

A Thesis/Project/Dissertation Report

on

SMART PARKING SYSTEM

*Submitted in partial fulfillment of the
requirement for the award of the degree of*

BACHELOR OF TECHNOLOGY IN CSE



(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

**Under The Supervision of
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INDIA
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CANDIDATE'S DECLARATION

I/We hereby certify that the work which is being presented in the thesis/project/dissertation, entitled "**SMART PARKING SYSTEM**" in partial fulfillment of the requirements for the award of the B.TECH submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of September, 2021 to December and 2021, under the supervision of N Gayathri (Assistant Professor), Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida.

The matter presented in the thesis/project/dissertation has not been submitted by me/us for the award of any other degree of this or any other places.

Ankit Kumar Singh , 19SCSE1010273
Karunanidhi Kumar , 19SCSE1010802

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

N Gayathri
Assistant Professor

CERTIFICATE

The Final Thesis/Project/ Dissertation Viva-Voce examination of Ankit Kumar Singh (19SCSE1010273) & Karunanidhi Kumar (19SCSE1010802) has been held on December 2021 and his/her work is recommended for the award of B.TECH.

Signature of Examiner(s)

Signature of Supervisor(s)

Signature of Project Coordinator

Signature of Dean

Abstract

There simply are too many vehicles on the road and not enough parking space. This has led to the need for efficient parking management systems. Thus, we demonstrate the use of IOT based parking management system that allows for efficient parking space utilization using IOT technology. To demonstrate the concept, we use IR sensors for sensing parking slot occupancy along with a dc motor to simulate as gate opener motors. We now use a Wi-Fi modem for internet connectivity and an AVR microcontroller for operating the system. We use IOT Gecko for online connectivity and IOT management GUI design. The system detects if parking slots are occupied using IR sensors. Also, it uses IR technology to sense if a vehicle has arrived on gate for automated gate opening. The system reads the number of parking slots available and updates data with the cloud server to allow for checking parking slot availability online. This allows users to check for available parking spaces online from anywhere and avail hassle free parking. Thus, the system solves the parking issue for cities and get users an efficient IOT based parking management system. locating locations to park even in automobile parks isn't always smooth for drivers who run in circles. research have proven that drivers looking for parking areas make a contribution up to 30% to visitors congestion. on this context, it's miles essential to predict the spaces available to drivers in parking lots in which they want to park. We propose in this paper a brand new system that integrates the IoT and a predictive model based on ensemble methods to optimize the prediction of the availability of parking areas in smart parking. The assessments that we completed at the Birmingham parking records set allowed to reach an average Absolute error (MAE) of 0.06% on common with the algorithm of Bagging Regression (BR). These outcomes have thus advanced the quality present overall performance with the aid of over 6.6% even as dramatically decreasing machine complexity.

In latest instances the idea of clever metropolises has won grate fashion ability. Thanks to the elaboration of Internet of results the take a look at of clever mega town now appears to be attainable. Harmonious sweats are being made inside the area of IoT so that you can maximize the productiveness and trust ability of civic structure. Problems comparable as, commercial enterprise traffic, constrained car parking installations and avenue protection are being addressed through IoT. In this paper, we gift an IoT grounded all included clever parking machine. The proposed Smart Parking device consists of an on- aspect deployment of an IoT module that is used to cover and announce the dominion of vacuity of every single parking space. A cell operation is likewise so long as lets in a quit stoner to look the pressure of car parking zone and book a parking area of interest consequently. The paper additionally describes a high- function view of the machine armature. In the quit, the paper tricky

the running of the gadget in form of a use case that proves the fact of the proposed model.

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Acronyms

B.Tech.	Bachelor of Technology
M.Tech.	Master of Technology
BCA	Bachelor of Computer Applications
MCA	Master of Computer Applications
B.Sc. (CS)	Bachelor of Science in Computer Science
M.Sc. (CS)	Master of Science in Computer Science
SCSE	School of Computing Science and Engineering

Chapter 1

*Introduction:

The continuous increase of the urban population favored through the big rural exodus driven towns in the direction of the optimization in their city assets. in this regard, the will of cities actors and the development in facts and conversation technology (ICT) gave birth to the “clever towns” (Bélissent, 2010). the appearance of smart towns is a developing global fashion. They purpose to integrate ICT answers to enhance the best of lifestyles of its residents and their interplay with authorities officials. accordingly, site visitors and urban mobility are one of the principal issues of urban development. They face many demanding situations of sustainable mobility in face of increasing call for of parking areas particularly those associated to the quandary of ability of the city’s transport, traffic and parking structures. one of the typical smart city illustrations is the usage of public delivery packages and the provision of custom statistics exercises to users. For the design of these packages (typically with support for cellular gadgets), treasured records need to be supplied by customers to optimize their motion. at the equal time, delivery groups are pressured to enhance the great of services furnished to satisfy the challenges of clever city mobility. The urban mobility in smart towns highlights numerous issues that are anchored on sustainable development, which targets to make them greater appealing, more ecological and greater comparatively cheap even as strengthening the social hyperlink. presently, a few clever gear help drivers with the aid of reporting phenomena such as site visitors jams, accidents or even street conditions (Tang and Gao, 2005; De Fabritiis et al., 2008). The rise in urban mobility is accentuated with the aid of the growing wide variety of trips in non-public way compared to the regularly precarious public shipping. This boom in urban mobility is causing a large variety of vehicles that make traffic or even parking greater tedious in the face of these sustainable development problems (Jin et al., 2014). This immediately influences driving force activity by means of the wasted time they spent to discover to be had parking areas, the disruption of city site visitors waft and the multiplied pollutants in towns. according to (Zheng et al., 2015), 30% of site visitors jams are because of automobiles looking for parking. on this context, understanding earlier the available parking areas might conquer this hassle. gadget getting to know techniques would be the nice tools for predicting this availability with fantastic precision (Zantalis et al., 2019; Camero et al., 2018). different device gaining knowledge of applications had been proposed within the literature to predict parking areas, these strategies range within the forms of accumulated facts and additionally within the used techniques to research those information. a few works used as facts the captured snap shots in actual time (Xiang et al., 2017) comparable to simple

sensor systems. those pics have constantly been processed in actual time with the aid of algorithms including deep mastering (Amato, 2017; Almeida et al., 2015; Bachani et al., 2016; Amato et al., 2016) to present users real-time availability. those models based totally on real time already have several drawbacks namely: snap shots are greater complicated to investigate. Our system overcomes this trouble by introducing a facts centric-IoTs for information collection, evaluation and processing. Our predictive facts evaluation system should be reinforced from time to time by using the maximum latest facts to alter and replace the prediction. The authors (Stolfiet al., 2017; Cameroet al., 2018) had to address this sort of records via the use of the very complex algorithms frequently specialized in picture processing (Convolutional Neural network “CNN”). In quick even supposing performance is improved, they continue to be to be optimized no longer most effective in terms of complexity however additionally in terms of overall performance and execution time. in this paper, we introduce a model primarily based on ensemble techniques which is able to conquer the above noted hassle. essentially in this paintings, we endorse a information centric method that aims to predict parking area availability for a given town parking. The proposed device uses device gaining knowledge of techniques and additionally integrates different linked sources of records (IoT). the primary sources of statistics used for the test of our model comes from car parks in Birmingham metropolis. For the predictions, one of a kind regression strategies were used to expect a parking lot availability for a given time. thrilling outcomes had been received with predictors primarily based on one-of-a-kind regression techniques.

