# VISION BASED PARKING OCCUPATION DETECTING WITH EMBEDDED AI PROCESSOR

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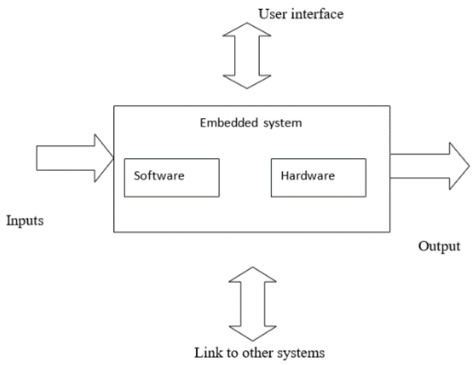
**Abstract :**
The essential thought of this undertaking is to make a shrewd stopping framework which is genuinely necessary framework to save time here web of things targets fostering a savvy stopping framework inside a brilliant city which naturally observes the closest accessible stopping opening in this task a brilliant stopping highlight which empowers a client in observing a stopping area and a free opening in that parking spot inside a city or beyond shopping centers this venture centers around diminishing time squandered on observing parking spot close by and continuous through the filled stopping spaces this framework is additionally used to perceive a client section and exit and it will be transferred to server

## Introduction :

A vehicle leaving framework that assists drivers with tracking down an empty spot. Involving sensors in each parking spot that recognize the presence or nonappearance of a vehicle, signs direct approaching drivers to accessible areas. This quick urbanization has prompted an expansion in autos on street which thus has spiked interest for parking spot. In any case, most metropolitan urban areas have restricted space they can designate for stopping. The answer for this issue is a shrewd vehicular stopping framework which effectively oversees stopping and furnish clients with data in regards to closest parking spaces. These frameworks consolidate advancements, for example, Wireless Sensor Networks (WSN), Webserver, Internet of Things (IOT) couples.

An implanted framework is one sort of a PC framework for the most part intended to play out a few assignments like to access, interaction, and store and furthermore control the information in different hardware based frameworks. Installed frameworks are a mix of equipment and programming where programming is generally known as firmware that is inserted into the equipment. One of its most significant attributes of these frameworks is, it gives the o/p inside as far as possible. Installed frameworks backing to make the work more awesome and advantageous. Thus, we habitually utilize implanted frameworks in straightforward and complex gadgets as well. The uses of inserted frameworks mostly include in our genuine for a considerable length of time like microwave, adding machines, TV controller, home security and neighborhood traffic signal frameworks, and so on.



## Embedded system:

Embedded system includes mainly two sections, they are

1. Hardware
2. Software

Likewise with any electronic framework, an inserted framework requires an equipment stage on which it plays out the activity. Inserted framework equipment is worked with a microchip or microcontroller. The installed framework equipment has components like information yield

(I/O) interfaces, UI, memory and the showcase. Generally, an inserted framework comprises of:

- Power Supply
- Processor
- Memory
- Clocks
- Sequential correspondence ports
- Yield/Output circuits
- Framework application explicit circuits

Installed frameworks utilize various processors for its ideal activity. A portion of the processors utilized are

1. Microprocessor
2. Microcontroller
3. Digital sign processor

Microchip versus Microcontroller

Microchip

- Central processor on a chip.
- We can join required measure of ROM, RAM and I/O ports.
- Costly because of outside peripherals.
- Enormous in size
- broadly useful

Microcontroller

- PC on a chip
- fixed measure of on-chip ROM, RAM, I/O ports
- Minimal expense.
- Conservative in size.
- Explicit – reason

Installed System Software:

The installed framework programming is composed to fill a particular role. It is regularly written in a general configuration and afterward arranged down to give code that can be held up inside a nonvolatile memory inside the equipment. An installed framework programming is intended to keep considering as far as possible:

- Accessibility of framework memory
- Accessibility of processor's speed
- At the point when the framework runs persistently, there is a need to restrict power scattering for occasions like stop, run and wake up.

