

SMART PARKING USING IoT

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ABSTRACT

Parking issues are a typical issue in most real urban areas. The constrained accessibility of parking spot brings about movement clog, air contamination, tedious and in addition economy of the country. The cost for stopping development is typically restrictively or to a great degree high. All above different issues can be overwhelmed by developing a stopping territory that is inserted with Wireless Sensor Network Technology. Auto stop administration frameworks is worked by observing the accessibility of auto parking spots and making that data accessible to clients and office heads. The entire framework depends on Wi-fi organize. The android application in portable is additionally given to the client to check the accessibility of free space for stopping and book that opening as needs be. The objective is to build an auto parking framework which is furnished with sensors and gives observation.

KEYWORDS: Infrared Sensor (IR), Wireless Sensor Networks (WSN), Radio Frequency Identification Tag (RFID Tag), Radio Frequency Reader, Android Application In Mobile, Wi-Fi.

INTRODUCTION

The concept of Internet of thing (IoT) [9] started with the identity communication devices. The devices could be tracked, controlled or monitor using remote computers connected through Internet. The two words in IoT are 'Internet' and 'Things' in which Internet means the vast world's network of connected servers, computers, tablets, mobiles using an internationally used protocols and connecting the systems enabling sending, receiving and communication of information. It provides a vision where things become smart and behave like alive through sensing computing and communication by embedding small devices which has an interaction with the remote objects and persons through connectivity.

Physical object + Controller, Sensor and Actuators + Internet = Internet Of Things

Savvy urban areas identified with auto parking office and movement control administration has turned into the significant issue. In huge urban communities pursuing for an accessible stopping opening is dependably isn't simple for drivers and it has a tendency to end up troublesome with expanding number of client having their own autos. This circumstance could be accepted as an open door so as to make progression in the effectiveness of stopping assets which will diminish the looking time, movement clog and street mischances.

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The drivers can be educated ahead of time about the accessibility of to their goal. Stopping is a costly procedure as far as cash, time and endeavors made for looking free spot. A current study has mirrored an expansion in number of creative thoughts identified with stopping framework. The savvy stopping framework proposed in this report is completed utilizing portable application associated with Wi-Fi [1]. The Wi-Fi organize has different favorable circumstances like adaptability, innate insight, ease, fast arrangement and all the more detecting point, extraordinarily in a territory where wired correspondence isn't conceivable.

In this work the most widely used sensors are Infra-Red (IR) sensors. These sensors are used for monitoring the vacancy of parking slot. The reason for using these sensors is they are cheap and use less memory as compared to camera if

used as sensors. The sensor will monitor that whether the car is parked or the slot is empty. If the slot is empty, then the sensor would sense it and give the notice to controller and controller will activate the LEDs as per the notification. If the car is parked in any slot then the LED would glow as RED showing that slot is not empty, otherwise when the slot would be empty or available it will glow GREEN [4] The mobile application used by the user acts like the interface for the end users to interact with the whole system. The Android Application is simply design to see and choose the slot for parking before arrival to the destination. It would be for the user to decide which slot is convenient for exit during departure. Doing this will save time as well as the fuel and also it would not arise the traffic congestion problem [4].



Figure 1. Smart Parkin

LITERATURE REVIEW

Numerous analysts in their different works expounded essentially the issue of actualizing dependable stopping direction and data frameworks, by finding the empty space in parking areas and additionally passing on such data to the auto proprietors. The current works can be extensively arranged in two territories, Wireless sensor network- based systems and Camera-based systems. R.E. Barone, T.Giuffrè,

S.M.Siniscalchi, M. A.Morgano, and G.Tesoriere in their research "Architecture for parking management in smart cities" [2]. They proposed intelligent parking assistant (IPA) architecture with the aim of providing public parking management solutions. This engineering gives drivers data in regards to on-road stopping slow down accessibility and enables drivers to hold the most helpful stopping slow down at their goal just before their takeoff. They utilize RFID innovation in

this framework. At the point when an auto stops or leaves the IPA parking garage, the RFID peruser and attractive circle distinguish the activity after all send the data to the unit controller for data refresh on the auto status. In this engineering, no extensive scale stopping framework that is made and just basic scientific conditions are utilized.