Recent advances in making low- cost, low electricity bedded structures are helping inventors to shape new operations for internet of Effects. Followed with the aid of using the tendencies in detector era, diverse current metropolises have decided for planting colorful IoT grounded structures in and across the metropolises for the goal of monitoring. A latest test completed with the aid of using the worldwide Parking Institute displays a upward thrust in range of progressive thoughts regarding parking structures. currently there are certain parking structures that claim to electorate of handing over actual time data regarding available in the marketplace parking regions. Similar structures endure powerful detectors to be stationed in the parking regions for masking the residency we have a tendency as rapid know-how usage devices on the way to realize practical perceptiveness from statistics accrued over colorful sources. The practical parking gadget that we suggest is carried out using a cell operation that' related to the pall. The gadget facilitates a aggressor recognize the vacuity of parking areas on a real time base.

We are using IOT based Smart Parking System to implement our idea.

***Tools used:**

1. Arduino Uno R3 – 1
2. LCD 16*2 – 1
3. Positional Micro Servo Motor – 2
4. Potentiometer (250 k ohm) – 1
5. Resistor (1 k ohm) – 1
6. PIR Sensors – 4

***About Parts Used:**

=>Arduino Uno:

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.

Arduino UNO features AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I/O pins out of which 6 are used as PWM output.

This board contains a USB interface i.e. USB cable is used to connect the board with the computer and Arduino IDE (Integrated Development Environment) software is used to program the board.

The unit comes with 32KB flash memory that is used to store the number of instructions while the SRAM is 2KB and EEPROM is 1KB.

The operating voltage of the unit is 5V which projects the microcontroller on the board and its associated circuitry operates at 5V while the input voltage ranges between 6V to 20V and the recommended input voltage ranges from 7V to 12V.

=>LCD:

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight.

As LCDs have replaced older display technologies, LCDs have begun being replaced by new display technologies such as OLEDs.

=>Servo Motor:

A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the appropriate position. As the positions approach, the error signal reduces to zero and the motor stops.

The very simplest servomotors use position-only sensing via a potentiometer and bang-bang control of their motor; the motor always rotates at full speed (or is stopped). This type of servomotor is not widely used in industrial motion control, but it forms the basis of the simple and cheap servos used for radio-controlled models.

More sophisticated servomotors use optical rotary encoders to measure the speed of the output shaft and a variable-speed drive to control the motor speed. Both of these enhancements, usually in combination with a PID control algorithm, allow the servomotor to be brought to its commanded position more quickly and more precisely, with less overshooting.

=>Potentiometer:

A potentiometer is a manually adjustable variable resistor with 3 terminals. Two of the terminals are connected to the opposite ends of a resistive element, and the third terminal connects to a sliding contact, called a wiper, moving over the resistive element. The potentiometer essentially functions as a variable resistance divider. The resistive element can be seen as two resistors in series (the total potentiometer resistance), where the wiper position determines the resistance ratio of the first resistor to the second resistor. If a reference voltage is applied across the end terminals, the position of the wiper determines the output voltage of the potentiometer.

A potentiometer is also commonly known as a **potmeter** or **pot**. The most common form of potmeter is the single turn rotary potmeter. This type of pot is often used in audio volume control (logarithmic taper) as well as many other applications.

Different materials are used to construct potentiometers, including carbon composition, cermet, wirewound, conductive plastic or metal film.

=>**Resistor:**

A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat, may be used as part of motor controls, in power distribution systems, or as test loads for generators. Fixed resistors have resistances that only change slightly with temperature, time or operating voltage. Variable resistors can be used to adjust circuit elements (such as a volume control or a lamp dimmer), or as sensing devices for heat, light, humidity, force, or chemical activity.

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors as discrete components can be composed of various compounds and forms. Resistors are also implemented within integrated circuits.

The electrical function of a resistor is specified by its resistance: common commercial resistors are manufactured over a range of more than nine orders of magnitude. The nominal value of the resistance falls within the manufacturing tolerance, indicated on the component.

=>**PIR Sensors:**

A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically activated lighting systems.

A PIR sensor can detect changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor. When an object, such as a person, passes in front of the background, such as a wall, the temperature at that point in the sensor's field of view will rise from room temperature to body temperature, and then back again. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission

pattern, and thus moving them with respect to the background may trigger the detector as well.

PIRs come in many configurations for a wide variety of applications. The most common models have numerous Fresnel lenses or mirror segments, an effective range of about 10 meters (30 feet), and a field of view less than 180°. Models with wider fields of view, including 360°, are available, typically designed to mount on a ceiling. Some larger PIRs are made with single segment mirrors and can sense changes in infrared energy over 30 meters (100 feet) from the PIR. There are also PIRs designed with reversible orientation mirrors which allow either broad coverage (110° wide) or very narrow "curtain" coverage, or with individually selectable segments to "shape" the coverage.

=>**Stepper Motor:**

A stepper motor is an electromechanical device it converts electrical power into mechanical power. Also, it is a brushless, synchronous electric motor that can divide a full rotation into an expansive number of steps. The motor's position can be controlled accurately without any feedback mechanism, as long as the motor is carefully sized to the application. Stepper motors are similar to switched reluctance motors. The stepper motor uses the theory of operation for magnets to make the motor shaft turn a precise distance when a pulse of electricity is provided. The stator has eight poles, and the rotor has six poles. The rotor will require 24 pulses of electricity to move the 24 steps to make one complete revolution. Another way to say this is that the rotor will move precisely 15° for each pulse of electricity that the motor receives.

