A Project Report

On

IoT based SMART CAR PARKING

A Project Work Submitted in Fulfillment of

the minor project

in

IOT & Cloud Computing LAB

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CERTIFICATE OF APPROVAL

This is to certify that the work embodied in this project entitled IoT based SMART CAR PARKING SYSTEM submitted by our group to the Department of Information Technology, have been carried out under my direct supervision and guidance. The project work has been prepared as per the regulations of Institute of Engineering and Management and I strongly recommend that this project work be accepted in fulfillment of the minor IOT project.

Supervisors

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Professor
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(Signature)

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ACKNOWLEDGEMENT

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ABSTRACT

Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. Drivers searching for parking are estimated to be responsible for about 30% of traffic congestion in cities. Historically, cities, businesses, and property developers have tried to match parking supply to growing demand for parking spaces. It has become clear, though, that simply creating more parking spaces is not sufficient to address the problem of congestion. New approaches using smart parking systems look to provide a more balanced view of parking that better manages the relationship between supply and demand. Smart parking can be defined as the use of advanced technologies for the efficient operation, monitoring, and management of parking within an urban mobility strategy. The global market for smart parking systems reached $93.5 million, with the United States representing 46% market share, and offering a strong growth opportunity for companies offering services in the United States and overseas. A number of technologies provide the basis for smart parking solutions, including vehicle sensors, wireless communications, and data analytics. Smart parking is also made viable by innovation in areas such as smartphone apps for customer services, mobile payments, and in-car navigation systems. At the heart of the smart parking concept is the ability to access, collect, analyze, disseminate, and act on information on parking usage. Increasingly, this information is provided in real-time from intelligent devices that enable both parking managers and drivers to optimize the use of parking capacity.

INTRODUCTION

Overview

At the point when IoT is increased with sensors and actuators, the innovation turns into an occurrence of the more broad class of digital physical frameworks, which likewise incorporates advances. For Example, keen networks, virtual power plants, brilliant homes, astute transportation and shrewd urban communities. Among the difficulties that confront in everyday life one of most unavoidable test is parking the car wherever people go. As our need expands our setting out increments however because of extreme increment in utilization of vehicles and increment in populace this project confront the intense assignment of parking car especially amid busiest hours of the day.

Nowadays most of the car parks require user's initiative to search for empty space to park their car. This will cause problems when it is too many cars and it makes them wasting their time and energy. One of the factors that contribute to this problem is because of lack of information that given at parking lot. So, one system has to be design to solve this parking problem which will include the information interface criteria.

BENEFITS OF SMART CAR PARKING USING IOT:

1. Optimized parking – Users find the best spot available, saving time, resources and effort. The parking lot fills up efficiently and space can be utilized properly by commercial and corporate entities.

2. Reduced traffic – Traffic flow increases as fewer cars are required to drive around in search of an open parking space.

3. Reduced pollution – Searching for parking burns around one million barrels of oil a day. An optimal parking solution will significantly decrease driving time, thus lowering the amount of daily vehicle emissions and ultimately reducing the global environmental footprint.

4. Increased Safety – Parking lot employees and security guards contain real time lot data that can help prevent parking violations and suspicious activity. License plate recognition cameras can gather pertinent footage. Also, decreased spot searching traffic on the streets can reduce accidents caused by the distraction of searching for parking.

5. Real-Time Data and Trend Insight – Over time, a smart parking solution can produce data that uncovers correlations and trends of users and lots. These trends can prove to be invaluable to Iot owners as to how to make adjustments and improvements to drivers.

An ideal IoT device consists of various interfaces for making connectivity to other devices which can either be wired or wireless.

Any IoT based device consists of following components:

- I/O interface for Sensors
- Interface for connecting to the Internet
- Interface for Memory and Storage
- Interface for Audio/Video

IoT devices can be of various forms like wearable sensors, smart watches, IoT smart home monitoring, IoT intelligent transport systems, IoT smart health devices etc.

IOT ENABLING TECHNOLOGIES

Internet of Things has a strong backbone of various enabling technologies- Wireless Sensor Networks, Cloud Computing, Big Data, Embedded Systems, Security Protocols and Architectures, Protocols enabling communication, web services, Internet and Search Engines.

Wireless Sensor Network (WSN): It consists of various sensors/nodes which are integrated together to monitor various sorts of data.

Cloud Computing: Cloud Computing also known as on-demand computing is a type of Internet based computing which provides shared processing resources and data to computers and other devices on demand. It can be in various forms like IaaS, PaaS, SaaS, DaaS etc.

Big Data Analytics: Big data analytics is the process of examining large data sets containing various forms of data types—i.e. Big Data – to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful business information.

