IOT BASED AND INTELLIGENT CAR PARKING SYSTEM

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ABSTRACT: As the usage of vehicles is increasing day by day, it became difficult to identify a proper parking space for every vehicle. Smart Parking System deals with development of mobile application, which helps the user to get detailed information about parking space and managing it efficiently in parking lot. Smart Parking System uses Image Processing technique to identify registration plate of a vehicle and also provides a beep sound whenever a vehicle at entrance of a parking lot. The mobile application provides information about available parking spaces, security and safety features of parking lot. Arduino and Node MCU is the control unit of this project which controls and processes the whole operation of the system. LCD display is placed at entrance of the parking lot to display current parking space availability. Infrared (IR) proximity sensors are used to detect the presence of vehicle at the entrance of parking lot. If the captured image is with proper resolution through which characters from vehicle registration plate can be identified, the user will then park the vehicle in the available parking slot. When the user wants to leave the space and moved the vehicle, the date/ time information will be captured.

Keywords: IR sensor, Rasbperry pi, camera, vehicle registration, data base.

1. INTRODUCTION:

The number of vehicles present on road is exponentially increasing day by day. To facilitate parking for every vehicle, we need to use the available space most efficiently. Due to increased number of vehicles in addition with mis-usage of available space is leading to parking issues. It is necessary to develop a smart parking system which helps the user to locate the nearest available parking space. This saves lot of time from user, reduce the consumption of fuel of the vehicle and in turn reduces the pollution which results in increase in fuel consumption, pollution, traffic problems and stalling user's time. Smart Parking System is the solution for the pertaining issue, which partially automate the process of identifying available parking lots with little or no human intervention. This includes an on-site hardware equipment of an IOT module used for many features like detecting the availability of parking spaces, integrating safety and security alerts, and capturing real-time information into cloud. A mobile application is developed as a part of this Smart Parking System which provides a detailed information about availability of parking spaces. The concept of IOT (Internet of Things) is used in this Smart Parking System which helps to monitor and control the hardware kits from a remote location just by connecting to internet. The IOT can be described as the network of physical devices which include various sensors and has the capability to connects with other physical devices and can share data in real time over the internet.

Purpose of the Project

Many of us are familiar with roads getting congested with vehicles which are trying to secure a parking space, and in the process impacting other vehicles by slowing them down. According to a survey conducted by IBM, more than 30% of the city's traffic is caused by vehicles which are actively searching for parking.

However, the issue cannot be resolved by creating more parking spaces in the densely populated cities. Instead, it can be solved by effectively utilizing the available parking spaces, which can be done with the help of Smart Parking System.

• Smart Parking System is not about creating new parking spaces, it is all about utilizing the available parking spaces most efficiently. It helps people to locate the existing parking space more quicky than usual based on their current location, which in turn reduces the traffic on roads.

• Smart Parking System helps the users to locate the available parking spaces faster and thus saving lot of valuable time of the users.

• Smart Parking System is combination of various sensors, processors, intuitive navigation system and automated bill generation system based on time thus providing real time information to the users. Users can check the availability of parking spaces with the help of integrated mobile application.

• Due to advancement in the technologies like IOT and Cloud computing, real time data can be seen and analyzed with the help of mobile application irrespective of location and time. The Mobile application helps users to identify the availability of parking spaces.

• Smart Parking System is more helpful in cities with high population. Based on a survey, after implementing the Smart Parking System, the time taken by a vehicle to find a parking space is reduced.

2. LITERATURE SURVEY:

2.1. Smart Car Parking Management System In [2], "Smart Car Parking Management System" has proposed and also discussed about the issue regarding increasing in number of vehicles year by year but the parking slots are not

increasing in the same rate. In this they designed "The Smart Parking System" with optimal cost when compared with commercially available systems. They store the information of particular parking slot in a particular local host in a region. Further to store information of multiple parking lots at common place, they used cloud storage and later on it is used for remote sensing. Further they developed the image processing technique for recognizing the number plate of the vehicle in the database where they store information.

