Design and Development of Smart Parking System Using RFID Technology

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ABSTRACT

We can now access all non- interenet things from anywhere through Internet of thinking IoT and it made easy to access. People must grow with the technology. With the Parking what we have now, People are facing difficulties to park their Vehicles in their Parking Space in Cities. In Our study we designed a Smart Vehicle Parking, with which people can know about the nearest Parking Slot it will give the data of available Parking Slots in respective parking Space. Using the Smart Vehicle Parking People can save their time by finding available Slots So they don't have to spend time and it they don't have to travel already filled parking lots in a parking areas. It also reduces fuel consumption which is good for atmosphere.Radio-frequency identification (RFID) is a device that allow us to store the data in RFID tag ,it is an automated identifying technique s for the remote retrieval or transponders.An RFID tag is a radio-frequency identification and tracking device that is used to integrated into a product, animal, or human, as it is using radio waves for tracking. Some RFID tags are read from many meters away . We can use RFID technology in malls and Buildings for vehicle Parking . This Vehicle Parking System is having RFID card,RFID Reader a LED display board, vehicle counter and a audrino micro-controller. When a car is to be parked , RFID reader which is installed near the entry gate will read the RFID card. When a vehicle enter a parking slot it will open the gate and the the vehicle will be identified and when it takes a Parking slot it will be displayed in the LED Display and the available spot will reduce by and occupied slot will be increased by 1. When the same vehicle leave the parking slot, the available slot will increase by 1 and occupied slot will reduce by one . We can also book and reserve a parking slot for us, when there are no parking slot availabe it will notify us as no Parking slot is available

INTRODUCTION

Urban parking management is about to undergo a revolutionary change thanks to the Internet of Things-based Smart Parking System. Conventional parking systems are not enough for the increase number of vehicles, leading to inefficiencies and obsolescence. But by incorporating IoT technology, this system offers a dynamic and clever strategy to take on these obstacles head-on.Advanced sensors, such as infrared or ultrasonic ones, positioned carefully to track each parking space's occupancy status are at the core of this innovation. These sensors provide accurate information about parking place availability by continuously collecting data in real-time. After that, this data is put into a centralized platform for in-depth processing and analysis.

The system can analyse incoming data and handle parking spot information efficiently by using complex algorithms and machine learning techniques. Based on past data and current variables including events, traffic patterns, and weather, it can forecast future parking needs, optimize space allocation, and dynamically modify parking prices.

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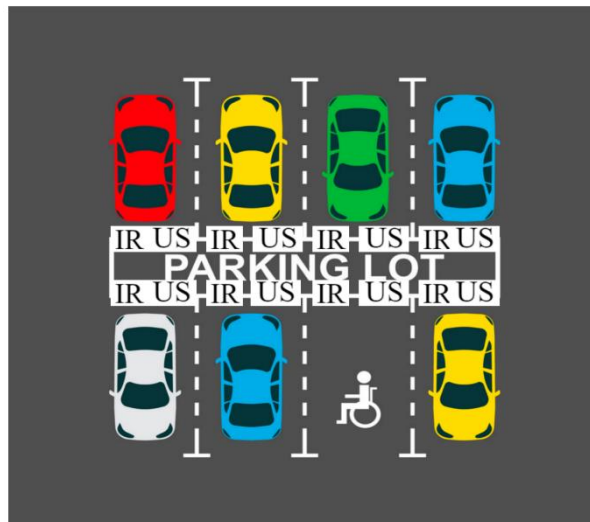
Fig (1.1) Project Outline

This system's capacity to give users a smooth and hassle-free parking experience is one of its main advantages. Through digital signage or smartphone applications, drivers can easily obtain information on available parking places, saving them the frustration of driving around in circles looking for a spot. Additionally, the technology can guide drivers to the closest parking spot, which will lessen traffic jams and pollutants.

The centralized platform provides unmatched administrative management and monitoring over the whole parking infrastructure. To optimize resource allocation and streamline operations, facility managers can generate analytical reports, analyse consumption trends, and monitor occupancy rates. By automatically generating fines or alerts for unapproved parking, the system can also help ensure the effective enforcement of parking laws.

Additionally, there is a plenty of room for integration between the Smart Parking System and other urban management systems, like public transportation systems and traffic control. Cities can attain a more comprehensive approach to urban mobility, improving overall efficiency and sustainability, by exchanging data and coordinating activities.