L. Lambrinos and L. Dosis, DisAssist: an author of SPS, "An Internet of Things and mobile communications platform for disabled parking space management," [5] described a smart parking system-based on the internet of things technology. Zigbeewireless sensor network were used in this architecture as well as internet of things middle layer and front-end layer as the final user interface which provides data reporting to the user D. J. Bonde, R. S. Shende, K. S. Gaikwad, A. S.Kedari, and A. U. Bhokre, "Automated car parking system commanded by Android application," [6] aimed at automating the car and parking. The research presents a miniature model of an automated car parking system that can regulate and manage the number of cars which can be parked in a given area at any specific time based-on the availability of parking spaces.

The automated parking is a method which facilitates in parking and exiting cars using sensing devices. Both entering and leaving the auto stopping is charged by an Android based application. This brings a distinction from D. J. Bonde framework and the others, which is the others aim. Where were meaning to plan a framework which is small depending to the human, they expected to mechanize the auto and the whole stopping in opposition to

different creators who it doesn't mind about computerization. Not to overlook a significant part of the disadvantages of the framework, for example, the driver needs to sit tight at the stopping entryway for distinguishing proof of empty parcel and noreservation of parking area which can encourage auto proprietors to spare time.

Mohammed Y Aalsalem, WazirZadaKhan, Khalid Mohammed Dhabbah both proposed SPS "An Automated Vehicle Parking Monitoring and Management System Using ANPR Cameras" [7], An Automatic number plate acknowledgment cameras are utilized to successfully oversee, screen and ensure the stopping offices, Android application is utilized to encourage the drivers in recollecting their stopping opening, be that as it may, No offices for searchers of empty parking spot, The framework is constrained in short separation since it doesn't give any data to the approaching drivers about the ebb and flow circumstance of the parking garages. Thanh Nam Pham, Ming-Fong Tsai¹, Der-Jiunn Deng² are the creator of "A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies" [8], Internet of things innovation is connected to facilitate the correspondence as the creators demonstrated, Performance is enhanced by diminishing the quantity of clients that neglect to discover a parking spot, Minimizes the expenses to the drivers of moving to the parking spots.

PROPOSED WORK

The smart parking system (SPS) considered for this work is built around a sensor-based method and designed isbased on a multi-layer framework as shown below.