Chapter 2 Literature Survey/Project Design

***IoT and predictive analysis for smart parking challenges:**

The net of factors (IoT) is speeding up the pace of innovation inside the delivery region, particularly with regard to clever parking and urban mobility. Today, many smart car parks are prepared with linked systems that permit drivers to view their clever cellphone apps, set directions, use roadside help, open doorways remotely, and locate unfastened parking spaces. Accordingly, the net of factors may even carry to the car zone novelties of which we've now not but the slightest idea. But, any new generation entails new demanding situations such as: generation complexity, protection, privacy, data control and analysis (Arasteh et al., 2016; Mainetti et al., 2015; Kubler et al., 2016). Are we not already drowned inside the records? The IoT will produce even extra information, adding additional complexity to our business enterprise information management systems. Certainly, absolutely practical IoTs which includes smart parking systems can generate a huge amount of information. Those so known as information centric IoTs have centered on all components of records flow, which includes collection, processing, garage and visualization (Jin et al., 2014). The large extent of facts poses challenges associated with the gathering of those data, their processing, garage, management and manipulation. Advanced scanning technologies could be had to offer relevant statistics from the records generated by way of the linked contraptions. It'll also open up new opportunities to optimize business methods, imparting new features for e- government, deliver chain and urban shipping management. Data seize and evaluation can be maximally effective if seize, analysis, and transport is carried out from a cloud-primarily based device. It is the case of the automated management device of intelligent parking. Inside the subsequent segment, we are able to present our ensemble-primarily based model to optimize the prediction of area availability in smart parking.

***Related Works:**

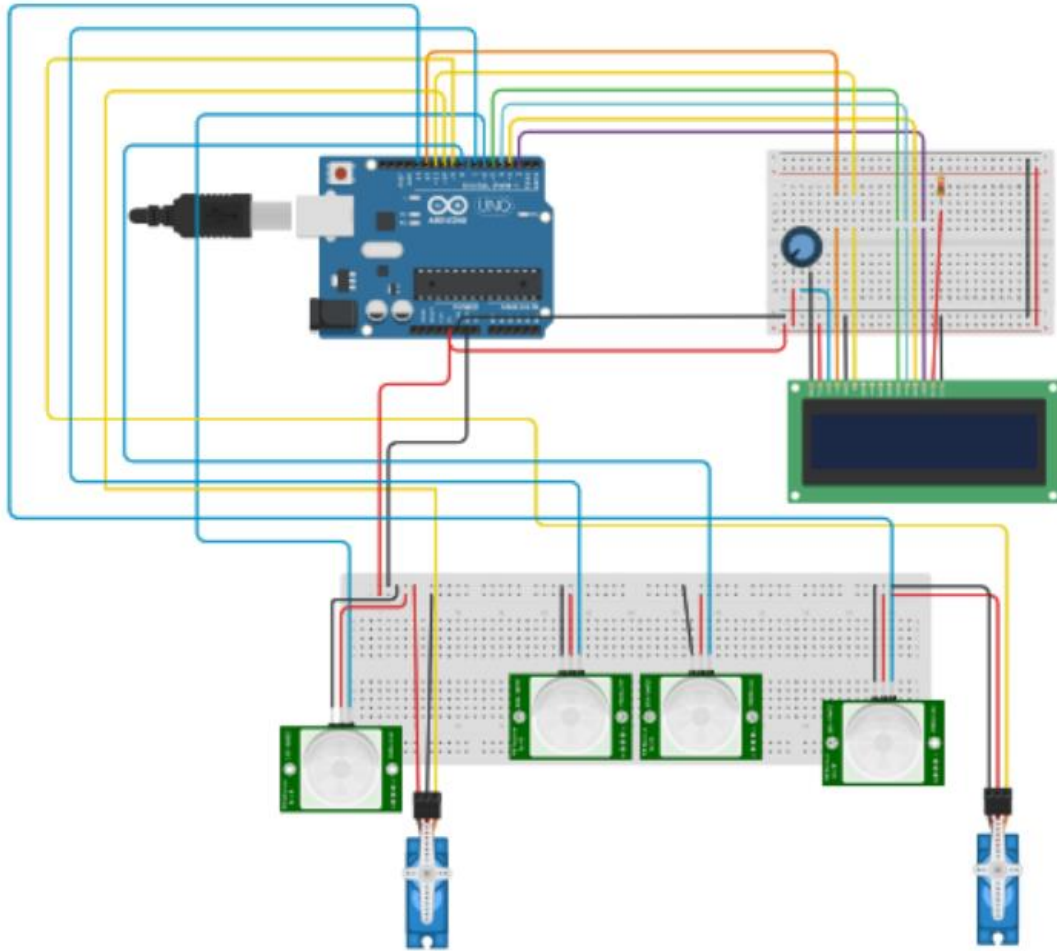
The detectors used in IoT grounded clever parking system stores and accesses statistics from remote locales with the help of the pall these rudiments deliver boost to pall of effects (Hut). The bumps may be covered and managed from any vicinity the machine that we advise affords information concerning the provision of the parking places with the help of the cellular software the guests from the away position can bespeak the parking places. An set of rules is used to growth effectiveness of pall- grounded parking machine and network structure generation is used. This set of rules is used to discover the smallest cost parking space. allowing about the volume of parking space available and also considering the gap of the parking area from the person. The person can without detention get admission to the pall- grounded garçon and discover the information at the parking space. The person also can installation an mileage of their cell phones to get admission to this statistics. With the help of this algorithm, staying time of the stoner to find a parking area can be minimized. protection factors are not covered on this paper. A wireless detector knot in confluence with smart telephone mileage is being used to discover the parking space. Considering that, wi-fi period is used then the device has inordinate delicacy and effectiveness. In this system, onboard widgets are used to communicate with other buses. The consumer premises his machine in any person of the several kudos to be had a mechanical carry lifts the auto out. A price label key and identity are given to the consumer and it's stylish honoured to the person that's used to recoup the auto. The consumer need no longer carry any paper price label due to the fact an Rfid card is given to the person. The technology used then costeffective. protection features ought to be advanced to guard the stoner's privateness. the author of smart parking device the check has divided sensor contrivance and vehicle detectors into calculation orders as protrusive detectors and non-protrusive detectors. Protrusive detectors are established in holes on the road face by means of tunnelling underneath the road. Non-intrusive detectors do now not affect the bottom of the road and it may be painlessly established and maintained. smart parking device allows us to remedy the grounding troubles of the callers traffic and it also reduces the emigration from a vehicle. A paper proposes effective manner to unfold the difficulty of parking vacuity in the factual time script and to lessen the time input. in this, the records is dispatched domestically with widgets which filters the data. This signal is transmitted over the pall for the procedure as well as for assessment which uses machine gaining knowledge of algorithms. This paper uses cell phone mileage that connects the stoner with the real time callers repute via Google API. Accordingly, keeping off business traffic. This paper does now not offer the reservation installation for the machine parking. Clever parking the operation of IoT technology enables to designs and develops a factual smart parking contrivance which affords statistics for vacant spaces and also enables the stoner to discover the closest vacuity.

