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MONETIZATION OF PARKING SLOTS USING IOT EDGE DEVICES

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ABSTRACT

We propose a new "smart parking" system for an urban living environment. The system will assign and reserves an particular parking space for a driver which is based on the smart parking system on the user's requirements that combine proximity to destination and parking cost, while also ensuring that the overall parking capacity is efficiently utilized. Our approach solves a problem at each decision point in a time-driven sequence. The solution of each individual car is an optimal allocation based on current state information and subject to random events such as new user requests or parking spaces becoming available.

The allocation is updated at the next decision point ensuring that there is no resource reservation conflict and that no user is ever assigned a resource with higher than the current cost where a customer is already assigned. Implementation issues including parking detection, reservation guarantee and Vehicle-to-model or, model-to-Vehicle communication are resolved in the paper. Our system can save driver time, fuel and expense, while reducing the traffic congestion and environment pollution.

The android app which is build for our particular application will help us to define the overall functioning of the model developed, this app gives the overall control of the smart parking system where a user can book his particular slot, calculate the amount of cost for a given period of time etc. This efficiently enhances the overall working of the model.

Keywords : *parking slots, ESP8266, Firebase, LCD panel,Android App.*

I. INTRODUCTION

The first and principal essential issue which stimulated us to try this undertaking changed into our very own non-public hobby withinside the subject of IOT and Application. Secondly, changed into the choice to construct a gadget which could assist to resolve actual international troubles being confronted on a normal foundation through the customers of the gadget.

In the traditional method of the billing gadget changed into hour primarily based totally.If someone needed to park a vehicle for 10 minutes,he/she could ought to pay the rate for one hour.Thus,this hassle changed into addressed through billing the patron for a set determine for first 10 to half-hour the price is30 Rs.Then,from subsequent 10 minutes, 1 Rs/min.Thus for a length of one hour, the price could be 60Rs. Thus the patron might be benefited and additionally the parking proprietor will now no longer move below loss accordingly.

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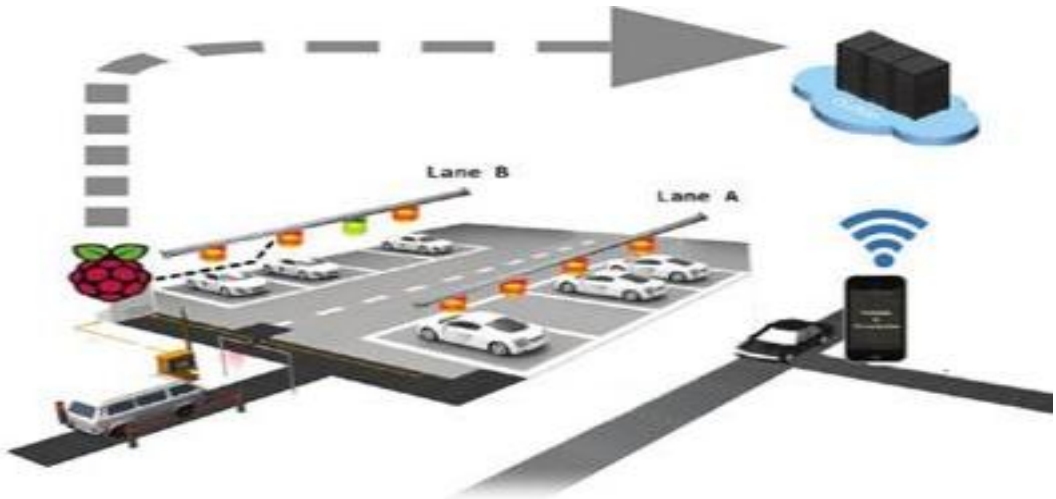
The fundamental goals desires to be taken into consideration for growing this gadget are

• To layout and expand an android app to pick a parking slot, ee-e book the slot and pay the rate dues, and additionally to expand an IOT aspect tool which calculate the rate primarily based totally at the length of the time for which the automobile is parked at any slot

• To provide secure and stable parking slots inside restrained vicinity.

• To automate and reduce time spent manually attempting to find the most fulfilling parking floor, spot or even lot.