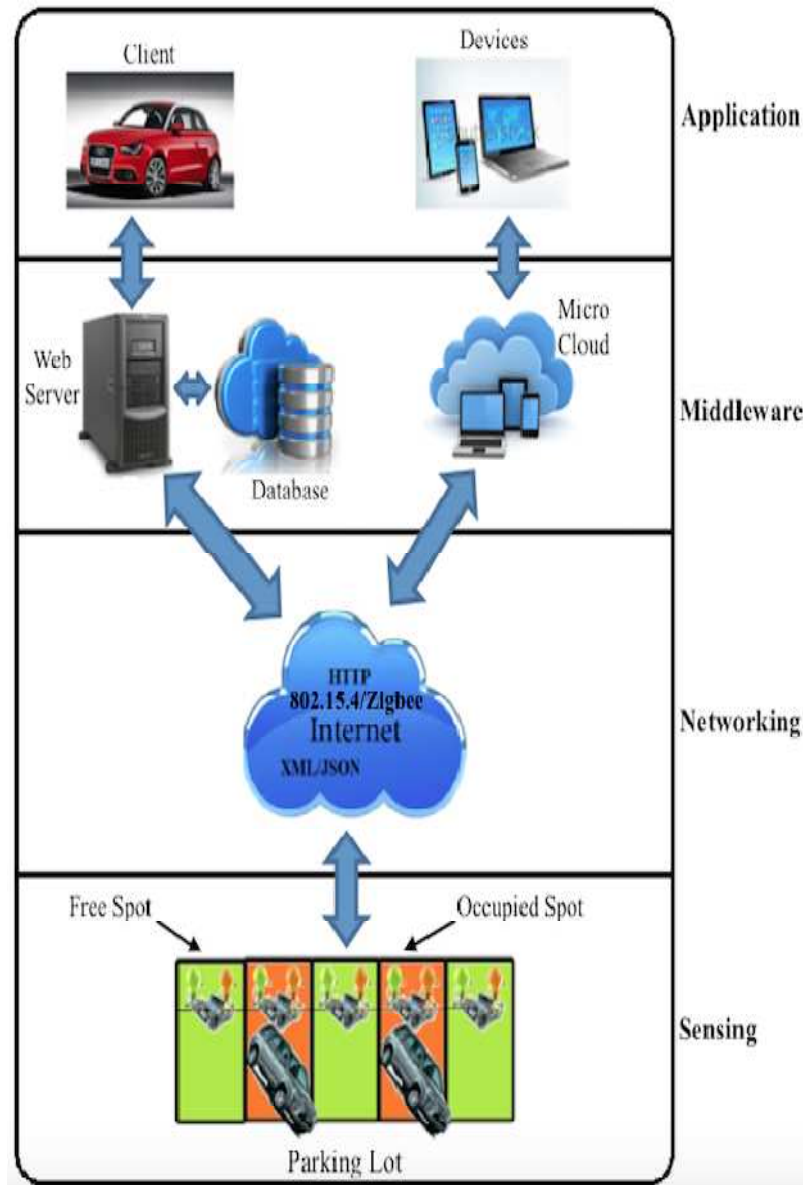


Figure 2. The smart parking system

THE APPLICATION LAYER

The application layer is where the diverse administrations are characterized and given to various clients. Customer gadgets have been associated by means of the TCP/IP convention to a stopping database. The last is refreshed continuously with the status of the parking areas. Two sorts of customer applications have been considered for parking garage checking:

- A cell phone application for telephones and tablets,

- A work area application for PCs and personal computers.

The Android App is produced and introduced in the clients portable. The client will take after the accompanying strides for booking the specific space of that framework. With the assistance of the App scan for a stopping region adjacent to the goal. Peruse through the diverse stopping openings accessible in the stopping zone. Select a specific or helpful space. Message or notice of booking will be given to the client subsequent to booking and when the auto is stopped.

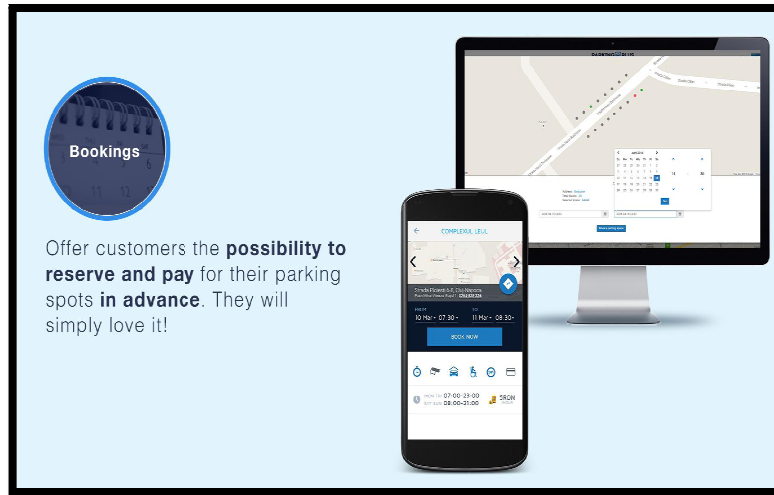


Figure 3.Booking of Parking Slot

RTC

A **real-time clock (RTC)** is a computer clock (most often in the form of an integrated circuit) that monitors the present time. In spite of the fact that the term regularly alludes to the gadgets in PCs, servers and implanted frameworks, RTCs are available in any electronic gadget which needs to keep exact time. RTCs regularly have a substitute wellspring of energy, so they can keep on keeping time while the essential wellspring of energy is off or inaccessible.

THE MIDDLEWARE LAYER

This layer is where circumstance acknowledgment is performed utilizing wise calculations and productive representation procedures to introduce savvy administrations and an easy to use interface to the clients. This layer has distinctive databases and related servers and deals with the majority of the product insight gave by the shrewd stopping framework to give brilliant administrations to clients by empowering correspondence between the application layer where administrations are asked for and the lower layers where keen gadgets are implanted into the parking area to give savvy administrations.