This paper makes use of a pc imaginative and visionary to discover machine wide variety plate for you to enhance the protection. The stoner pays for the parking area former to the entry of the auto via mobile figure. thus, assuring the reservation of the parking. The person is notified about the parking position, number of places to be had and all other applicable data. The paper uses green algorithms and strategies for rooting enrolment law textbook. An algorithm operates at the ultrasonic detector discovery of the vehicle entering into the parking niche and calculates the minimal price for the consumer. Clever parking device grounded on reservation grant the reservation of a empty place which includes clever parking machine primarily grounded on reservation (SPSR). This consists of host parking database operation which collects and stores statistics about the motorist's identity and parking place. While the parking reservation time is about to expire a announcement will be transferred to the stoner via the web service that has been handed to the person through the admin. the main strike is that a many different person can enthrall a reticent parking area to avoid this QR scanners are used to discover the person. It allows us to advise a way in which the stoner can reserve his parking area through mentioning the holiday spot and the vehicle kind with the help of cellular programs. The booking word could be stored inside the pall which finds the shortest route from the person to the parking area, the position of the person is over to date regularly inside the pall with the help of GPS. whilst the stoner reaches the auto parking the Rfid is scrutinized and the person is permitted into the parking area. The billing is carried out through the pall garçon. The principle strike is that the machine parking space need to be registered within the clever parking system for the stoner to use it. This paper describes the perpetration of wireless detector networks (WSN) used in a auto parking machine with the help of a garçon that's using xbeezigbee. the machine parking system can discover the auto that is situated within the parking niche. The end of this assignment is to make it price important and consumer friendly. auto parking machine allows the stoner to maintain the records with ninety of accuracy. Smart machine parking system provides a complete parking answer for the stoner as well as admin of the parking region. It presents the point for a reticent parking niche and discover reticent person. on this, person can navigate to the nearest parking region depending upon the confines of the machine. The stoner can reserve parking niche primarily grounded on hourly, day by day, daily or yearly base.

***Methodology:**

Prediction of the hassle and the very last prediction is a combination (typically through weighted or unweighted vote) of alternative predictions. The prediction approach via combining the predictions of a set of person base fashions generally allows for extra solid and accurate output prediction due to the fact the mistake is a whole lot smaller than that supplied by one of the man or woman base fashions which form the general model. Certainly, the final ensemble based model corrects the mistakes made for my part through the primary fashions to notably lessen the whole blunders. To be effective, the simple fashions have to be pressured to fulfill situations particularly to be impartial and to be susceptible models. The preliminary idea become to divide the education data D into n simple statistics to train n fashions $m_1; m_2, \dots, m_n$. however this method become quickly exceeded because it promotes below-fitting whilst n turns into excessive. To conquer this restriction, there are techniques of re-sampling the education records into n unbiased and large statistics sub-samples to generate susceptible fashions. To do this, numerous strategies among which the maximum used acknowledged are: bagging and boosting. Hence, the maximum favorable algorithms for those conditions are unstable algorithms consisting of decision bushes and neural networks, a slight amendment of which within the statistics set makes it possible to reap a special version. The Fig. five illustrates the drift chart of a prediction gadget from a set-primarily based model. In the rest of this component we can gift our simple model which are the selection trees, then the two techniques of sampling (bagging and boosting) and ultimately our 3 fashions of set namely Random woodland regressor, Gradient boosting regressor and Ad boost regressors.

***Model Design:**



Chapter 3

Functionality/Working of Project

***System model of smart parking:**

The sensible parking gadget is an sensible parking gadget that uses a detection device to define the occupancy charge of the parking space. It enables the driver to park competently and informs him/ her of the availability of parking spaces thru suitable car control. thanks to shrewd technologies, optimized parking can reach the town center. A sensor gadget indicating to drivers in which the closest loose parking space is located has already been efficiently tested in multi store vehicle parks. avenue assessments are presently underway. In San Francisco, CA, 6000 sensors have been embedded within the asphalt and are operating along with an software and a GPS (Lin et al., 2017; Rodier and Shaheen, 2010). a complicated smart parking machine architecture wishes to have the following factors:

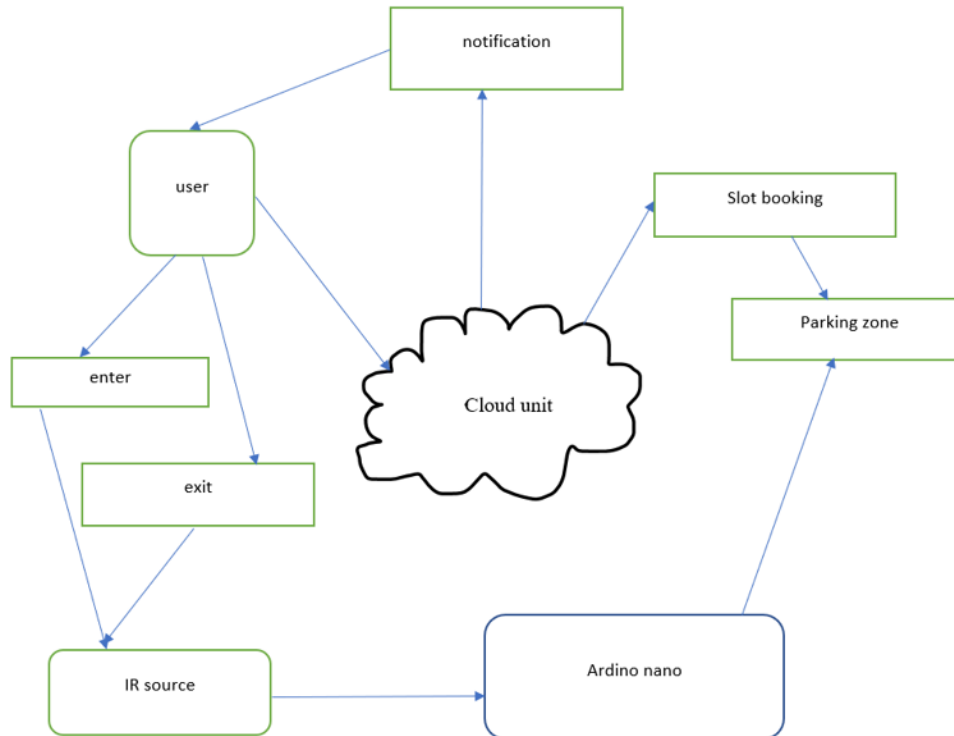
- 1.Sensor
- 2.Gateway hardware
- 3.Server/Cloud

***System Architecture**

A) Proposed System:

It consists of three sections: first section is the parking region which incorporates Arduino devices alongside IR sensor. The person interacts with the parking area with the assist of those devices. The person cannot enter the parking place without the assist of RFID card. the second one section contains the cloud based net services which acts a mediator among the person and parking area. The cloud is up to date relying upon the availability of the parking location. The admin administers the cloud offerings and it may additionally be considered through the person for checking the availability. The 0.33 section is the consumer facet. The user gets notification on the premise of the supply via SMS via GSM module.