Uniting programming and equipment for installed framework:

To make programming to work with installed frameworks we want to unite programming and equipment .for this reason we really want to consume our source code into chip or microcontroller which is an equipment part and which deals with all activities to be finished by implanted framework as indicated by our code.

By and large we compose source codes for implanted frameworks in low level computing construct, yet the processors run just executable files.The cycle of changing over the source code portrayal of your installed programming into an executable double picture includes three unmistakable advances:

1. Each of the source records should be aggregated or gathered into an article file.All of the item documents that outcome from the initial step should be connected together to deliver a solitary article record, called the re-locatable program.
2. Physical memory addresses should be doled out to the general balances inside the re-locatable program in an interaction called migration.

The consequence of the last advance is a document containing an executable double picture that is prepared to run on the inserted framework.

## Literature Review :

1 IEEE Transaction (2015) ElMouatezbillah Karbab Car Park Management with Networked Wireless Sensors and Active RFID. Integration of networked sensor/actuator and radio frequency identification (RFID) technologies is explored to enable sophisticated services via the Internet in the emerging internet of things (IoT) context.

2 IEEE Transaction (2014) Harmeet Singh Automated Parking System with Bluetooth access. Applied Bluetooth technology implemented in mobile phones enables the user to perform the identification and the state of presence while entering/exiting the parking space without stopping the vehicle.

3 IEEE Transaction (2019) Paul Seymer Secure Outdoor Smart Parking Using Dual Mode Bluetooth Mesh Networks We develop a smart parking solution that uses a single low-power wireless radio technology to seamlessly perform parked vehicle localization and transport of sensor data for use by a central management system.

4 IEEE Transaction (2016) Abhirup Khanna IoT based smart parking system In this paper, we present an IoT based cloud integrated smart parking system. The proposed Smart Parking

system consists of an onsite deployment of an IoT module that is used to monitor and signalize the state of availability of each single parking space. A mobile application is also provided that allows an end user to check the availability of parking space and book a parking slot accordingly.
5 IEEE Transaction (2018) Wael Alsafery Smart Car Parking System Solution for the Internet of Things in Smart Cities The paper proposes a smart car parking system that will assist users to solve the issue of finding a parking space and to minimize the time spent in searching for the nearest available car park. In addition, it provides users with roads traffic congestion status.

## Methodology :

The proposed Smart Parking system consists of an on-site deployment of an IOT module that is used to monitor and signalize the state of availability of each single parking space. It is uploaded in the server is also provided that allows an end user to check the availability of parking space and book a parking slot accordingly.
Our proposed system is a web-based application which provides the user the option to look into the occupancies for each parking block without the help of an external technical user. It eases the comfortability for the individual using the application. The proposed system also focuses on a dynamic rather than a general model for the taken problem because the same solution works differently for different users based on their preference(class-schedule). Therefore, it handles the multiple user scenario as well. One of the major questions which arise when a common solution is devised is the security as well as the parallel use-case for the solution. The proposed solution has security intact because the authentication factor uses the in-built Django module for authentication where the passwords are stored in hashed formats rather than plaintext[25]. The parallel use-case scenario is dealt with on the basis of having class schedule-based executions of the solution i.e. the solution works differently for different class schedules which infers that the solution works differently for different individuals. The resolution of the problem is resolved primarily with the help of computer vision libraries. The function of enabling computers and systems to derive meaningful information from digital photos, videos, and other visual inputs is referred to as computer vision.The integration of computer vision libraries into the solution provides the capability to mark the parking slots, store the intensity of the pixels in each slot, render the video frame by frame and detect occupancies based on difference in intensity. The open-source Computer Vision libraries enable the solution for occupancy detection to work well. The parking spaces are detected with the help of numpy arrays which come along with the Computer vision packages when you install it. The first step to identify the existing parking slots requires manual intervention which is not costly since it is a one-time effort for each parking block and needn't be repeated unless the parking slot is renovated or redesigned which rarely happens. Once the parking slots are identified, the locations of the parking slots are stored in a file in JSON format so that they can be passed over to another computer when the solution is transferred over as a whole. This further signifies the individual nature of the project. This step can be considered as a prerequisite step before using the solution.