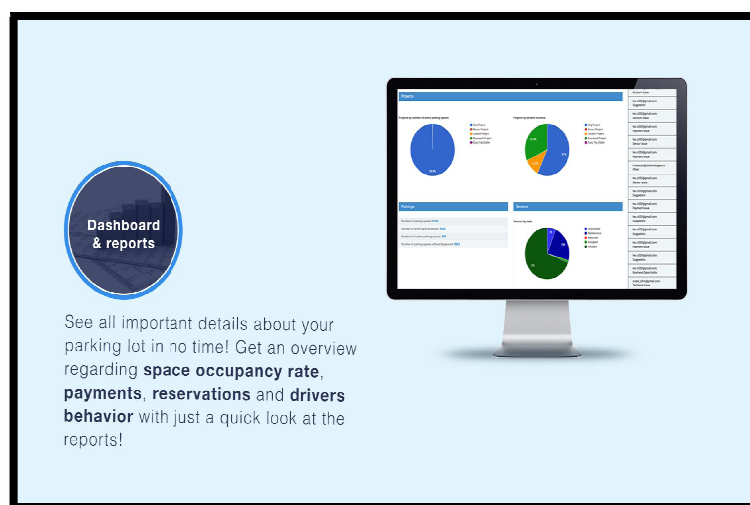


Figure 4.Data Collection

THE NETWORKING LAYER

Different modes of communication have been proposed in this layer to help correspondence from the ace and grapple sensors to the sensor door and from the passage to the stopping clients (stopping drivers, remote clients and stopping proprietors).

These incorporate:-

- The 802.15.4/ZigBee correspondence for directing the sensor readings from ace sensors to the portal,
- TCP/IP over Ethernet for interfacing the portal to the stopping server and database and
- Internet access for remote access to the shrewd stopping framework from outside.

ZIGBEE

Zigbee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection. Hence, Zigbee is a low-power, low data rate, and close proximity (i.e., personal area) wireless network.

TCP/IP

The Internet protocol suite is one of the conceptual model and set of communications protocols utilized on the Internet and comparative PC systems. It is usually known as TCP/IP in light of the fact that the first conventions in the suite are the Transmission Control Protocol (TCP) and the Internet Protocol (IP).

The Internet convention suite gives end-to-end information correspondence determining how information ought to be packetized, tended to, transmitted, directed, and got. Abstraction layers:

- Link layer
- Internet layer
- Transport layer
- Application layer

The architecture is shown in figure (5), where the dashed lines indicate wireless link and the solid lines indicates wired link. This type of parking network incorporates switches that frame as the framework for associated customers. The CPN framework/spine can be worked to permit sensor systems to interface utilizing remote radio advancements. The switches frame a self-arranging and self-recuperating join organize.

