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Engineering

Smart parking



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concept

- Smart parking is an IOT solution that uses sensor and or cameras in combination with a software to inform users of vacant parking spaces in a certain area

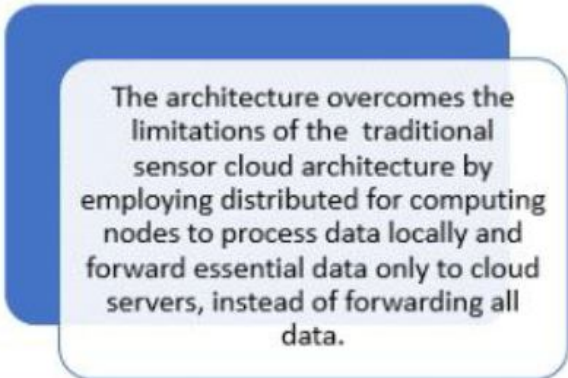




Developing the smart parking



A multi- layer IOT architecture for the parking system manages and monitors parking lots efficiently and maintains a low congestion rate.



The architecture overcomes the limitations of the traditional sensor cloud architecture by employing distributed for computing nodes to process data locally and forward essential data only to cloud servers, instead of forwarding all data.

development

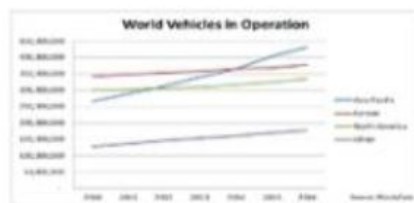
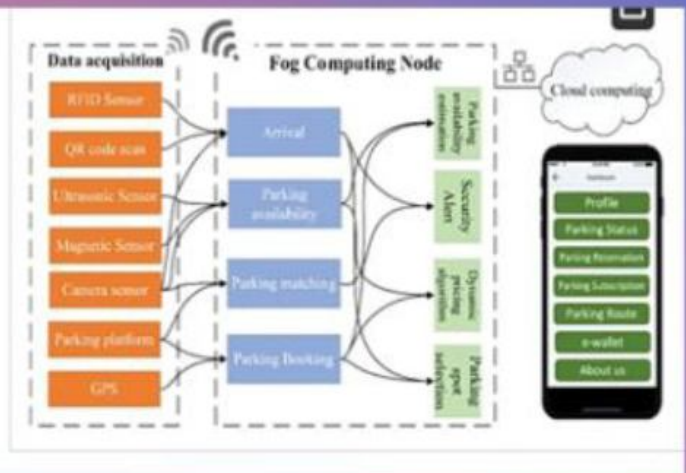
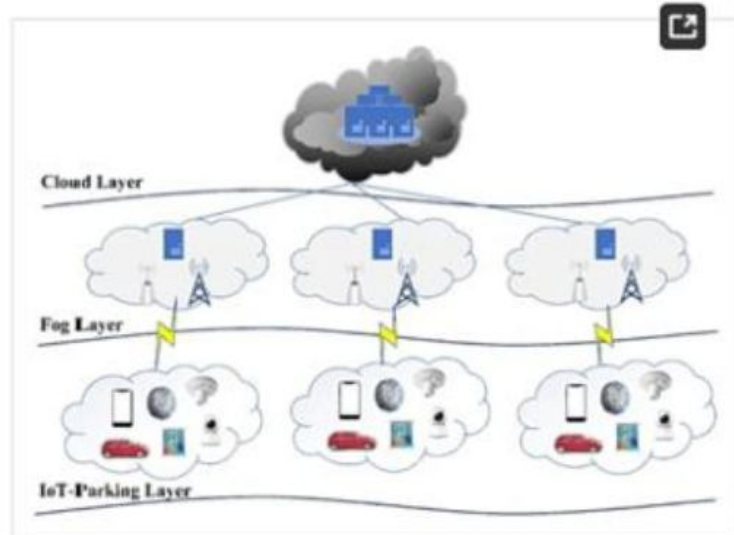


Figure 1. Graph of number of cars on the road (regionally divided)



