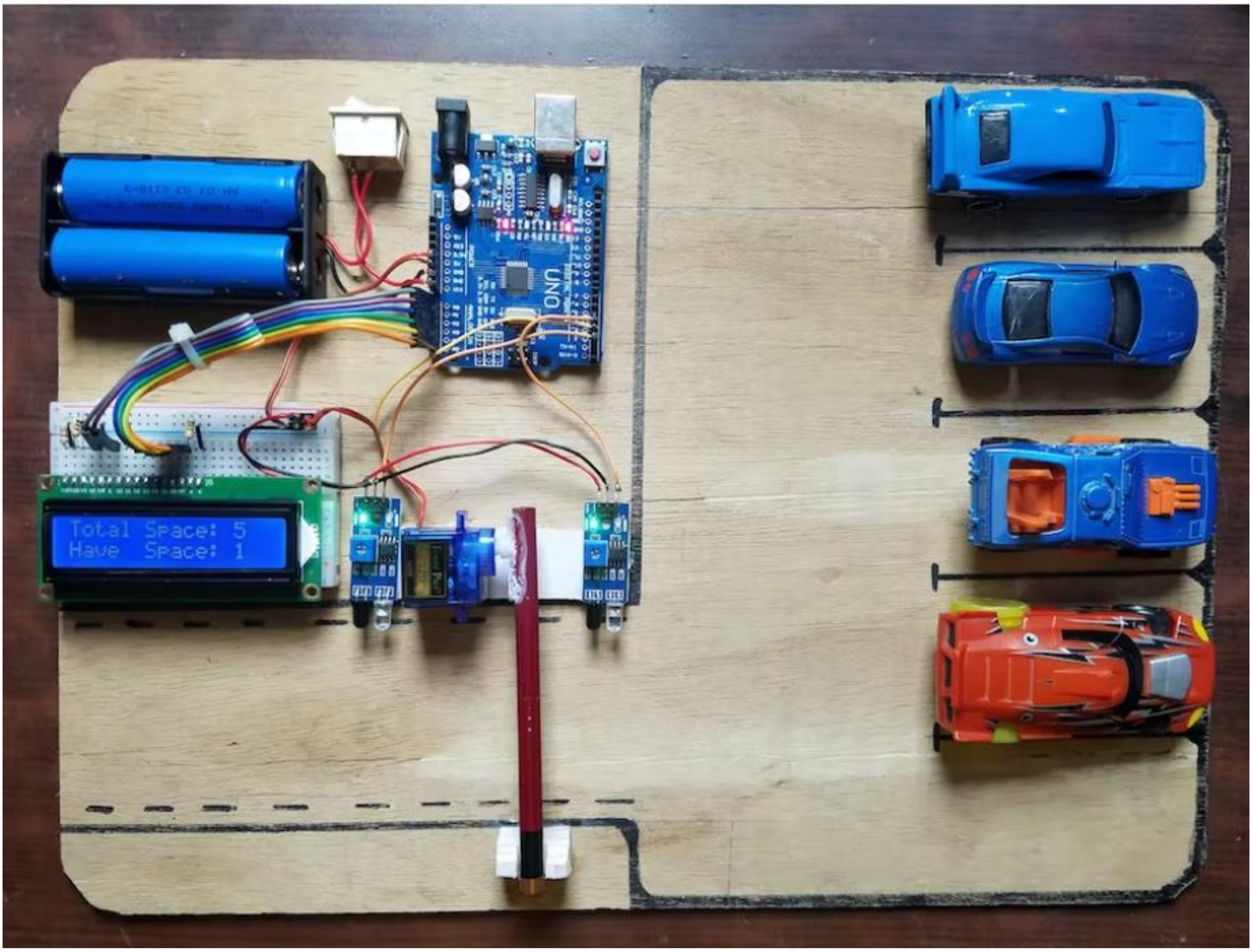


Fig.9 SMART CAR PARKING SYSTEM USING ARDUINO

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