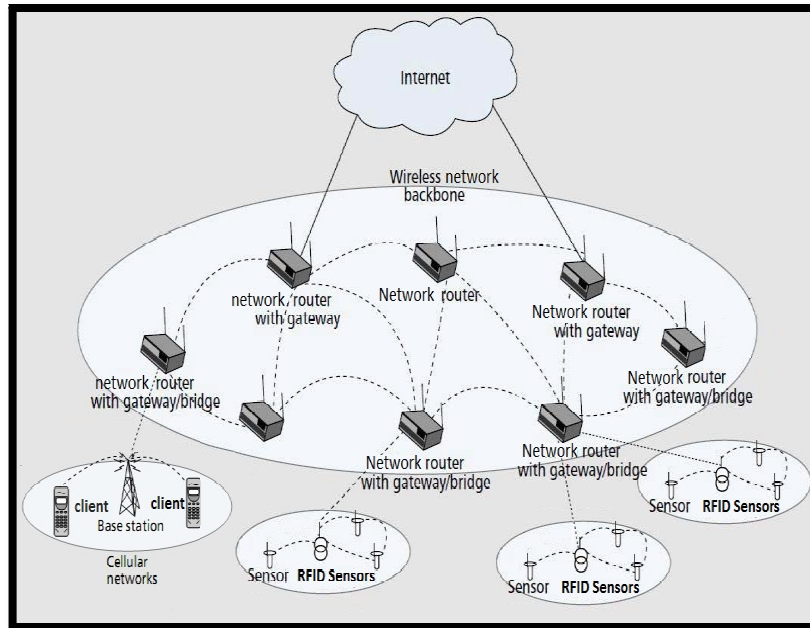


Figure 5. Infrastructure/backbone of the CPN architecture

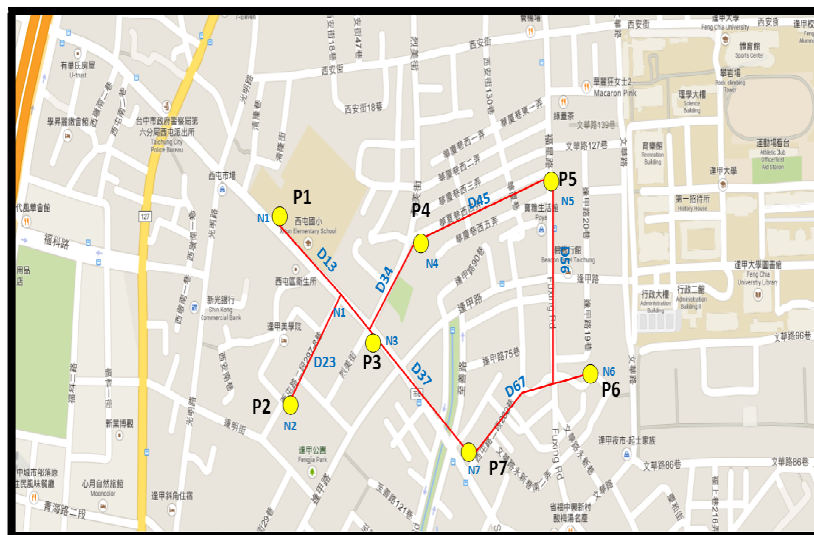


Figure 6. CPN deployment for car parking system

This layer defines a platform where sensor gadgets are implanted into the parking garage to recognize auto nearness/nonappearance, and RFID gadgets situated at the stopping doors and key purposes of the stopping are utilized to distinguish autos in light of a special mapping between RFID labels and autos.

RFID

RFID is an acronym for "radio-recurrence recognizable proof" and alludes to an innovation whereby computerized information

encoded in RFID labels or shrewd marks (characterized underneath) are caught by a peruser through radio waves. RFID is like banish coding in that information from a tag or name are caught by a gadget that stores the information in a database. A RFID label comprises of a coordinated circuit and a reception apparatus. The tag is likewise made out of a defensive material that holds the pieces together and shields them from different ecological conditions. The defensive material relies upon the application.

Three types of sensor devices are used:

- a. "slave" devices, also called "receivers", which are placed on the parking spots to detect presence/absence,
- b. "master" devices, also called "transmitters", which are tasked to collect the sensor readings from their connected slave devices and transmit these readings to a gateway for further processing,
- c. "anchor" devices used as repeaters to increase the wireless sensor coverage of the parking for efficient routing of the sensor readings. The slave devices are connected to the master devices through wired communication using the I2C protocol.