Multi-layer parking system



Smart parking system project using arduino and IR sensor

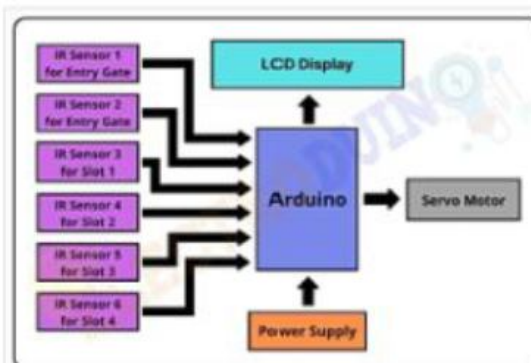


Smart Parking System Project Concept

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.

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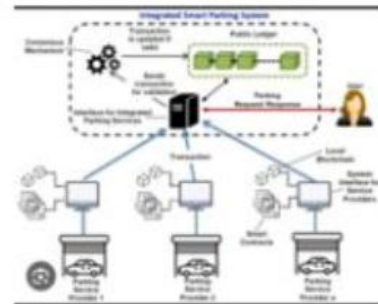
Block Diagram of Smart Parking System Project



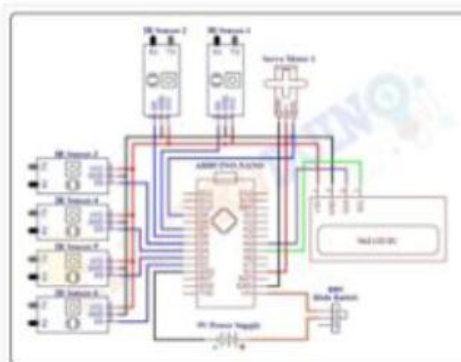
Smart Parking System Project Block Diagram

Working principle

There are four parking slots in this project , IR sensor –3,4,5 ,and 6 are placed at slot 1,2,3 and 4,respectively and a servo motor is used to operate the common single entry and exit gate.



Circuit Diagram of Smart Parking System Project using Arduino and IR Sensor



Arduino Code

```
#include <Servo.h>
//includes the servo library
#include <Wire.h>
#include
<LiquidCrystal_I2C.h>
//includes LiquidCrystal_I2C
library
LiquidCrystal_I2C lcd(0x27,
20, 4);

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 = 6;
```



```

void setup(){
  Serial.begin(9600);
  // initialize digital pins
  as input.
  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(9); // Servo
  motor pin connected to D9
  myservo.write(90); // sets
  the servo at 0 degree
  position

  // Print text on display
  lcd.begin(20, 4);
  lcd.setCursor (0,1);
  lcd.print("      Smart Car
  ");
  lcd.setCursor (0,2);
  lcd.print(" Parking System
  ");
  delay (2000);
  lcd.clear():

```

```

Read_Sensor( );

int total = S1+S2+S3+S4;
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" );
}

/* Servo Motor Control
*****/

    if(digitalRead (ir_enter)
== 0 && flag1==0) // read
digital data from IR sensor1
{
    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) // read
digital data from IR sensor2
    {
        flag2=1;
        if(flag1==0)
            {
                myservo.write(180); //
sets the servo at 180 degree
position
                slot = slot+1;
            }
    }

    if(flag1==1 && flag2==1)
    {
        delay (1000);
        myservo.write(90); //
sets the servo at 90 degree
position
        flag1=0, flag2=0;
    }
    delay(1);
}

```

```
void Read_Sensor()  
{  
    S1=0, S2=0, S3=0, S4=0;  
    if(digitalRead(ir_car1) ==  
0){S1=1;} // read digital  
data from IR sensor3  
    if(digitalRead(ir_car2) ==  
0){S2=1;} // read digital  
data from IR sensor4  
    if(digitalRead(ir_car3) ==  
0){S3=1;} // read digital  
data from IR sensor5  
    if(digitalRead(ir_car4) ==  
0){S4=1;} // read digital  
data from IR sensor6  
}
```