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AUTOMATED CAR PARKING SYSTEM COMMANDED BY ANDROID APPLICATION

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Abstract - *Now days with growing vehicle production and world population, there is a need for more spaces and facilities. A new car parking program called an android solution is introduced in this project to assist driver in locating empty spaces in a car park in a shorter period. Different technologies are tested and evaluated to determine the best technology to be able to implement this program. This system uses IR sensors to detect vehicle presence in the parking slot and display the slot vacant. We build t and separate application on the Smartphone and we find shorter and easier paths to reach the destination with the aid of Bluetooth module by using this program. Car parking system features an android approach including vacant parking space detection, view of vacant parking spaces and offer Smartphone application direction to switch to vacant parking slot. This project also describes the proper and efficient use of a parking system from the entrances into a parking area until a vacant parking slot has been found. A prototype of an android parking system would help car owners improve their facilities inside the parking area to efficiently direct car drivers to empty parking slot within the parking area. This system is built in two floors, and each floor has three parking spaces and we can expand it according to our requirements. This system architecture defines the essential design features, such as sensor location, number of sensors required and LCD display board.*

***Key Words*: Arduino UNO, Microcontroller, IR Sensors, IoT ESP8266-12E, DC Motor, LCD Display**

1. INTRODUCTION

Our country has been dramatically built over the decades, now we are in this state where we have a lot of well-contacted highways, commercial development and an growing number of automobiles. We use the manual parking procedure while parking these automobiles in the parking space. In most cases are unplanned and because of this lack of discipline, people can park their cars wherever they want, in causes confusion because people most of the time don't follow the specific signal. As a result, there is a huge jam of traffic at that spot. Although cars due to mismanagement can be parked in and retrieved by bumping with each other as there is a shortage of space. This leads to disagreements, fights among people that sometimes make traffic jams big. This is also an economic loss because we need to repair our broken car and while driving in or out cars often use extra fuel. Traffic jams are a problem here, as they kill our precious time. Because of this parking chaos our precious time is wasted. This substantially affects teachers, office-going staff and emergency patients.

1.1 OBJECTIVE

[1] Introducing and benefiting from the automatic vehicle parking system in Tamilnadu.

[2] To compare the different aspects of this manual parking system with the automated parking system.

[3] To determine the economic benefits of the introduction of an automated vehicle system.

2. EXISTING SYSTEM

Parking is expensive and limited in almost every major city in the world. The existing system takes more time to park your car. It also causes economic losses to commercial places such as shopping malls, amusement parks, as people are more likely not to visit these places because of this risk of parking. As we move forward with time, the Manual Car Parking System in Commercial Areas is creating a hurdle that is causing time loss and some economic losses. We therefore need a solution that can overcome these problems. Here, Automated Car Parking Systems are being introduced as a solution to these problems and as a replacement for manual car parking systems in commercial premises.

PROPOSED SYSTEM

In this project, a new parking system called Automatic car parking system, an android approach is proposed to help drivers find vacant parking spaces in a shorter period of time. We create a separate application on your Smartphone

and use this application to find a shorter and easier way to reach your destination with the help of the WiFi module. Features of this system include vacant parking space detection, display and direction on Smartphone application to move to vacant parking space. This project also describes the proper and efficient use of the parking system from the entrances to the parking area until a vacant parking space has been found. This system architecture defines key design features such as the location of the sensors, the required number of sensors and the LCD display board.

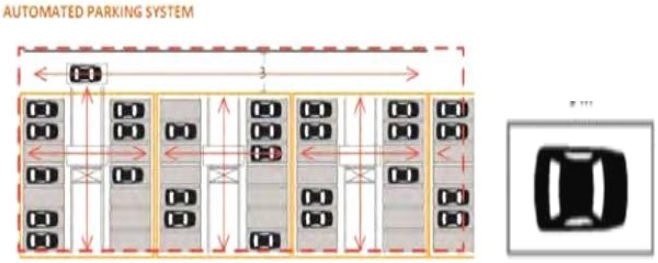

Figure 1: Proposed Car Parking

4. SCHEMATIC DIAGRAM

The entire process of working is described in the schematic diagram.