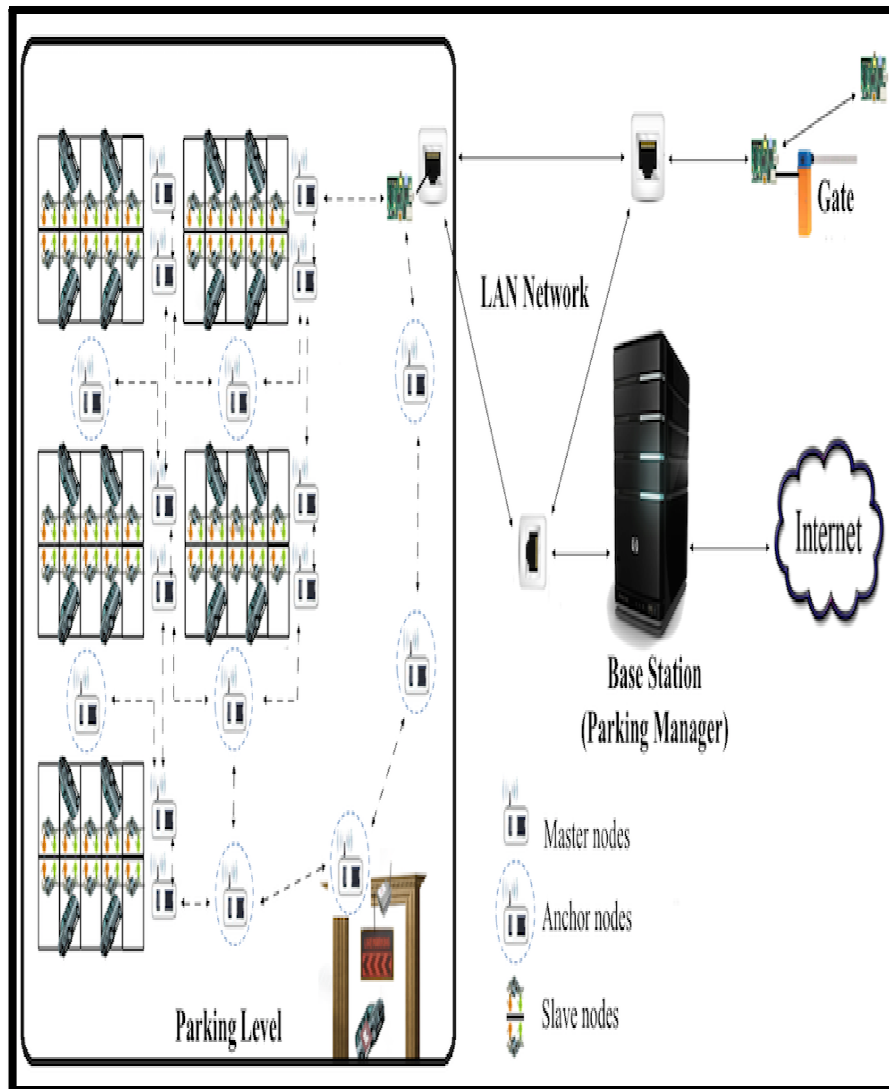


Figure 7.The Smart Parking Sensor Placement

DATA FLOW

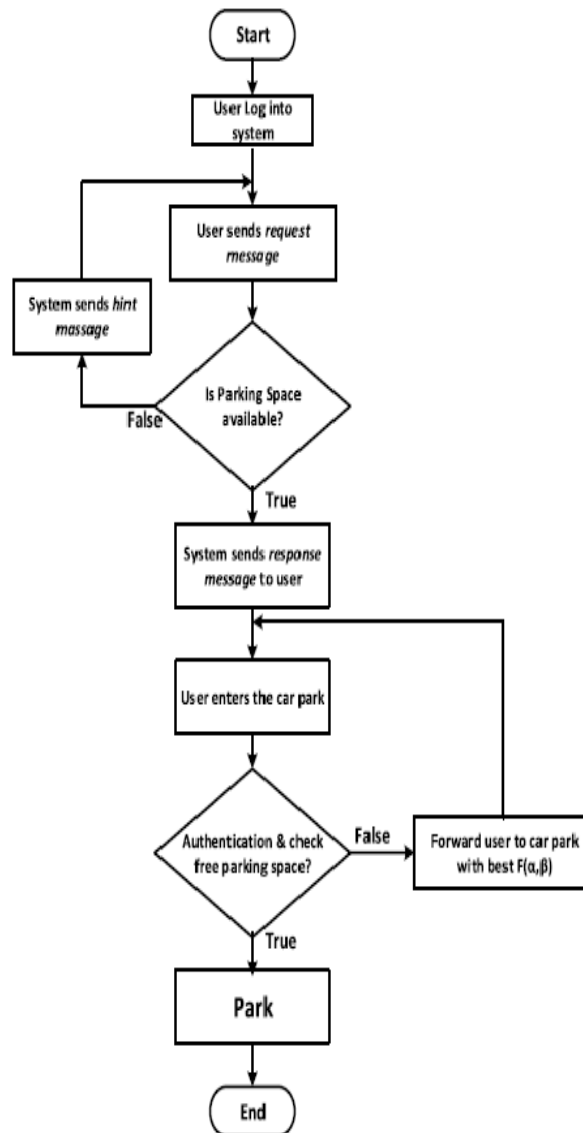


Figure 8. Flowchart for system operation

When a user wants to find a parking slot, he must login to our system. After successful login, a demand message is sent to scan for a free stopping opening. At that point, the framework will send back a reaction message containing the data, including the auto stop deliver and the bearings to achieve it. At the point when the client lands at the auto stop, he should be approved to enter. This approval is accomplished through the RFID innovation or by checking the client card. This component is basic yet conservative. On the off chance that the data is right, the client is permitted to stop.

On the off chance that the present auto stop is full, the framework will send a recommendation message that incorporates data on another auto stop, including the address and new headings, with a base cost. In our proposed framework, we utilize RFID innovation to ascertain the level of aggregate free parking spots in every auto stop. In every auto stop, a RFID peruser is introduced at the passage. We use a variable named "Count" to calculate the total number of vehicles in the car park. $Count = Count + 1$ when a vehicle enters, and $Count = Count - 1$ when a vehicle leaves.

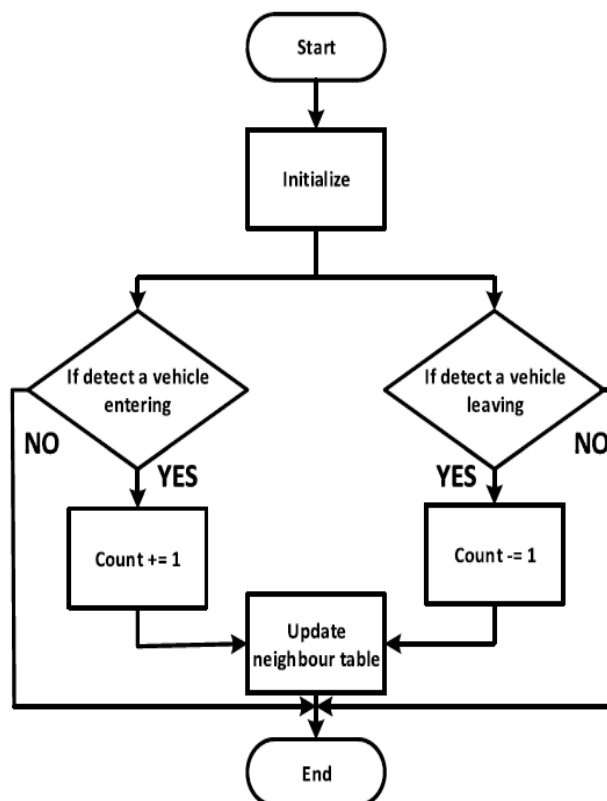


Figure 9. Flowchart for updating the status of car parking

FUTURE SCOPE

The future extension to receive this Smart Parking System (SPS) so accessibility of spaces could be shown on an advanced mobile phone application or even to satellite route gadget with the goal that drivers will dependably know about whether there are free spaces are most certainly not. And furthermore upgrade to send a few warnings to clients advanced mobile phone when vehicle enters to specific shopping spots and a few boulevards in a city and so on.

CONCLUSION

In this system, the issue of parking is presented using IoT and wi-fi based. This system includes RFID technology with Android application which provides user interface for control system and vehicles. The average waiting time of users for parking their vehicles is effectively reduced in this system. The optimal solution is provided by the proposed system, where most of the vehicles find a free parking space successfully.

This smart parking system provides better performance, low cost and efficient large scale parking system. The system proposed provides real time information regarding availability of parking slots in a parking area. User from remote area can book a parking space using mobile app. The efforts taken in this system are with intention to improve the parking facility of the city and aim to provide the ease to people. Advantages of this are User friendly, Saves time for chasing the empty space, Saves fuel and traffic congestion is under control.

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