Diagram 1st :



B. Hardware:

The three main tackle complements used are GMS module, RFID card, IR detectors. A consumer is allowed inside a parking area most effective if the person has a RFID card. RFID card contains the records of the registered stoner. As the auto enters the parking niche, anthology system scans the registered stoner's RFID label. The statistics is transferred to the Arduino for checking the force of the bus parking and contemporaneously, the person is notified thru SMS about the fissionability of the parking area. The GSM module sends the communication harmonious with the vacuity. IR detector sends the signals in keeping with the presence of the auto.

Diagram 2nd:

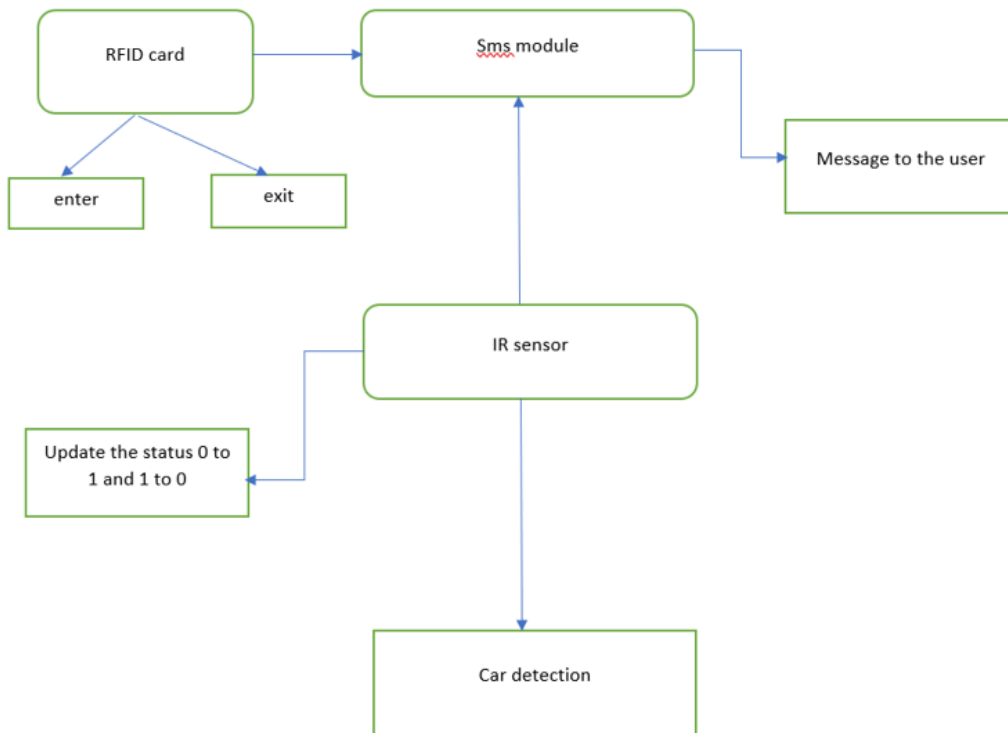


Diagram 3rd: Digital logic circuit

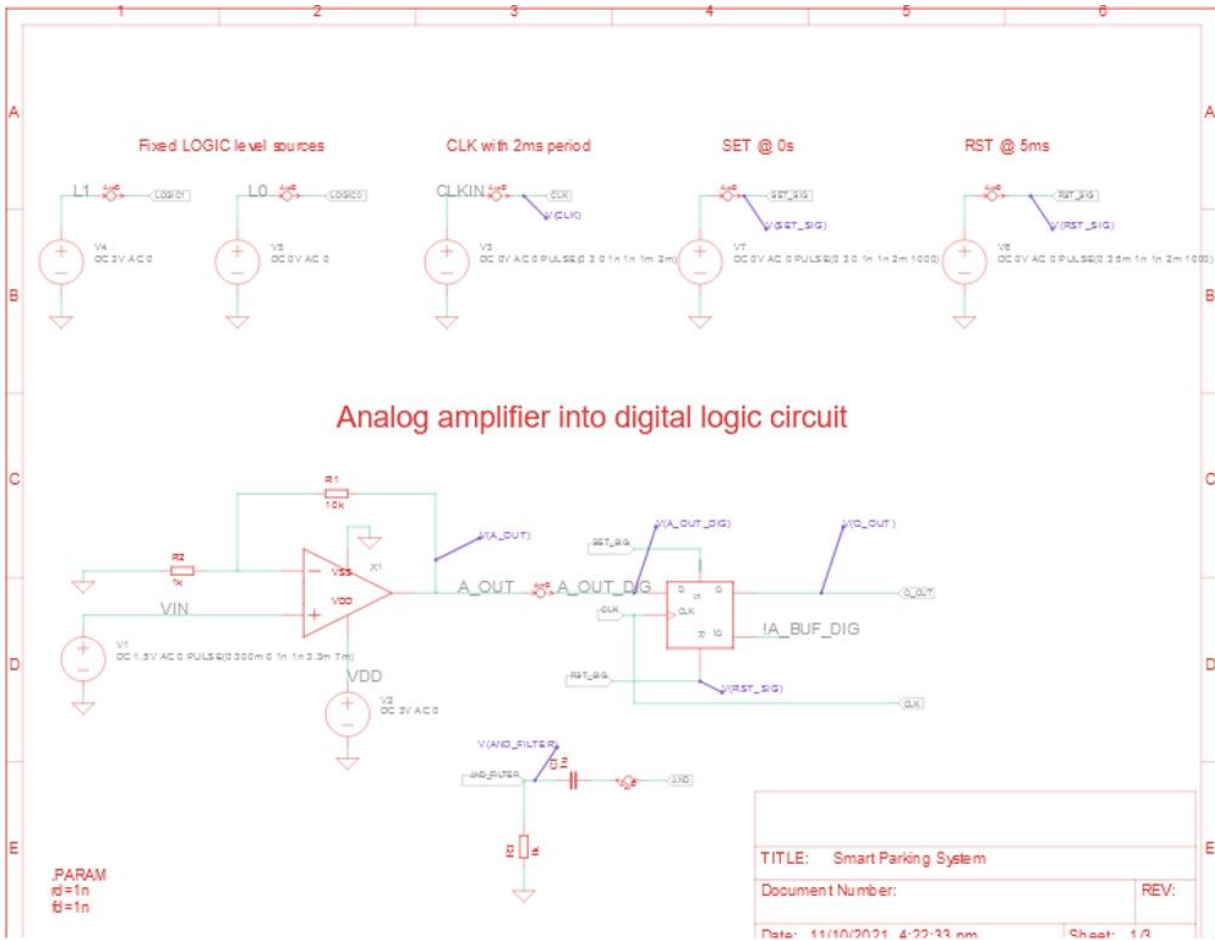


Diagram 4th: Graphical representation of smart parking system

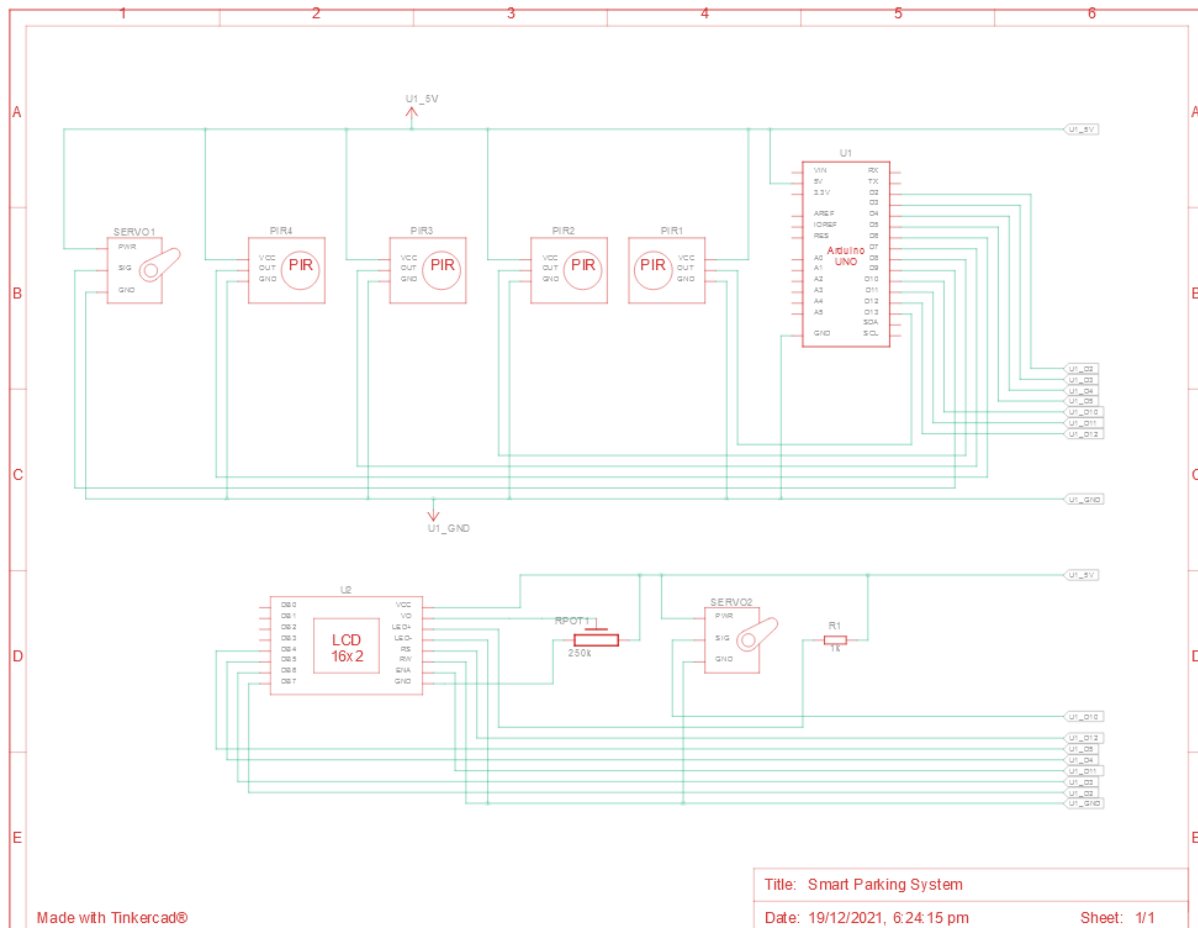
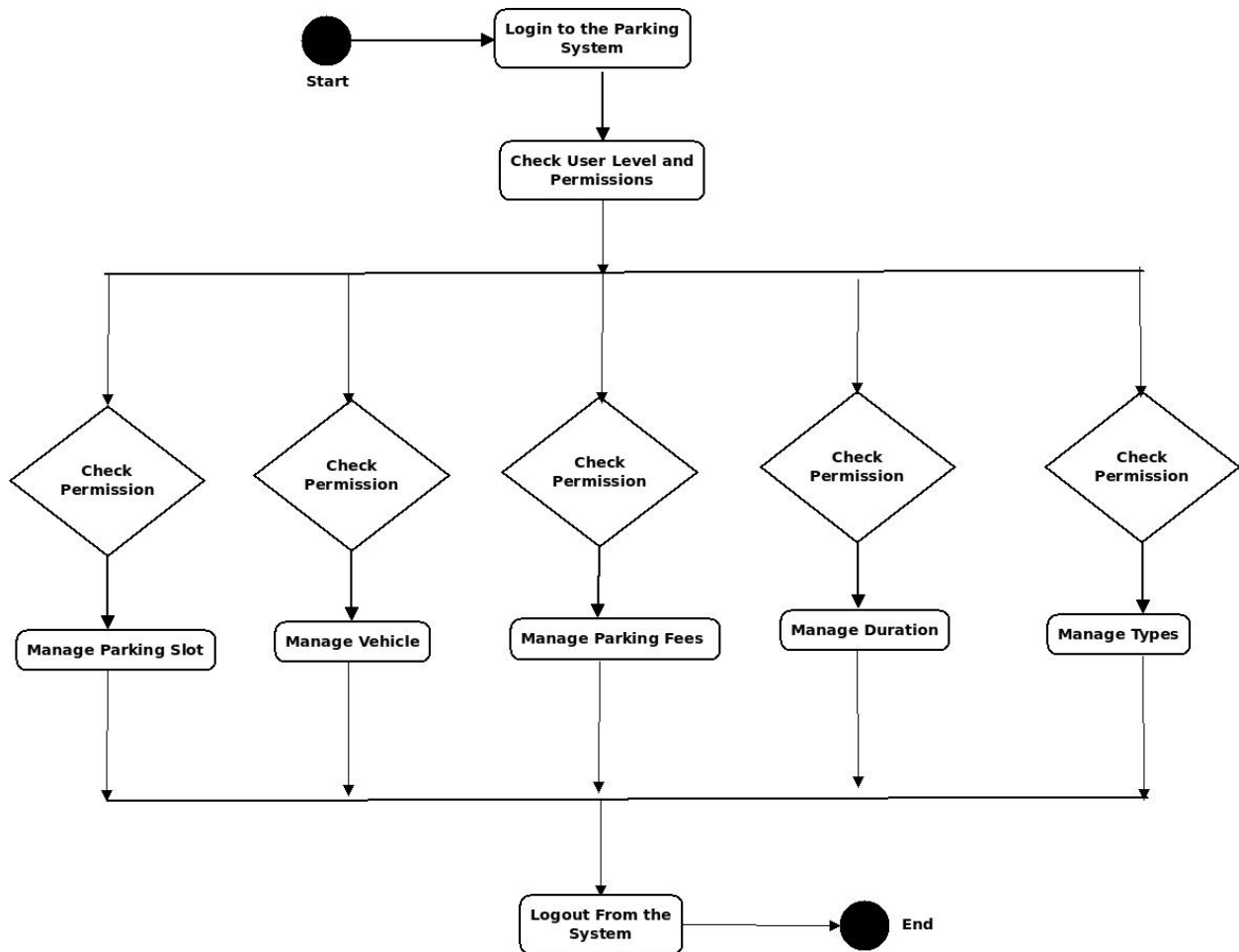