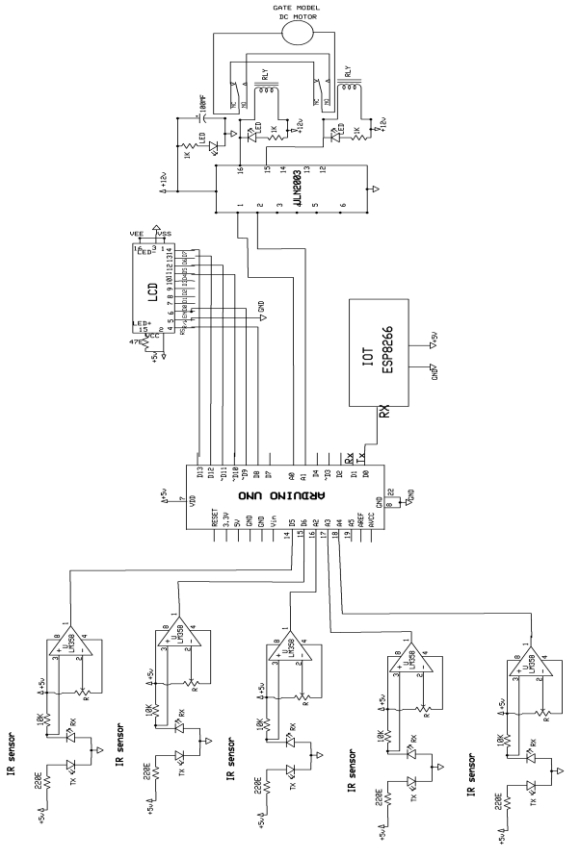

Figure 2: Overall Circuit Diagram

5. SOFTWARE AND HARWARE REQUIREMENTS

To implement this solution, we are using hardware components and software. The following are used in this idea implementation.

5.1 SOFTWARE REQUIREMENTS

5.1.1 ARDUINO IDE SKETCH

The sketch is the name Arduino uses for the program. It's the code unit that's uploaded to and running on the Arduino board.

Arduino is an open source, computer hardware and software company, project and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can detect and control objects in the physical world. Project products are distributed as open-source hardware and software licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), allowing the production of Arduino boards and the distribution of software by anyone. Arduino boards are commercially available in pre-assembled do-it-yourself kits.

Arduino board designs use a wide variety of microprocessors and controllers. The boards are fitted with digital and analog input / output (I / O) pin sets that can be attached to different expansion boards (shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some versions, which are often used to load programs from personal computers. Microcontrollers are usually designed using a dialect of features in the C and C++ programming languages. In addition to the use of traditional compiler toolchains, the Arduino project provides an Integrated Development Environment (IDE) based on the Processing Language Project.