2.2. A Novel Parking Management System In [5], "A Novel Parking Management System, for Smart Cities, to save Fuel, Time, and Money", the hardware and software components interact with each other has proposed. They reduced the money spent by the user and fuel consumed by the vehicle and the time consumed also saved. The drivers can park their vehicles very quickly as they developed a sophisticated parking management system. This design will give the best runtime and a good success rate. This design will save a huge amount of money. The money and fuel saved will be used for other purpose of uses.

2.3. Towards a Smart Parking Management System for Smart Cities In [6], "Towards a Smart Parking Management System for Smart Cities" has been proposed and discussed about the development of Smart Parking Management System which can provide real-time data regarding availability of parking spaces in a parking lot. This system helps the users to the nearest available parking lot where there is an availability for parking their vehicles and it is based on real time data. The developed SPMS saves a lot of time for the user which reduces the amount of fuel consumes and save a lot of money spent on fuel by the user.

2.4. SRSP: A Secure and Reliable Smart Parking Scheme with Dual Privacy Preservation In [7], "SRSP: A Secure and Reliable Smart Parking Scheme with Dual Privacy Preservation" has proposed and developed a reliable system with dual

privacy protection. This system uses a group signature technique in order to authenticate among vehicles, parking spaces and parking lots. They analysed the reliability of the system in terms of computational power and evaluated it with the help of analysing performance of various vehicles.

2.5. Low Cost Smart Parking System for Smart Cities In [4], The "Smart parking system" have proposed and discussed about a system which provides complete information about available parking spaces and also helps the user to locate it. They used a camera module to capture the image of the number plate for the purpose of monitoring user's vehicle. They developed this system based on IOT and also developed a mobile application. With the help of mobile application, user can identify available parking space, information of parking time and bill payment.

3. PROPOSED SYSTEM:

The proposed system includes a camera module, Arduino and Node MCU, Stepper Motor, Infrared Sensors and a Mobile application. Infrared (IR) sensor is used to detect the presence of vehicle at the entrance of parking lot. If any object is sensed, a signal will send to Arduino and Node MCU which activates the camera module to capture the image of the object. The intelligent system will identify whether the object at entrance is a vehicle or not. If the captured image is of vehicle, then the image is processed to obtain characters from vehicle registration plate. Arduino and Node MCU sends a signal to servo motor to open the gate for a specified interval of time. In mobile application, we will get complete information regarding parking space, vehicle parked and provides security against stealing, theft and provides safety against fire and gas leakages in parking space by early alert. The proposed system also calculates total time parked.
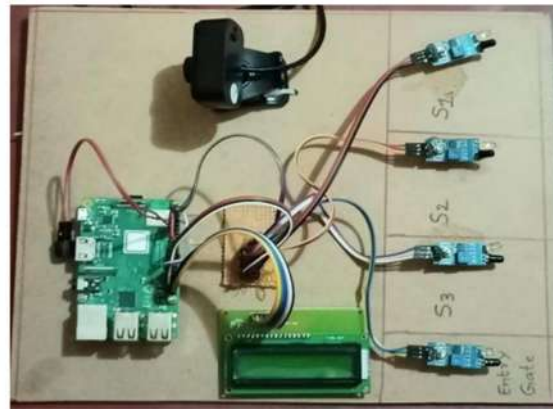
Fig.1. Hardware kit image.

Operation:

When a vehicle is detected at the entrance with the help of IR Proximity Sensor, the system will check for availability of parking space in the lot. If the parking space is not available, the system will display a message on LCD as "Parking Full" and if the parking space is available, the system will activate camera module to capture the image of the vehicle including its number plate very precisely. Once the image of the vehicle is captured, the system will extract the characters of the number plate. If it is successful, the process continues further else the system activates the camera module to capture the image much precisely. This process will continue until the system extracts the characters of the number plate successfully [11]. Once the process of extraction is completed, the system sends a signal to buzzer to the parking lot for certain duration to allow the vehicle into the parking lot. Flexibility is with the user to park the vehicle in any of the available parking slot [9]. Once the user parks his/ her vehicle in a particular slot, the system will capture the date time stamp information in the cloud. • When a vehicle with 'Crime' or 'Theft' status tries to enter the Parking Lot When a vehicle is detected at the entrance of the parking lot, the system will check for the availability of the parking space. If the parking space available, the system will activate camera

module to capture the image of the vehicle including its number plate very precisely. Then, the system wil extract the characters of the number plate with the help of various image processing techniques. Once the characters of the number plate are extracted, the system will check the data base to know the status of the vehicle. If the status of the vehicle is 'Normal', the system will trigger to allow the parking lot. If the status of the vehicle is 'Unidentified', then the system will activate the camera module to capture the image of the vehicle more accurately. If status of the vehicle is 'Crime' or 'Theft', the system will not allow in parking lot and immediately triggers the buzzer to alert the people and security in the parking lot.
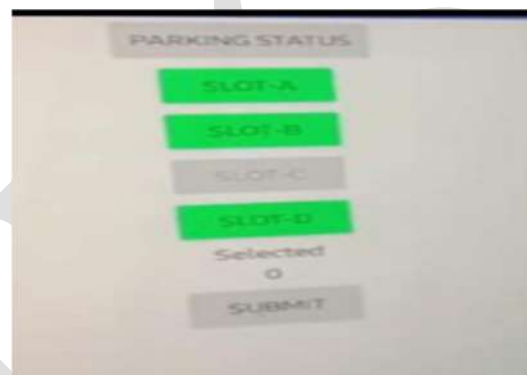

Fig.2. Vehicle detected output.

When a vehicle gets detected at the entrance, the image of the vehicle is captured and the system tries to extract the characters of the number plate of the vehicle. If the extraction of character of the number plate is successful and there is no criminal record on that vehicle then, the system will automatically open the gate for a particular duration of time to allow the vehicle enter the parking lot and it captures date timestamp. In above scenario, a vehicle is detected at entrance with number AP39AY8049. The system extracted the characters of the number plate successfully and then the system will check the status of the vehicle. As it is 'Normal', the system will open the gate for certain duration and closes it.

As a vehicle enters the parking lot and the vehicle is parked in an available parking space. This information will be updated in the mobile application, represents that particular parking space is occupied which showed below.
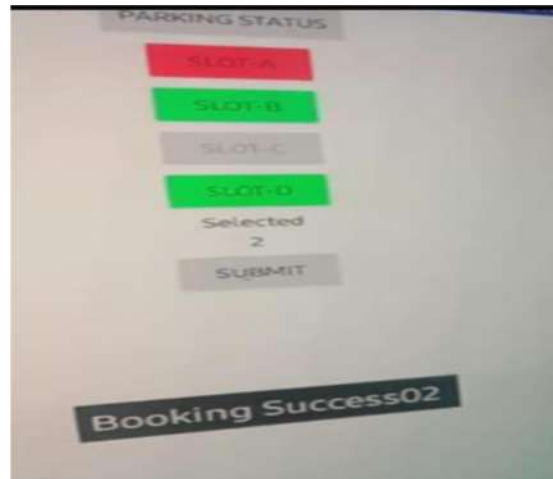

Fig.3. Number of slots is empty indication.

5. CONCLUSION:

In this work, we discussed about the solution for the issue of parking which is Smart Parking System. Smart Parking System adds value to users by saving a lot of time and adds value to environment by reducing the human generating traffic which in turn reduces the pollution and profits the community by utilizing all the available and existing parking spaces more effectively.

Future Scope: Further enhancements to Smart Parking System are to integrate the existing system with Artificial Intelligence and Machine Learning through which identification of vehicles becomes easier and through multi layered security standards in AI, the parking lots can be made security proof eliminating any fraudster attacks. Also, with the collected data in cloud, the user parking patterns can be identified and suggestions on available parking slots can be given to user in form of push notifications.

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