• To offer a green parking in order that most area is utilized. Parking slot System



Parking slot System

II. LITERATURE REVIEW

The Smart Car parking [1] gadget is a gadget this is used to assist handling motors in parking vicinity in different to avoid congestion and set up motors in an allotted position. The gadget additionally enables to tune what number of motorsbyskip thru the gate and the length taken through every, after which it's going to calculate the quantity of cash a vehicle have to pay whilst exiting. Car parking gadget is getting used in lots of congested vicinity or vicinity wherein there are numerous meeting factor of human beings like wherein there are multiple purchasing complicated close to to every different or wherein there may be megamall ,theatres, stadium. When we talk approximately current vehicle parking gadget In many towns today, numerous vehicle parking structures may be found in one of a kind parking regions or complicated.

The parking structures assist each the customers and [2] the drivers to have a conducive and unfastened surroundings for his or her parking sports the use of. Thus, the writer has determined to pick the subsequent parking gadget to examine for his overview of the prevailing structures as an instance we've Sunway pyramid vehicle parking gadget The preferred traits that a clever parking gadget have to include in it are to allow the

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driving force to collect price price tag upon front: vehicle Parking gadget have to be capable of permit the driving force to get his price price tag after he press the button of the gate barrier. The gadget have to document the whole motors that byskip thru the front. The gadget have to permit the gate to open on every occasion a driving force has press the button and take his price price tag. Allow the drivers to make charge: if it's of business use, the gadget have to allow the drivers to make charge in their expenses before exiting.

Allow the driving force to go out:[4] if the driving force has paid his expenses and require exiting, the gadget have to open the gate to permit him exiting. The fundamental procees in a clever vehicle parking gadget is that the patron presses the button at the machine; price price tag will pop out from it and the patron take his price price tag after which the gate will open. The patron will now continue to the to be had area. The to be had areas are regarded through the inexperienced mild bulb on pinnacle of every to be had lot. The red mild on pinnacle of parking zone suggest both the gap is being reserved or there may be vehicle parked at it.For the technique of exiting, if the patron is the use of "contact and move" (Malaysian pay as you go card), there may be a sensor furnished which will study the cardboard and if there may be sufficient cash the gadget will deduct the quantity of the expenses.But if the patron goes to pay coins there are to be had paying machines which the patron will insert his price price tag and the gadget will study the price price tag, estimate the hours spent and calculate the quantity to be paid through the patron.

Customer have to insert the [5] cash said through the gadget into machine. The gadget will validate the price price tag and assign 15minutes on it that's sufficient for someone to his automobile to the closest go out gate. The most important blessings of a clever vehicle parking gadget The computerized parking gadget will increase the variety of motors that may be parked in a garage. It affords extra parking areas because the motors are nicely organised parkedIf you use computerized parking gadget, you'll want handiest a much less vicinity of land for constructing a garage.This gadget permits secure parking of motors in comparison to the ramp-fashion parking centers. This approach of parking is so handy for the drivers and that they want now no longer ought to stroll searching for parking areas. This gadget reduces the preservation expenses of the garages because it extensively lowers the air flow and lights necessities and no want of highly-priced deck repairs as nicely. As stated earlier, the possibilities of automobile getting broken because of incorrect parking are significantly reduced in computerized vehicle parking gadget.

In order to resolve the ones troubles is through the use of the pc-primarily based totally gadget with a few extra functions or functionality. [6] Some of the functions are through Assigning the bay variety to a vehicle from the front gate.Synchronizing the unfastened parking zones after the holiday of every vehicle.To remove the lengthy touring of automobile through assigning the automobile to the closest feasible lot.The use of sensor at every lot

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may be prevented considering that the automobile is being assigned to a selected lot. There through lowering the price of growing and the price of retaining the vicinity.Also like said withinside the examine of COINS gadget mild may be very vital to sensor as it enables in detecting the presence of automobile.

III.SYSTEM ARCHITECTURE

The below mentioned components constitutes a smart parking area. The parking system implementation shows that the communication happens between various actors. The primary actors that constitute the parking slotsare ESP8266,IR Sensors, LCD Display, HTTP, Firebase, Android studio.

Parking Sensors: For our parking system we have made use of sensors like Infrared, Passive Infrared(PIR) and Ultrasonic Sensors. The work of these sensors is to sense the parking area and determine whether a parking slot is vacant or not. In this case we are using ultrasonic sensors to detect the presence of a car. The ultrasonic sensors are wirelessly connected to arduino using the ESP8266 chip. An WiFi chip consists of a self contained SOC and integrated TCP/IP protocol stack. The chip allows any microcontroller to access a WiFi network. The sensors are connected to a 5V supply either from arduino or an external source. External source is more prefered..