5.1.2 PROGRAM

ARDUINO CODE

```
#include <LiquidCrystal.h>

LiquidCrystalLcd(8,9,10,11,12,13);

#define SLOT1 2

#define SLOT2 3

#define SLOT3 4

#define SLOT4 5

#define SECURITY 6

#define MF 7

#define MR A0

inta,b,c,d,e,E=1,I=0;
```

```
void setup()
{
Lcd.begin(16,2);
Lcd.setCursor(0,0);
Lcd.print("WELCOME");
delay(1000);
Serial.begin(115200);
pinMode(SLOT1,INPUT);
pinMode(SLOT2,INPUT);
pinMode(SLOT3,INPUT);
pinMode(SLOT4,INPUT);
pinMode(SECURITY,INPUT);
pinMode(MF,OUTPUT);
pinMode(MR,OUTPUT);
Lcd.clear();
delay(100);
}
void loop()
{
a=digitalRead(SLOT1);
b=digitalRead(SLOT2);
c=digitalRead(SLOT3);
d=digitalRead(SLOT4);
 e=digitalRead(SECURITY);
//**********************************************************************
// SLOT 1 FUNCTION
//**********************************************************************
Lcd.setCursor(0,0);
Lcd.print("SLOT1=");
if(a==1)
 {
Lcd.setCursor(6,0);
Lcd.print('0');
Serial.print('A');
delay(600);
Serial.print('0');
delay(600);
 }
if(a==0)
 {
Lcd.setCursor(6,0);
Lcd.print('1');
Serial.print('A');
delay(600);
Serial.print('1');
delay(600);
 }

//**********************************************************************
// SLOT 2 FUNCTION
//**********************************************************************
Lcd.setCursor(8,0);
Lcd.print("SLOT2=");
if(b==1)
 {
Lcd.setCursor(14,0);
Lcd.print('0');
Serial.print('B');
delay(600);
Serial.print('0');
delay(600);
delay(200);
 }
if(b==0)
 {
Lcd.setCursor(14,0);
Lcd.print('1');
Serial.print('B');
delay(600);
Serial.print('1');
delay(600);
 }
```

```
//*********************************************************************
// SLOT 3 FUNCTION
//*********************************************************************
Lcd.setCursor(0,1);
Lcd.print("SLOT3=");
if(c==1)
 {
Lcd.setCursor(6,1);
Lcd.print('0');
Serial.print('C');
delay(600);
Serial.print('0');
delay(600);
 }
if(c==0)
 {
Lcd.setCursor(6,1);
Lcd.print('1');
Serial.print('C');
delay(600);
Serial.print('1');
delay(600);
 }
//*********************************************************************
// SLOT 4 FUNCTION
//*********************************************************************
Lcd.setCursor(8,1);
Lcd.print("SLOT4=");
if(d==1)
 {
Lcd.setCursor(14,1);
Lcd.print('0');
Serial.print('D');
delay(600);
Serial.print('0');
delay(600);
 }
if(d==0)
 {
Lcd.setCursor(14,1);
Lcd.print('1');
Serial.print('D');
delay(600);
Serial.print('1');
delay(600);
 }
//*********************************************************************
// SECURITY ROOM FUNCTION
//*********************************************************************
if((a==0)&&(b==0)&&(c==0)&&(d==0))
 {
 I=1;
 }
 if((((a==0)||(b==0)||(c==0)||(d==0)))&&((e==0)&&(E==1)&&(I==0)))
 {
 E=0;
digitalWrite(MR,LOW);
 digitalWrite(MF,HIGH);delay(400);digitalWrite(MF,LOW);delay(400);
 }
if((a==0)&&(b==0)&&(c==0)&&(d==0)&&(e==0)&&(I==1))
 {
 I=0;
 }
if((a==1)&&(b==1)&&(c==1)&&(d==1)&&(e==0)&&(E==1))
 {
  E=0;
digitalWrite(MR,LOW);
 digitalWrite(MF,HIGH);delay(400);digitalWrite(MF,LOW);delay(400);
 }
if((e==1)&&(E==0))
 {
 E=1;
```

```
digitalWrite(MF,LOW);

digitalWrite(MR,HIGH);delay(400);digitalWrite(MR,LOW);delay(400);

 }

}
```

IOT CODE

```
#define CAYENNE_PRINT Serial

#include <CayenneMQTTESP8266.h>

// WiFi network info.

int sen1=0,sen2=0,sen3=0,sen5=0,sen6=0,sen7=0,vala=1;;

charssid[] ="SELVA";

charwifiPassword[] ="012345678";

char red1;

// Cayenne authentication info. This should be obtained from the
Cayenne Dashboard.

char username[] = "11935ef0-636c-11ea-8221-599f77add412";

char password[] = "2d77c94d73ea4651f2fed211635fb54046c1abaf";

charclientID[] = "206502d0-636c-11ea-b301-fd142d6c1e6c";

void setup()

{

Cayenne.begin(username, password, clientID, ssid, wifiPassword);

Serial.begin(115200);

}

void loop()

{

Cayenne.loop();

if(Serial.available()>0)

{

char red1=Serial.read();delay(100);

if(red1=='A')

{

int sen1=Serial.parseInt();

Cayenne.virtualWrite(1,sen1);delay(200);

}

if(red1=='B')

{

int sen2=Serial.parseInt();

Cayenne.virtualWrite(2,sen2);delay(200);

}

if(red1=='C')

{

int sen3=Serial.parseInt();

Cayenne.virtualWrite(3,sen3);delay(200);

}

if(red1=='D')

{

int sen4=Serial.parseInt();

Cayenne.virtualWrite(4,sen4);delay(200);

}

}

}
```

5.2 HARDWARE REQUIREMENTS

5.2.1 ARDUINO UNO

Arduino is an open source, computer hardware and software company, project and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can detect and control objects in the physical world.

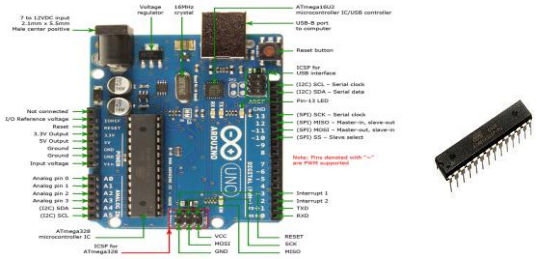

Figure 3: Arduino UNO and ATmega 328 Microcontroller

The Arduino Uno is a microcontroller board based on the ATmega328 data sheet, i.e. the PIC microcontroller. It has 14 digital input / output pins (6 of which can be used as PWM outputs) , 6 analog inputs , a 16 MHz ceramic resonator, a USB connection , a power jack, an ICSP header , and a reset button. It contains everything you need to support a microcontroller; just connect it to a computer with a USB cable or power it with an AC-to - DC adapter or a battery to get started. SDA and SCL pins near the AREF pin and two new pins near the RESET pin, the IOREF, which allow the shields to adapt to the voltage provided by the board. In the future, shields will be compatible with both the AVR-based board that operates with 5V and the Arduino Due that operates with 3.3V. The second is a non-connected pin, which is reserved for future purposes.