In conclusion, the IoT-powered Smart Parking System is a game-changer for urban parking management, combining ease, efficiency, and innovation. This technology has the potential to completely change the urban environment by utilising IoT technologies to lessen traffic, cut emissions, and enhance both locals' and tourists' quality of life.

METHODOLOGY

1. **Automatic Searching**

   While driving, picture yourself using your phone to view a real-time map that shows you where parking spots are available in neighbouring garages and streets.

The following functions of the system enable this:

Link up to the internet: It collects information from cameras, parking sensors, and other devices that are mounted in parking spots.

Evaluate information instantly: The technology analyses sensor data and applies sophisticated algorithms to identify whether a location is occupied or vacant.

Give current updates in real time: To give you the most up-to-date information, the mobile app updates the map continuously.

2. **Integration of Mobile Applications:**

   Gone are the times when you would furiously circle obstacles. An interactive and user-friendly interface is provided by the mobile app:

Look up a place: The app filters local parking possibilities based on your destination.

Sort based on your preferences: Select the kind of parking you want (garage, street, etc.) and establish your budget.

**Help with navigation:** Get precise turn-by-turn directions to the parking location of your choice.

Integration of payments: You may pay for parking straight through the app, doing away with cash machines and metres.

Time Management: Both drivers and cities may save a great deal of time with this system:

Decreased search time: Less time is wasted by drivers circling and looking for parking, which reduces annoyance and fuel loss.

Better traffic flow: Everyone on the road benefits from less traffic and less congestion, which is achieved when fewer automobiles are looking for parking.

Enhanced parking management: By gaining important information into parking usage trends, city authorities may enhance parking allocation and enforcement tactics.
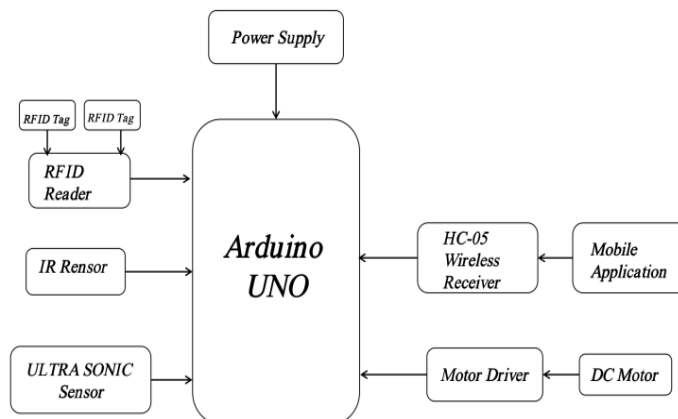
Fig : (1.2) Block Diagram

3. Accuracy & Precision:

Complex algorithms are essential to guaranteeing the efficacy of the system:

Machine learning: By examining past data and user feedback, the system continuously learns and gets better, producing information that is more and more accurate.

Data validation: To guarantee that the availability of parking spaces is accurate, the system combines data from multiple sources and double-checks the information.

Error correction: To give accurate and current parking data, the system can take into account circumstances such as sensor malfunction or momentary unavailability.

All things considered, the goal of this smart parking system is to completely transform the parking experience by providing drivers with a seamless, effective, and user-friendly solution, all the while promoting better traffic flow and astute city administration.

OBJECTIVE

The Smart Parking System (SPS) uses infrared or ultrasonic sensors, among other sensors, to determine if a car is parked in each slot. Installed at each parking place, these sensors keep track of whether the area is occupied or empty all the time. The sensor recognizes when a car moves into or out of a parking spot and alerts the Arduino micro-controller to the change.

The system's central processing unit is the Arduino microcontroller. It gathers real-time sensor data and uses the inputs from the sensors to calculate each parking space's occupancy status.

The micro-controller then uses a wireless communication protocol, like Wi-Fi or Bluetooth, to send this parking space occupancy data to an Internet of things platform.

Users can receive parking space occupancy data through a variety of means, including a mobile application, thanks to the Internet of Things platform.The smartphone app allows user to view up-to-date information regarding nearby parking space availability. With the app users can quickly look for parking spots and reserve open parking lanes in advance.

The mobile app shows visual representations of parking space availability in addition to written information.