HTTP: HTTP is a protocol which allows the fetching of resources, such as HTML documents. It is the foundation of any data exchange on the Web and it is a client-server protocol, which means requests are initiated by the recipient, usually the Web browser. A complete document is reconstructed from the different sub-documents fetched, for instance text, layout description, images, videos, scripts, and more

LCD Display: The LCD Display acts like an interface for the end users to interact with the system. The LCD display is developed in Android Studio and Java as a programming language. The application is connected with the SQL server through a secure channel and a 2 factor authorization. The purpose of this LCD application is to provide information regarding availability of parking spaces and allowing the end user to book a slot accordingly. Transfer of data takes place in JSON format between SQL server and the developed application. In order to ensure proper communication both the Arduino and LCD application must be subscribed to a particular channel on SQL server. Here based on the display the vacant spots in the area is being displayed to the user and correspondingly filling occurs.

FIREBASE: Firebase is a Backend-as-a-Service — BaaS — that started as a YC11 startup and grew up into a next-generation app-development platform on Google Cloud Platform.. Firebase frees developers to focus crafting fantastic user experiences. You don’t need to manage servers. You don’t need to write APIs. Firebase is your server, your API and your datastore, all written so generically that you can modify it to suit most needs. Yeah, you’ll occasionally need to use other bits of the Google Cloud for your advanced applications. Firebase

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can't be everything to everybody. Firebase provides for following services:

. Firebase Auth which is used for sign in /sign up.

. real time database(no SQL)

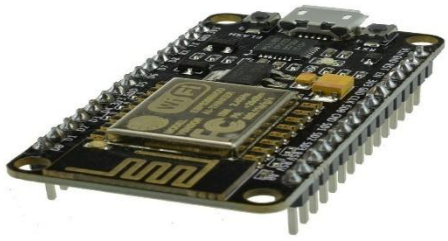
. FCM(firebase cloud messaging notifications)

REST API : An API is an application programming interface. It is a set of rules that allow programs to talk to each other. The developer creates the API on the server and allows the client to talk to it.REST determines how the API looks like. It stands for "Representational State Transfer". It is a set of rules that developers follow when they create their API. One of these rules states that you should be able to get a piece of data (called a resource) when you link to a specific URL.

ANDROID STUDIO: Android Studio is the official Integrated Development Environment (IDE) for android application development. Android Studio provides more features that enhance our productivity while building Android apps

Android Studio is also capable of running some debug routines and running the APK file from within the interface. In all, Android Studio is an extremely comprehensive software development kit that has not just emulation and graphical layout previews but also a large number of tips and code samples for creating, polishing and testing Android applications.

ESP8266: The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems in Shanghai, China.. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker.



BUZZER: A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

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IV.BLOCK DIAGRAM:

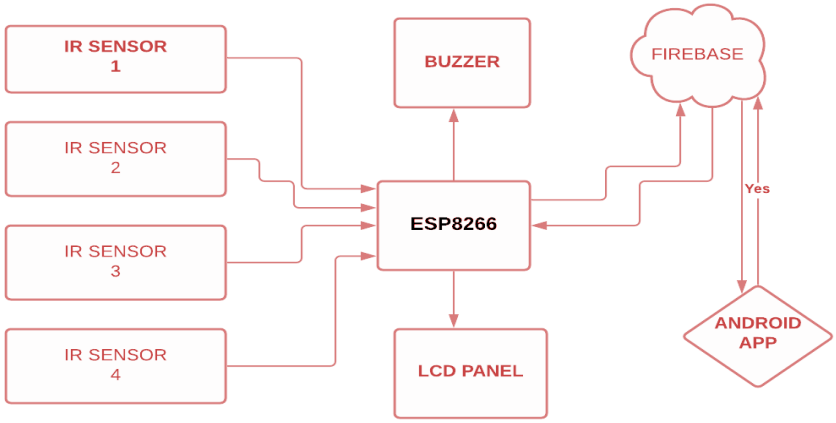

Figure 1:Block diagram of the Monetization of parking Slot

V. METHOD STRATEGY

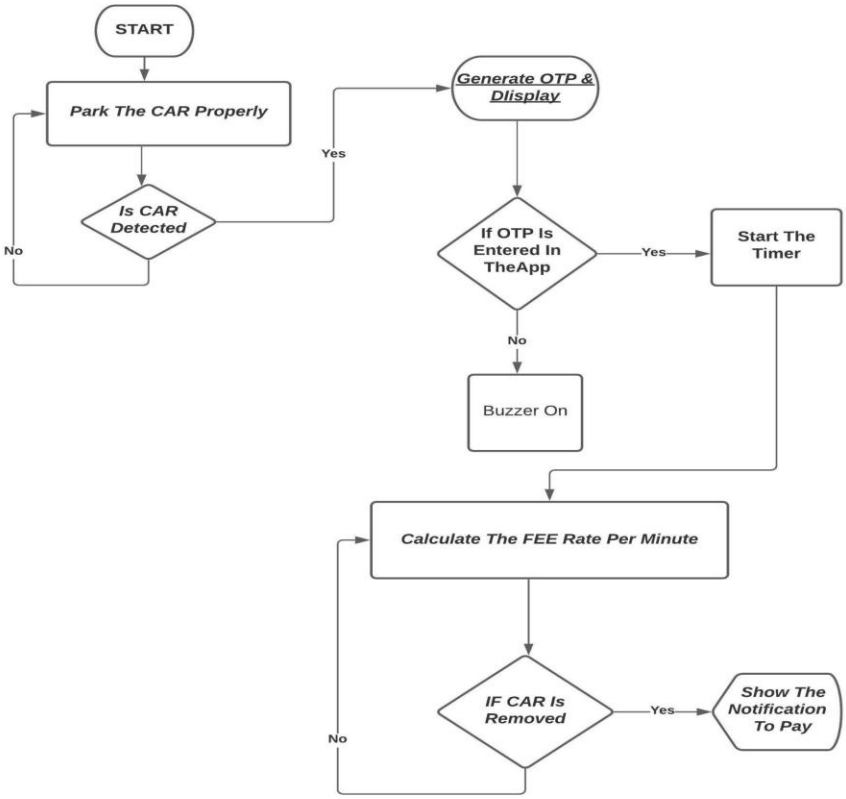

Figure 2: Flow Chart of Parking Slot

Monetizing the parking slots brings advantage to the consumers to pay only for the time for which they park the vehicle. It provides an opportunity to implement state-of-the-art technology to solve the program. This

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technology works similar to bounce and other products in terms of software and hardware implementation.

This Iot based project is subdivided into categories . Hardware implementation and its software support. Every parking slot in a parking area has a IOT hardware interface with a LCD panel,Irsensor and a Buzzer. The Iot hardware which we have used is ESP8266 is connected with the internet.

The IR Sensor is placed on the ground below the surface level, protecting itself from the damage while parking cars. These IR sensors detect the presence of cars. If the IR signals transmitted by the sensor are received due to the presence of a reflector, then it means there is a presence of a car above the sensor. When the ir signal is detected, it sends a HIGH signal to the microcontroller (ESP8266). ESP8266 generates a 4 to 6 digit OTP, which is updated to the Firebase Realtime database. ESP8266 also initiates the timer. The timer provides 1:30 seconds for the user to provide the otp from their phones to authenticate their identity and initiate the billing.

The billing will happen based on the time for which the parking slot is occupied with the car. If the user does not provide the OTP in the time given to him, the buzzer will beep until he authenticates the parking of the car.

He/she should open the app. If the person is not a user of the app before, then must be directed to the registration page. If he is a user of the app, then he should be able to provide the login credentials. Once he is authenticated, then he/she should be able to select the slot, provide the otp and finish authenticating the parking slot with his/her car.

He should be able to view the bill which is being calculated in real time. Once the car is removed from the slot, a notification should be sent from the firebase, to pay the bill.

The cloud used here is Firebase. Firebase is a backend-as-a-service platform, where the developers need not program the server. All the services are provided by the firebase product. They offer realtime database, Authentication, storage access.

The communication which takes place between the hardware and the cloud is HTTP methods. The data is streamed in realtime between the server and the client (esp8266).

Figure 3: Parking Slot With IR sensor and LCD Display

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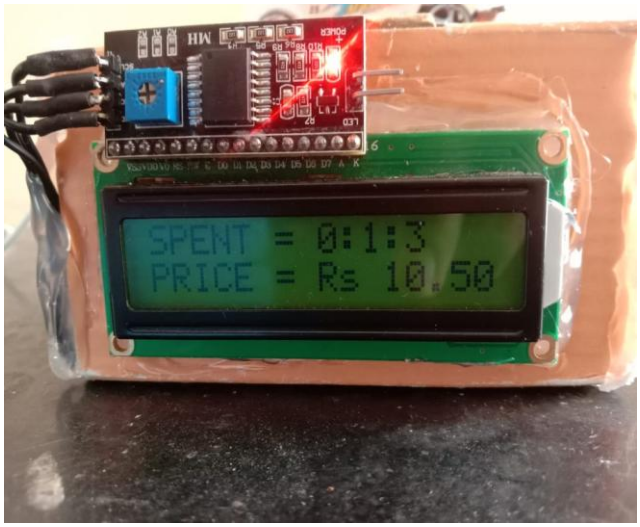