5.2.2 IR SENSOR

Infrared radiation (IR) is electromagnetic radiation with a wavelength between 0.7 and 300 micrometers, which is equivalent to a frequency range between approximately 1 and 430 THz. Its wavelength is longer (and frequency lower) than that of visible light, but its wavelength is shorter (and frequency higher) than that of terahertz microwave radiation. Bright sunlight provides an irradiance of approximately 1 kilowatt per square meter at sea level. Of this energy, 527 watts are infrared light, 445 watts are visible light, and 32 watts are ultraviolet light.

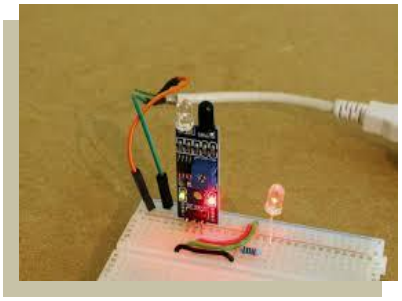

Figure 4: Infrared Sensor

5.2.3 IoT ESP8266-12E

ESP-12E is a miniature Wi-Fi module present on the market and is used to establish a wireless network connection for a microcontroller or processor. The core of the ESP-12E is the ESP8266EX, a high integration SoC (System of Chip) wireless system. It features the ability to integrate Wi-Fi capabilities into systems or to function as a standalone application. It is a low-cost solution for developing IoT applications.

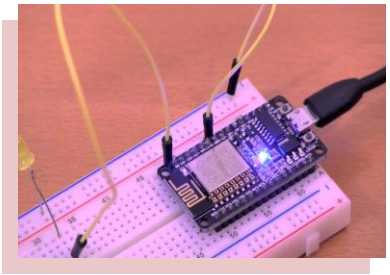

Figure 4: ESP Module

5.2.4 DC Motor

DC motors are part of electrical motors that use DC power as a source of energy. These devices convert electrical energy into mechanical energy. The basic principle of DC motors is the same as that of electrical motors in general, the magnetic interaction between the rotor and the stator that generates spin.

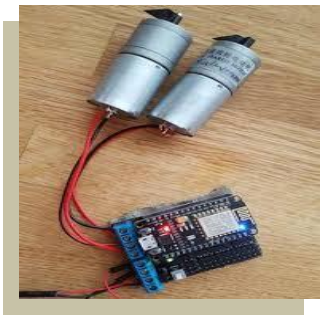

Figure 5: DC motor with ESP Module

5.2.5 LCD DISPLAY

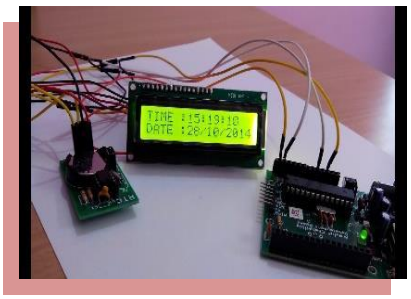

Figure 6: LCD Display

The LCDs are lightweight with a thickness of just a few millimeters. As the LCD consumes less power, it is compatible with low-power electronic circuits and can be powered over long periods of time. This gives a message about the vehicle, whether it was identified or crossed, on time and time. The two polarisers and the liquid crystal rotate light rays while the LCD is off, so that the light rays come out of the LCD without any direction, and thus the LCD appears transparent. It shows the status of the slots and the cars are parked automatically.

