SMART PARKING SYSTEM USING IOT

TEAM MEMBER

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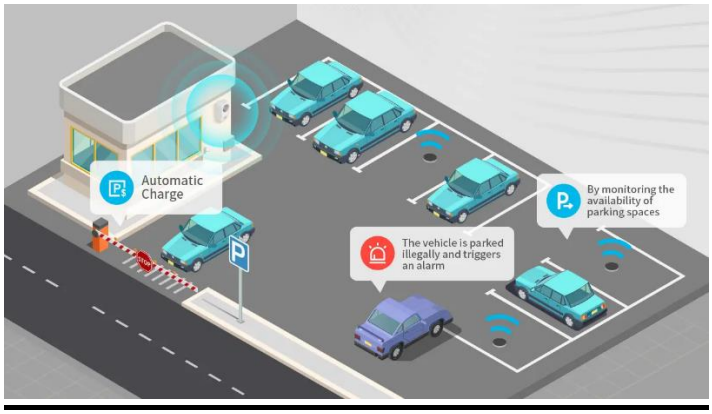
Phase 2 Submission Document

Project: SMART PARKING



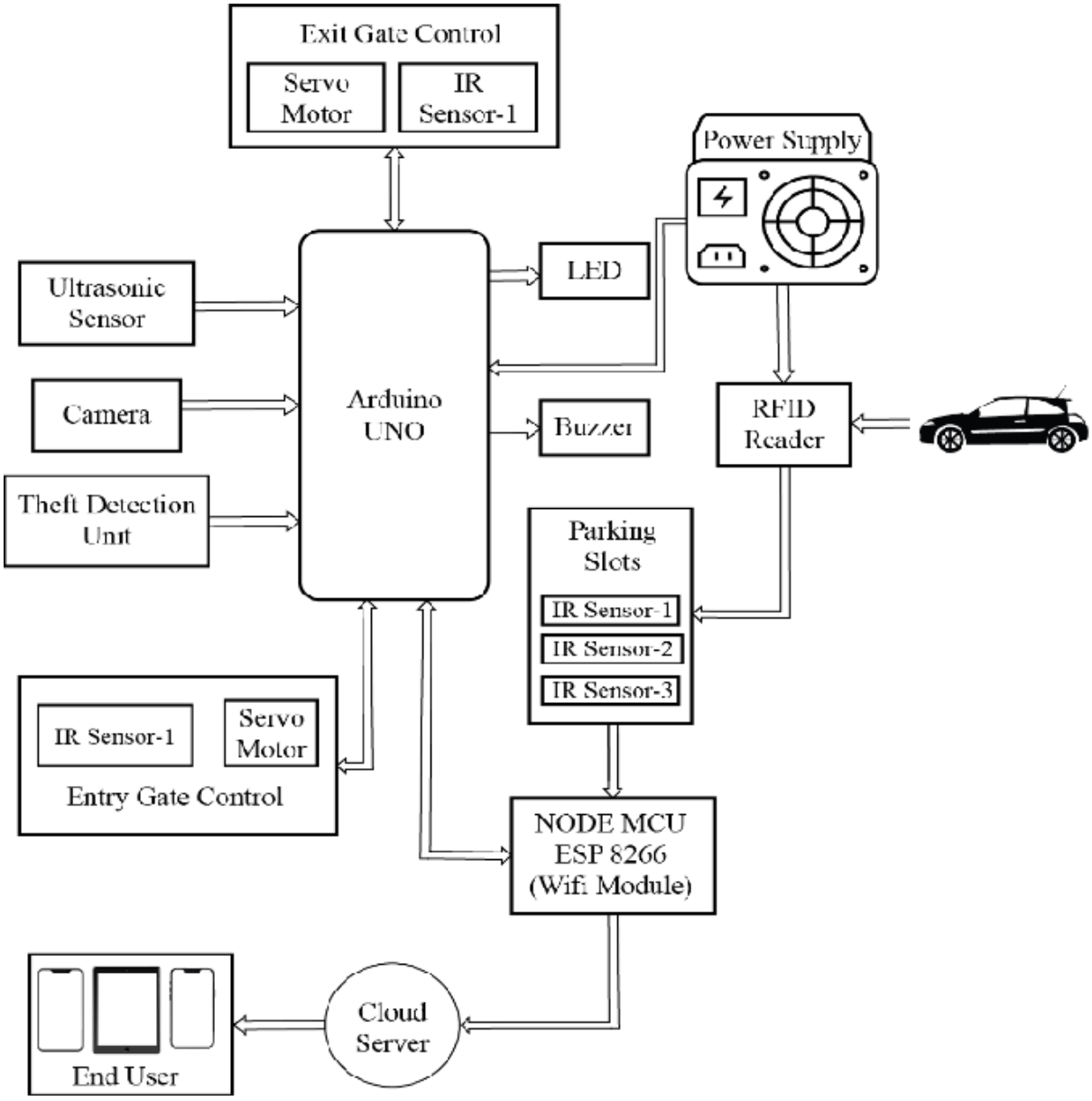
INTRODUCTION:

Internet of thing (IoT) can transfer data through network without involving human interactions. IoT allows user to use affordable wireless technology and helps the user to transfer the data into the cloud. IoT helps the user to maintain transparency. The idea of IoT started with the identity of things for connecting various devices. These devices can be controlled or monitored through computers. Over internet. IoT contains two prominent words “Internet” and “Things”, where Internet is a vast network for connecting servers with devices. Internet enables the information to be sent, receive, or even communicate with the devices. The parking problem causes air pollution and traffic congestion. In today’s scenario, parking space is hard to search in a day-to-day life for the people. According to the recent survey, there will be a rapid increase in the vehicle’s population of over 1.6 billion around 2035.Around one million barrels of world’s oil is being burnt everyday Thus, smart parking system is the key

solution to reduce the waste stage of the fuel. The solution for the problems that is being raised. The smart parking can be a solution to minimise user's time and efficiency as well as the overall cost of the fuel burnt in search of the parking space. In this, the data is collected from the sensor and through analysing and processing, the output is obtained.

This data gets transmitted in the devices which extracts the relevant information and sends it to the Arduino device which gives the command instruction for the data to devices simultaneously. Arduino sends the signal to the servo motor along with GSM module which further gives instructions and notification to the user. When the user enters in the parking area, RFID card allotted to the registered user is scanned by the reader module thus ensuring the security of the user identity. This enables the user to get the information of the available parking space as well as SMS notification to the registered user's mobile number. It consists of three parts where first part is the parking area which include Arduino devices along with IR Sensor. The user interacts with the parking area with the help of these devices. The second section of the paper includes the cloud web services which act as a mediator between the user and the car parking area. The cloud is updated according to the availability of parking area. The cloud service is administered by the admin but it can also be viewed by the user to check the availability. The third section of the paper is the user side. The user gets notified for the availability via SMS through GSM module. The user interacts with the cloud as well as parking area. The user gets the notification when the parking availability is full which saves the time for the user.

BLOCK DIAGRAM:



the proposed technique. The car arrives at the entrance. It is detected by the IR sensor at the entrance.QR code is available at the entrance which contains the link of the website. The user now has to scan the QR code that directs the user to that particular website. User has to enter the details in the form of that Website and can see the slots both available/unavailable. Once the car is detected by the IR sensor the Pi-camera captures the image and sends the data to the Open ALPR cloud. The number plate is detected. Both user details and the results are stored in the database for future access. Once the

number plate from the cloud is obtained it is indicated by the status code (for success = 200) when the code runs and once this status code is achieved, the entrance gate opens. The user enters the parking area and avails the slot. At the exit, IR sensor detects the car and till the time IR sensor gives high output,the exit gates are opened, the user now can exit the parking. area. When all the parking slots are full the HTML page will now show a message indicating Unavailable Slots and also, the car will not be detected at the entrance.