Figure 4:Time Spent by the Car in Parking Slot

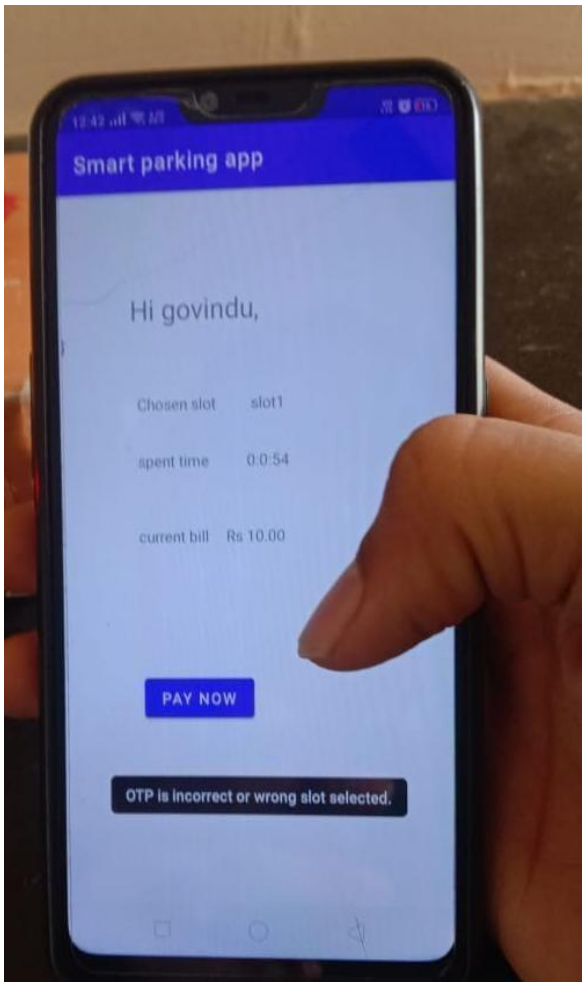

Figure 5: Smart parking App for Paying Amount

VI.CHALLENGES

There are major challenges facing today's transportation systems and drivers on a daily basis regarding special parking systems for which smart city engineers and designers have to be prepared. Numerous innovations have led to the conclusion that new smart parking systems are needed in almost every metropolitan city in the world especially in the next ten years to alleviate many problems, such as petrol consumption and pollution emission,have been increasing in a rapid rate and to improve time-saving and reduce frustration when looking for a parking space. Therefore, for any proposed system to be considered a really smart in relation to the parking process, it should have as a minimum, the following factors and specifications: .

1. Be able to accurately sense vehicle occupancy in real-time .
2. Provide guidance for users about available parking.
3. Simplify the parking experience and add value for parking stakeholders, such as drivers .
4. Enable intelligent decisions to be made using data, including real–time status applications, and historical analytic reports .

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VII.CONCLUSION

Smart parking systems gives rise to new solutions with the help of Internet of things . The system have always been at the core of constructing smart cities. In this paper, we address the issue of parking. It presents an IoT based Cloud integrated smart parking system. The system provides real time information regarding availability of parking slots in a particular parking area. With the help of this mobile application user can book a parking slot for them from remote location. The efforts made in this paper are indented to improve the parking facilities of a city and thereby aiming to enhance the quality This designed automatic smart parking system which is simple, economic and provides effective solution to reduce carbon footprints in the atmosphere. It is well integrated to access and map the status of parking slots from any remote location through web browser. Thus it reduces the crisis of car parking across a remote city and also it eliminates unnecessary travelling of vehicles across the filled parking slots in a city. So it reduces time and it is cost effective also.

So here we are building an **IoT based Car Parking Slot using ESP2866**, four IR sensors, one Buzzer, and one LCD panel. Four IR sensors are used at the parking slots to detect the car for parking slot availability.Buzzer is used to make sound if OTP is not entered.LCD panel is used to display the OTP. Here we are using many components to publish the data on the cloud which can be monitored from anywhere in the world.

VIII. ACKNOWLEDGEMENTS

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