6. PROPOSED METHODOLOGY

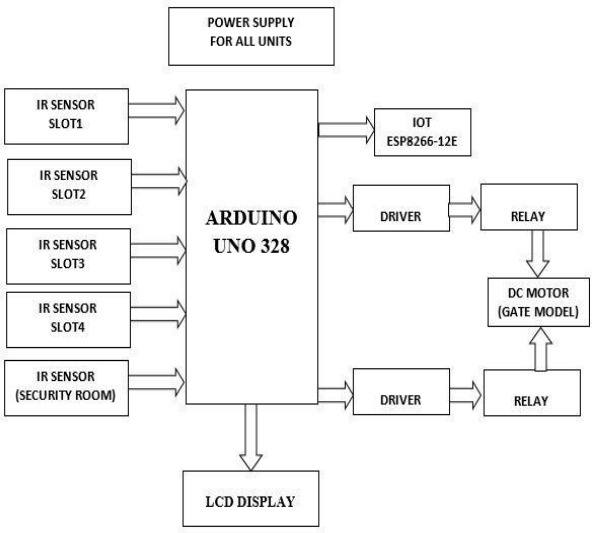

Figure 7: Block Diagram of Automated Car Parking System

6.1 WORKING PRINCIPLE

The LCD display will display the number of slots available. When a car arrives, the operator will send instructions through arduino to open the gate. The DC motor helps the gate to open when the signal is coming from arduino. Arduino will only receive the signal and send it to the DC motor using the IR sensor. The operator will then send the data containing the code to the mobile phone of the user through the arduino & IoT module (ESP WiFi Module). This code will be stored in the system against the slot that will be sent to the car parking tray using the IR module. The car parking tray will also be called using the IR module and the arduino module. When an empty slot is detected (referred to as '0'), the car park tray will park the car and then leave to park the next car. The wheels of the car parking tray will be controlled by arduino, so that the particular slot can be reached. In order to park the car, the user must give the code provided to the operator at the exit gate.

6.1.1 HARDWARE SETUP

Figure 8: Hardware set up with LCD Display

6.2 IoT MODEL

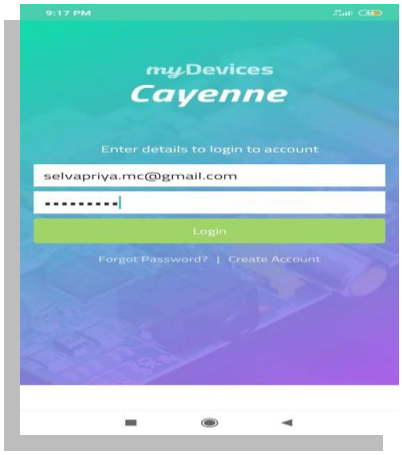

Figure 9: Login Page

6.2.1 SLOT DETECTION (FINAL OUTPUT)

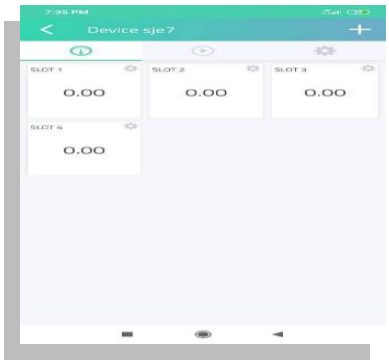

Figure 10: All slots are available

Figure 11: Slot 3 is available

As a result, the final output of detecting empty slots and parking the car in empty slots was automatically successfully implemented through this project, reducing costs and time and making it more efficient.

7. ADVANTAGES AND DISADVANTAGES

7.1 ADVANTAGES

[1] There is high parking efficiency

[2] Emissions are greatly brought down and reduced.

[3] There are less chances for vehicle vandalism.

7.2 DISADVANTAGES

[1] It requires a maintenance contract with the supplier.

[2] It may be a bit confusing for unfamiliar users.

8. CONCLUSION

In this way, we conclude that this project will display vacant car parking slots using the PIC microcontroller and the Android cell phone. The proposed parking management system takes into account all possible attributes that are expected from it. Vacant car parking slots are granted on the basis of priority. The main contribution of the study is the introduction of the most significant parking problem, which

is the finding of vacant space and the smallest path to reach that vacant space. It helps to ensure proper management of parking. Reduces instances of single car parking incorrectly across two spaces. Parking detection system would reduce the search time for vacant slots. It is important to have an effective vacant parking slot tracking system to display vacant parking spaces available at each row of parking slots and to guide the car driver there. It therefore reduces the driver's effort to find a vacant slot and also reduces the time needed to reach that vacant parking slot.

9. FUTURE IDEAS

SMART RECOGNITION OF CARS

With the help of image processing in the ACP system, we can recognize the cars by their number plates. Using this type of technology, users can directly pay for their car parking using the prepaid balance of the mobile phone or the car parking account balance.

10. ACKNOWLEDGEMENT

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