## BLOCK DIAGRAM FOR PROPOSED METHOD

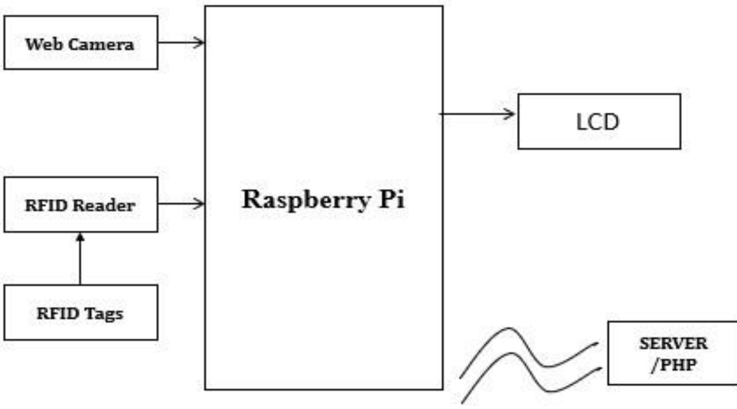
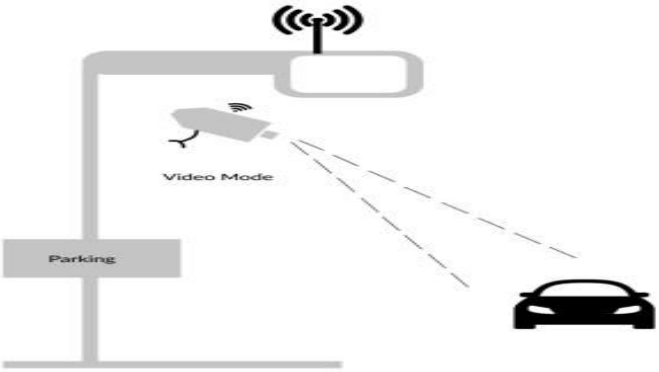


**Fig: block diagram of proposed method**

The second part of the solution involves registration of the user into the system. Since the solution was developed with multiple users in mind, the registration component is integrated into the solution. An user can register himself with the help of an username and password and login into the solution to look at his schedule. While registration, the security aspect is taken care of by hiding the password as the user types it in and when the user tries to login to the system as well, the password will be hidden from the eyes of the user. For password storing, the default authentication module has been built to the solution so that hashing and other security-driven aspects of the authentication module are dealt with. Since the strength of a password is also important when it comes to maintaining the security, users will only be allowed to set strong passwords which we will discuss in the implementation section of the paper.



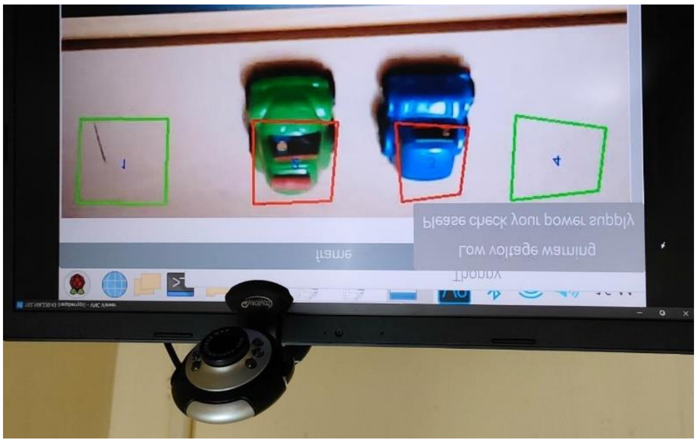
The third part of the solution revolves around the user editing or choosing his schedule. The user has the ability to edit and choose his class schedule so that the solution can provide suggestions on which block he needs to visit so that he doesn't waste time by walking or choosing for random slots in different blocks which are far away from the class. While the user logs into the system for the first time, he will not be shown any classes as per his schedule which is expected. When he edits his schedule, he will be able to see all the classes which are present in the current semester and choose which and all he is currently enrolled into with the help of a Yes/No question. Once he saves his selections, he will be able to see his schedule on his home page. He can change his schedule at any point of time because he might modify his classes or add some classes into his schedule as per his interest and needs which quite often happens.