One way to help users rapidly discover open spaces and arrange their parking is to provide color-coded maps or diagrams that indicate both occupied and vacant parking spaces.

The Smart Parking System provides a comprehensive solution for effective parking spot management by leveraging sensors for detection, Arduino microcontrollers for data processing, and an Internet of Things platform for data transmission and retrieval. Combining a mobile app with visual aids improves accessibility and user experience even more, which in turn helps cities have less traffic, fuel use, and environmental effect.

PROBLEM STATEMENT

Urban parking systems are currently frequently characterised by manual procedures that cause delays and inefficiency. These manual processes include things like issuing tickets by hand, collecting payments by hand, and keeping an eye on parking spots. Because of this, parking procedures take far longer than they should, which irritates drivers and adds to traffic congestion.

The inability of drivers to obtain information regarding forbidden zones and designated parking lots is one of their biggest problems. In the absence of explicit instructions, drivers could unintentionally park in prohibited zones, incurring fines and penalties. In addition, the lack of up-to-date information regarding

parking availability makes matters worse by causing cars to waste time looking for open spots.

Our goal is to provide solutions that address these issues and improve urban parking experiences by streamlining parking operations and improving information transmission.

Using IoT-powered smart parking systems is one important way to solve the problem. These systems gather real-time occupancy data and can automatically detect the presence of vehicles by installing sensors in individual parking spaces and sending it to a centralized platform. Drivers can then easily find available parking spaces by using this information to access websites, smartphone applications, and electronic signage.

Automated payment systems can also do away with the necessity of manually issuing tickets and collecting payments. Alternatively, vehicles can pay for parking online through pre-registered accounts or mobile payment networks, cutting down on wait times and increasing productivity.

Drivers can receive real-time updates on parking availability, rates, and policies via mobile applications and digital signage, which can improve the dissemination of information. Interactive maps and navigation systems can also direct cars to the closest parking lots and make complicated parking situations easier for them to manoeuvre through.By putting these ideas into practice, we can cut down on the amount of time that parking procedures take, enhance drivers' access to information, and eventually ease traffic congestion in cities. Additionally, we can increase the overall effectiveness of parking management systems and enhance the parking experience for all stakeholders by utilising technology to automate routine operations.

RESULT

When Vehicle entering parking slot:

As soon as a vehicle enters a Parking Slot it will read the number of vehicle and tell us the particular vehicle entered the parking slot and when the Vehicle take a particular Parking spot it will inform us about the which slot the vehicle is being parked and the algorithm will reduce the total available slots by 1 and increase the occupied Spot by 1

```
TN_33 AH_3245 Vehicle Enter Into Parking Slot
distance: 102
Vehicle Occupied Zone: 3
 Total Available Space  : 2    Occupied slots : 1
distance: 101
distance: 6
E00F72B06E4
TN_55 JK_5577 Vehicle Enter Into Parking Slot
distance: 103
distance: 102
distance: 48
distance: 102
distance: 101
distance: 102
Vehicle Occupied Zone: 1
 Total Available Space  : 1    Occupied slots : 2
```

Fig : (1.3) Vehicle Entering Parking Slot

When Vehicle leaving parking slot:

As soon as a vehicle leaves the parking Slot, it will read the number of vehicle and tell us the particular

vehicle leaving the parking slot and the algorithm will increase the available slots by 1 and reduce the occupied slot by 1

```
E00F72B06E4
TN_55 JK_5577 Vehicle Leave Parking Slot
distance: 45
distance: 102
distance: 102
Vehicle Free From Zone: 3
 Total Available Space  : 2   Occupied slots : 1
```

Fig : (1.4) Vehicle Leaving Parking Slot

CONCLUSION

Time Savings: People don't spend as much time looking for parking.

Decreased Congestion: The technology assists in reducing traffic congestion in and around parking facilities by effectively directing users to available parking spaces. This enhances traffic flow for everyone, not just individual drivers. Resource

Optimization: The system ensures that every parking space is used efficiently by helping to optimize its utilization.

Data insights: The system can produce useful data regarding parking usage and patterns, which transportation authorities and city planners can use to inform their decisions regarding urban planning and parking management.

Promotion of Alternative Transportation: By increasing parking's efficiency, the system can subtly promote the use of other forms of transportation, like walking, bicycling, and public transportation. This is because people are likely to park farther from their destination if they know there are spaces available.

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