Communication Protocols: They form the backbone of IoT systems to enable connectivity and coupling to applications and these protocols facilitate exchange of data over the network as these protocols enable data exchange formats, data encoding and addressing.

Embedded Systems: It is a sort of computer system which consists of both hardware and software to perform specific tasks. It includes microprocessor/microcontroller, RAM /ROM, networking components, I/O units and storage devices.

OVERVIEW OF THE PROJECT

This project deals with an effective way of finding empty spaces and managing the number of vehicles moving in and out in complex multi storeyed parking structures by detecting a vehicle using IR sensors and thus providing a feedback. The fully automated smart car parking system is rudimental and does not require heavy lines of code nor expensive equipment. It is a simple circuit built for the exact need of purpose. This automated system is used to find the vacancy in parking spaces available and navigate the driver to reach the desired space using visuals and in an effective manner, thus reducing search time. This system is required for malls, multistore parking structures, IT hubs and parking facilities. This makes sure the requirement of labor is insubstantial.

COMPONENTS & MODULES

Components Details:- Solderless Breadboard, Arduino Uno, IR Sensors, Servo Motor SG-90 ,20x4 LCD Display,I2C, Male to Male and Male to female Jumper Wires, Power supply

ARDUINO UNO: The Arduino Uno is a microcontroller board based on the ATmega328.It has 14 digital input/output pins(of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz crystal oscillator, a USB connection ,a power jack, an ICSP header , and a reset button.

IR SENSOR:- An infrared sensor is an electronic device, that emits infrared rays so as to detect a few parts of the environment. An IR sensor can gauge the warmth of an object as well as detects the motion. These sorts of sensors measure just the infrared light that falls on them, as opposed

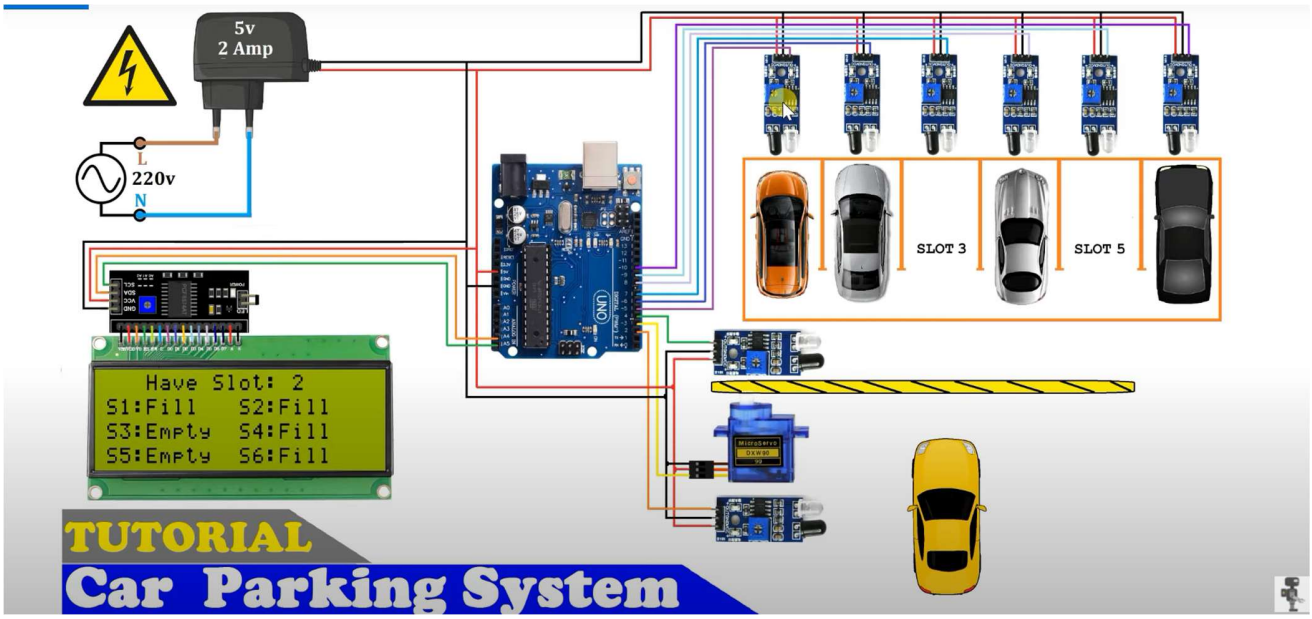
to transmitting it that is called as a passive IR sensor. Most of the objects radiate some type of warm radiations. These sorts of radiations are imperceptible to our eyes. It can only be identified by an infrared sensor. The emitter is just an IR LED (Light Emitting Diode) and the detector is basically an IR photodiode which is delicate to the IR light of a similar wavelength as that discharged by an IR LED. When the imperceptible light falls on the photodiode, the resistance and the output voltages change in relation to the size and intensity of the IR light. They require very low power and do not require any kind of contact for detection, they are not affected by oxidation or corrosion. IR sensor is used in this project by considering all these advantages.