Diagram 5th: Activity Diagram



Activity Diagram for Parking System

Diagram 6th: Use Case Diagram

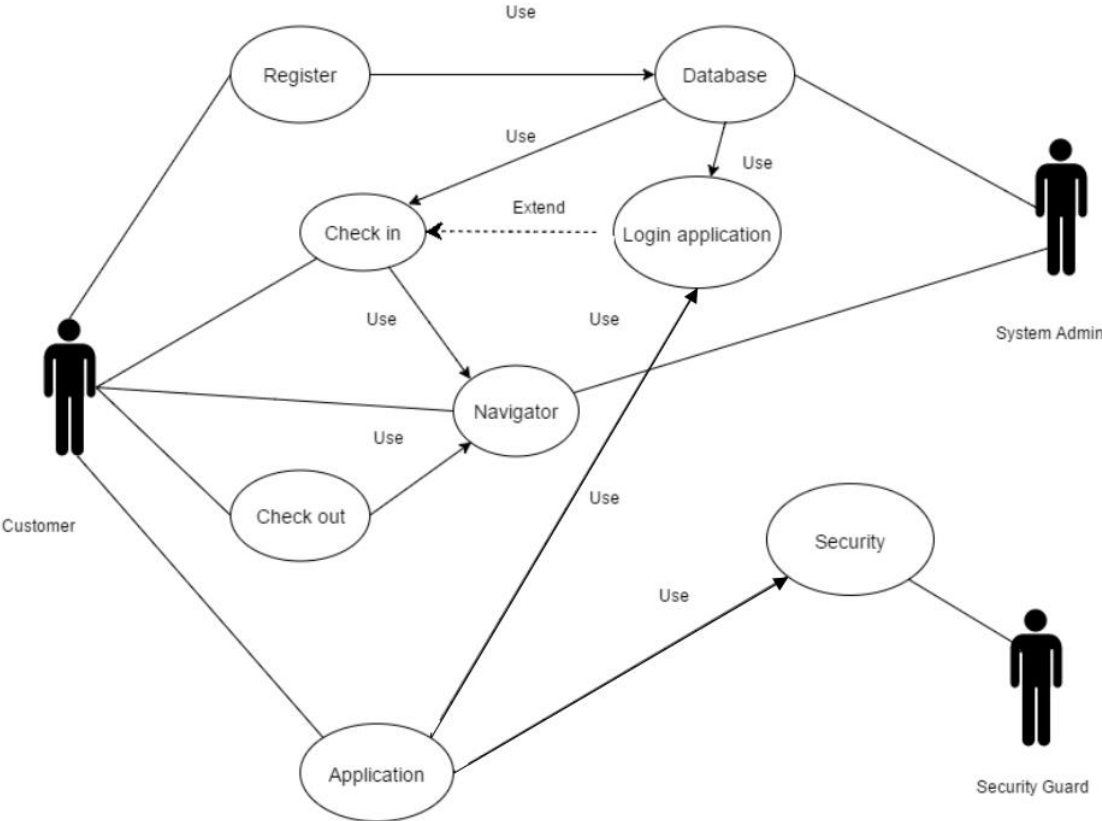
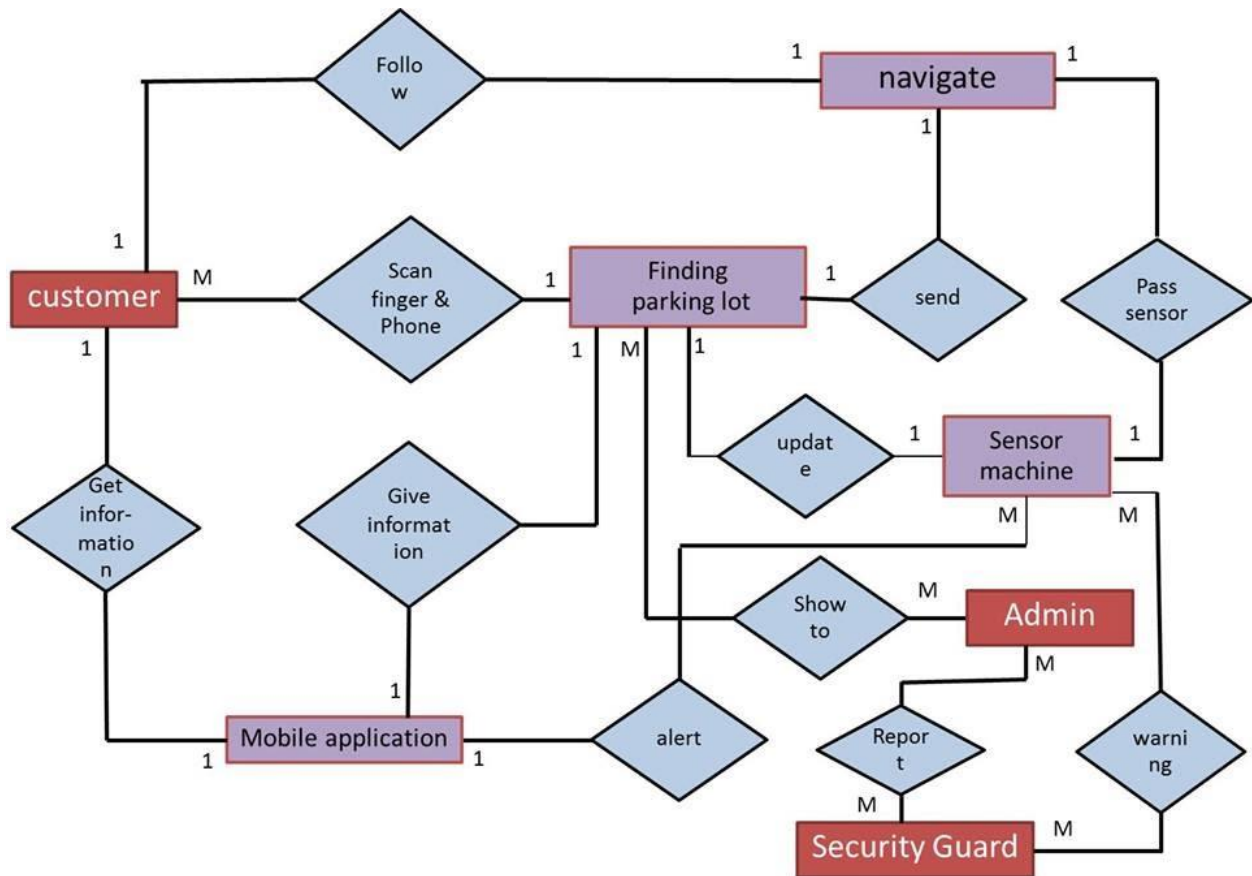