HARDWARE DESCRIPTION:

Microcontroller:

Raspberry pi is used as microcontroller for processing the data coming from sensors. Due to its Small size, high processing power, we preferred using Raspberry pi over other processors available in the market. Another advantage is that, Raspberry pi is a general purpose computer having its own operating system such as Raspbian, Windows 10 IOT core, Moebius etc. For our model we installed Raspbian which is the most popular operating system for IOT applications Raspbian has been used extensively because it is based on Debian (Linux) which makes it easy to use and it also protects against malware. The output of the IR sensors is saved in the text file in Raspberry pi.

Sensors:

We used IR sensors at the parking slots and at both the gates. These sensors are connected to the microcontroller through wires. The output pins are connected to the GPIO pins of Raspberry pi. Raspberry pi has total 26 GPIO pins out of which 2 are used by the servo motors. Hence total 24 sensors can be connected to Raspberry Pi through wires. These connections can also be made wireless and the number of sensors integrated can be increased by using MUX.

Servo Motors:

Two servo motors are used at the ENTRANCE and EXIT gate which are interfaced using the python script. The angle of rotation of both the motors is specified in the python script. Like IR sensors servo motors are also connected with wired connection.

Pi-Camera Module:

The function of camera module is to capture the image and pass these pictures to the processing unit. In our model, pictures are captured when the camera module receives the signal from IR signal which is situated at the entrance gate.

Network Protocols:

A parking system also requires protocols to ensure IoT devices' and sensors' connectivity in the parking lot. These can be MQTT, LoRaWAN, Zigbee protocol for wireless IoT networks, or else.

Such a system also requires video transmission protocols if it uses video surveillance. For example, Webby Lab used RTCP for

our Propuskator project. This way, we provided a real-time video stream users can monitor through the application.

User Interface:

A mobile or web application is the final component of an IoT-based smart parking system. As a rule, such apps ensure parking management, time tracking, reservation, billing tools, data logging, remote video surveillance, guest passes, and driver authorization.

IoT Sensors Used to Create a Smart Parking System

Smart parking solution development involves various sensors. Let's consider the most common options.

Ultrasonic Sensors

The integration of ultrasonic sensors, which measure the distance between objects using ultrasonic waves, allows for precise parking. However, such devices have one drawback — the sensor might get blocked with dirt.

Electromagnetic Field Sensors

An electromagnetic field sensor detects and measures changes in the magnetic field. This way, it reacts to the approach of metal objects.

Infrared Sensors

Infrared (IR) sensors emit an infrared signal and catch the reflection of this signal from the environment. Integrating such a device enables measuring the temperature or detecting movement.

How to Create an MVP for an IoT Smart Parking System

Let’s now look at the smart parking development process. It consists of the following stages.

1. Concept

First, you come up with the concept of your IoT-based parking solution. At this stage, consider which sensors, microcontrollers, cloud-based services, and network protocols to use. You also decide which app to create: mobile, web, or both.

2. Prototype

Next, you engage the Internet of Things experts to build an IoT prototype. It’s the initial version of your smart parking system. You can test and analyze the prototype to suggest further improvements.

3. Design

At this stage, your experts create the user interface and select features for the MVP. The main goal is to create a user-friendly app suitable for all major operating systems.

4. Development

This step involves mobile, front-end, and back-end, hardware developers. They implement the technical side of your IoT-based smart parking system MVP and connect it with ready-made design solutions.

5. Testing

Once every component of your IoT smart parking system is connected, it’s time to test it. First, the hired experts examine the MVP for flaws and limitations and check if it achieves the goals set. Then, your specialists fix bugs and offer updates for your system.

Conclusion and Future Work (Phase 2):

The concept of smart cities have always been a dream. There have been advancements made from the past couple of years to make smart city dream to reality. The advancement of internet of things and cloud technologies has given rise to new possibilities in terms of smart cities. Smart parking facilities have always been the core of constructing

smart cities. The system provides a real time process and information of the parking slots. This paper enhances the performance of saving users time to locate an appropriate parking space. It helps to resolve the growing problem of traffic congestion. As for the future work the users can book a parking space from a remote location. GPS, reservation facilities and license plate scanner can be included in the future.