Servo Motors: A servo motor (or servo motor) is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

20x4 LCD Display with I2C:- A 20x4 LCD means it can display 20 characters per line and there are 4 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. This is standard HD44780 controller LCD. I2C_LCD is an easy-to-use display module, It can make display easier. Using it can reduce the difficulty of make, so that makers can focus on the core of the work. We developed the Arduino library for I2C_LCD, user just need a few lines of the code can achieve complex graphics and text display features.

Breadboard: A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted.

CIRCUIT DESCRIPTION & WORKING PRINCIPLE



Algorithms and Flowcharts

ALGORITHM

THE ALGORITHM OF OVERALL PROCESS:-

STEP 1: START THE PROCESS

STEP 2: INITIALIZE THE SENSORS

STEP 3: SENSE WHETHER THERE ID CAR OR NOT

STEP 4: IF A CAR ENTERED THROUGH GATE DECREASE THE COUNT BY 1

STEP 5: IF CAR IS PARKED AT SOME PARTICULAR SLOT UPDATE THE SLOT ON DISPLAY

STEP 6: DELAY TO 10 SECONDS

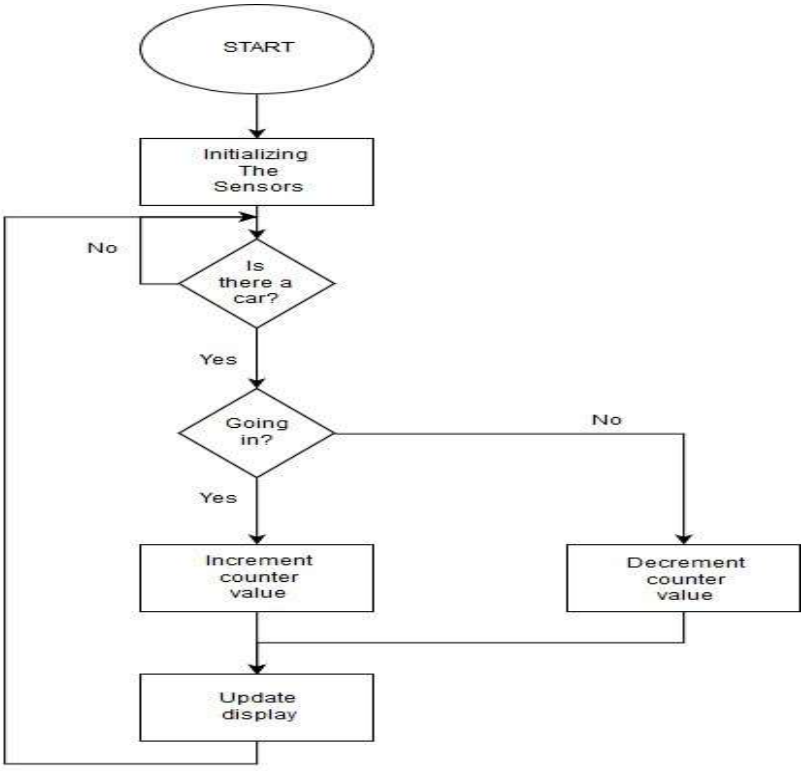
STEP 7: REPEAT STEP 3, 4, 5 & 6 UNTIL THE PARKING SLOT IS FULL

STEP 8: ONCE THE SLOT WILL FULL IT WILL PRINT SORRY NO SPACE AVAILABLE.