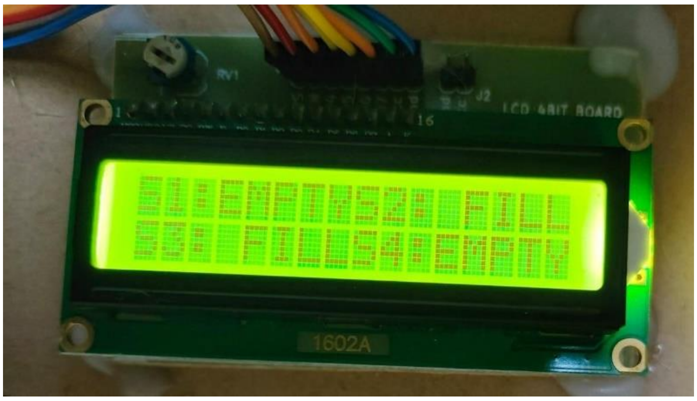
The fourth part of the proposed system is the vital one. The solution when given a video, it will detect the number of occupied and vacant slots and provide the result to the user with respect to the time when the user tries to check it. Once a video is recorded, it needs to be placed into a location mentioned by the solution so that it will be picked by the solution and rendered and show suggestions to the user. There might be confusion regarding the question of what if multiple videos are recorded. This issue has been dealt with by fetching the latest video from that particular location however the system which places the video into the folder needs to input that it has placed the video into the database table which stores the video list.

A database table is being used over here so that the history of the videos are maintained and if the video location is hacked or incorrectly deleted for any reason, we will definitely have a back-up. Thus, the database table provides a safety option. After the video is fetched by the solution, the solution will have two aspects of the prominent solution in its hand. One will be the location of the parking slots in that particular location and another will be the video which it needs to render. As the solution renders the video frame by frame, with the use of the first aspect it will be able to determine whether the slot is occupied or vacant and update the user screen as well as the backend. Since it renders the video frame by frame , it can also be used for detecting trends or patterns of the car parking slots which will be as part of future work. Once the video is rendered completely, the final status of the blocks of the parking slots will be mentioned to the user and the solution will provide suggestions as to which slot the user needs to take based on his class schedule. Currently, the mapping between slots and blocks is built using a database model but it can be converted into a geographic location model using google maps API which we will discuss further in the future.

The final part of the solution is the user experience. Once the solution finds the slots, it will list down all slots which are open in each block and the user will be able to decide which slot he needs to go. Also, since the solution provides a suggestion as to which slot will be helpful for the user, the user can only read the final suggestion and start his way to the parking slots. This will be helpful for students who are in a rush to the class and they wouldn't want to miss a few precious minutes of a lecture.

## RESULTS :





## CONCLUSION

We see that, this new framework is an additional worth to the metropolitan way of life. In the ongoing scene , where Google vehicles are presented and an improvement of extraordinary size. Computerized vehicles can do the leaving all alone ,in the event that this vehicle leaving application is a piece of their underlying framework. Consequently, I trust that this basic idea ,when delivered into the world, will be one of those progressive changes in ordinary exercises.

## FUTURE SCOPE

In future, we will think about the security parts of our framework as well as execute our proposed framework in enormous scopes in reality.

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