Diagram 7th: ER Diagram



***Source Code:**

```
//include the library code:

#include<LiquidCrystal.h>

#include<Servo.h>//Library for the servo motor

Servo S1,S2; //Object of type servo

#define IR_Slot1 7 //Defines pins

#define IR_Slot2 8

#define IR_entry 6

#define IR_exit 13

int pos=0; //Initial position of servo motor

//initialize the library with the number of the interface pins

LiquidCrystal lcd(12, 11, 5, 4, 3, 2);

void setup(){

    S1.attach(10); //Servo 1 on 10 pin

    S2.attach(9); //Servo 2 on 9 pin

    S1.write(pos); //Initial position at 0 for both motors

    S2.write(pos);

    pinMode(IR_Slot1, INPUT); //Pin modes

    pinMode(IR_Slot2, INPUT);

    pinMode(IR_entry, INPUT);
```

```
pinMode(IR_exit, INPUT);

lcd.begin(16,2); //Initialize the 16 x 2 lcd

//Print a message to the LCD.

lcd.print(" Smart Parking ");

lcd.setCursor(0 , 1); //Set cursor to column 1 , row 2

lcd.print(" System");

delay(2000);

lcd.clear(); //Clear the lcd screen

lcd.setCursor(0, 0); //Set cursor to column 1 , row 0

lcd.print("Slot 1 = A");

lcd.setCursor(0,1); //Set cursor to column 1 , row 1

lcd.print("Slot 2 = A");

delay(2000);

}

void loop()

{

if (digitalRead(IR_Slot1)== HIGH)

{

lcd.setCursor(0 , 0);

lcd.print("Slot 1 = NA");
```

```
}  
  
else  
  
{  
  
    lcd.setCursor(0 , 0);  
  
    lcd.print("Slot 1 = A");  
  
}  
  
if (digitalRead(IR_Slot2)==HIGH)  
  
{  
  
    lcd.setCursor(0 , 1);  
  
    lcd.print("Slot 2 = NA");  
  
}  
  
else  
  
{  
  
    lcd.setCursor(0 , 1);  
  
    lcd.print(" Slot 2 = A");  
  
}  
  
if(digitalRead(IR_entry)==HIGH)  
  
{  
  
    S1.write(pos+90);  
  
}
```

```
else
{
  S1.write(pos);
}
if (digitalRead(IR_exit)==HIGH)
{
  S2.write(pos+90);
}
else
{
  S2.write(pos);
}
}
```

***Libraires Used:**

IRremote = Library to decode IR sensors.

LiquidCrystal = Controlling liquid crystal displays (LCDs).

Keypad = Allows reading keypad button pushes.

NeoPixel = Controlling NeoPixel LEDs.

Servo = Controlling servo motors.

SoftwareSerial = Allow serial communication on other digital pins of the Arduino.

Wire = This library allows you to communicate with I2C / TWI devices.

SD = The SD library allows for reading from and writing to SD cards.

SPI = Communicating with devices using the Serial Peripheral Interface (SPI) Bus.

Stepper = Controlling stepper motors.

***Algorithm:**

Step 1: Encode the answer, the usage of binary encoding scheme.

Step 2: Generate population of answer where every man or woman within the population may be a binary encoded solution.

Step 3: Practice wheel selection to select the first-rate man or woman to try to mating and generate offspring.

a) Calculate the health fee of every solution the usage of the defined health function.

b) Calculate the chance of choice, chance percent and predicted remember of the individuals. Determine the particular count after making use of wheel selection.

Step 4: Create the mating pool by means of choosing the character based totally at the important count. Generate offspring by way of applying three determine crossover to the individuals inside the mating pool.

Step 5: Calculate the entire and customary fitness price of the offspring.

Step 6: Create the next technology of offspring based totally at the fitness price.

Step 7: Repeat step 3 to Step 5 till most generation is reached and return the foremost reliable solution.

Chapter 4

Conclusion

The excellent Cities have forever been a dream for human. From beyond years huge improvements are created in growing clever towns a reality. the enlargement of net of Things And Cloud technology have flip out to new possibilities in phrases of clever towns. excellent parking and site visitors control structures have usually been on the middle of in improvement clever towns. at some point of this paper, we have a tendency to deal with the hassle of parking and present an IoT based totally Cloud incorporated clever parking machine. The machine that we recommend offers actual time data regarding handiness of parking slots during a parking area. Users from a lot places may book a parking slot for them through exploitation of cellular application. The efforts created during this paper are indented to boost the parking centres of a city and thereby aiming to decorate the pleasant of length of its people. Calculate the health fee of every solution the independent trolley system and therefore the genetic set of rules implementation to locate the fine parking slot, make the proposed machine efficient in phrases of space utilization and trolley performance. Genetic set of rules assist the proposed gadget to optimize the searching process for the fine vicinity without plenty time wastage. The independent trolley machine reduces the waiting time of the purchaser in queue. The purchaser can depart their vehicle at the doorway and therefore the parking are going to be taken care by way of the clever trolley. The queuing idea is applied to derive the usage, efficiency and prepared time factor of the machine. Destiny paintings consists of more considerable investigation and modeling about parking allocation model, i.e., calibrating parking disutility feature for IPA answers depending via neighborhoods capabilities. further considerations it might be make about assessment of the sales of the parking site. Usage of the defined health function.

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