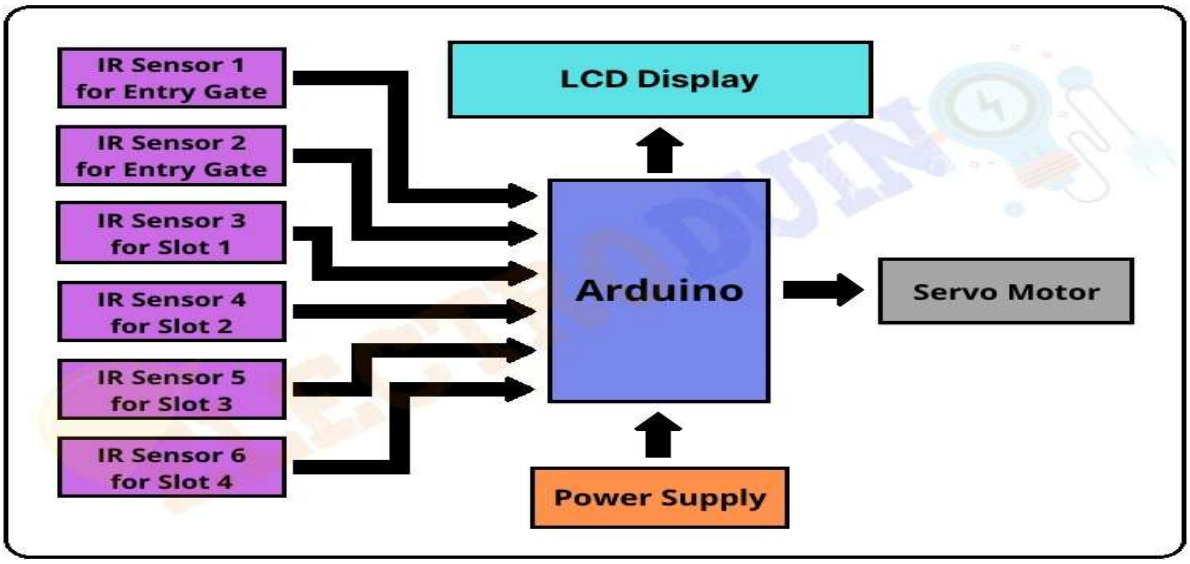
STEP 9: IF THE CAR LEAVING FROM THE PARKING SLOT INCREMENT THE PARKING SLOT AVAILABLE BY 1

STEP 10: END

FLOWCHART



FLOWCHART OF OVERALL PROCESS



CODE FOR I2C LCD MODULE

```
#include <Wire.h>
void setup()
{
Wire.begin();
Serial.begin(9600);
Serial.println("\nI2C Scanner");
}
void loop()
{
byte error, address;
int Devices;
Serial.println("Scanning...");
Devices = 0;
for(address = 1; address < 127; address++ )
{

Wire.beginTransmission(address);
error = Wire.endTransmission();
if (error == 0)
{
```

```
Serial.print("I2C device found at address 0x");
if (address<16)
Serial.print("0");
Serial.print(address,HEX);
Serial.println("  !");
Devices++;
}
else if (error==4)
{
Serial.print("Unknown error at address 0x");
if (address<16)
Serial.print("0");
Serial.println(address,HEX);
}
}
if (Devices == 0)
Serial.println("No I2C devices found\n");
else
Serial.println("done\n");
delay(5000);
}
```

CODE FOR FUNCTIONALITY OF SYSTEM

```
#include <Servo.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 2, 1, 0, 4, 5, 6, 7, 3, POSITIVE);

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
#define ir_car5 9
#define ir_car6 10

int S1=0, S2=0, S3=0, S4=0, S5=0, S6=0;
int flag1=0, flag2=0;
int slot = 6;

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

pinMode(ir_car1, INPUT);
pinMode(ir_car2, INPUT);
pinMode(ir_car3, INPUT);
pinMode(ir_car4, INPUT);
pinMode(ir_car5, INPUT);
pinMode(ir_car6, INPUT);

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

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

lcd.begin(20, 4);
lcd.setCursor (0,1);
lcd.print("    Car  parking  ");
lcd.setCursor (0,2);
```

```
lcd.print("       System     ");
delay (2000);
lcd.clear();

Read_Sensor();

int total = S1+S2+S3+S4+S5+S6;
slot = slot-total;
}

void loop(){

Read_Sensor();

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

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

lcd.setCursor (10,1);
if(S2==1){lcd.print("S2:Fill ");}
    else{lcd.print("S2:Empty");}

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

```
lcd.setCursor (10,2);
if(S4==1){lcd.print("S4:Fill ");}
    else{lcd.print("S4:Empty");}

 lcd.setCursor (0,3);
if(S5==1){lcd.print("S5:Fill ");}
    else{lcd.print("S5:Empty");}

lcd.setCursor (10,3);
if(S6==1){lcd.print("S6:Fill ");}
    else{lcd.print("S6: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, S5=0, S6=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;}
if(digitalRead(ir_car5) == 0){S5=1;}
if(digitalRead(ir_car6) == 0){S6=1;}
}
```

CONCLUSION & FUTURE SCOPE

CONCLUSION

The concept of Smart Cities have always been a dream for humanity. Since the past couple of years large advancements have been made in making smart cities a reality. The growth of Internet of Things and Cloud technologies have give rise to new possibilities in terms of smart cities. Smart parking facilities and traffic management systems have always been at the core of constructing smart cities. we are addressing the issue of parking and present an integrated smart parking system. The system that we propose provides real time information regarding availability of parking slots in a parking area. The efforts made in this paper are indented to improve the parking facilities of a city and thereby aiming to enhance the quality of life of its people.

FUTURE SCOPE

We are planning to develop a website along with an android app which will provide a real time update for the parking system so that Drivers from remote location can get the information regarding the Parking which will reduce their fuel cost and Pollution due to searching for parking here and there

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