

A Project Report

On

**“Parking Spot indicator in vicinity”**

Batch Details

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1. **INTRODUCTION**

Nowadays, people are facing problem to find an available parking space in parking lot due to the tremendous increase of occupancy of cars. When a driver enters a certain parking lot, the driver takes a long time just to find an available parking space. A Counting Available Parking Space using Image Processing (CAPSuIP) has been developed to solve the problem that drivers faced with low cost. CAPSuIP uses image processing to detect of existence of the car and also provide information such as number of available parking space and the location of that parking. The system captures images using surveillance cameras and process the image to counting available parking space. Techniques of image processing have been embedded in each phase of methodology. This system gives information about the location of available parking space and the number of available parking space. It will be benefit to all drivers when enter a parking lot.

**2. LITERATURE REVIEW**

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| **EXISTING METHOD** | **ADVANTAGES** | **DISADVANTAGES** |
| [Parking space](https://ieeexplore.ieee.org/document/4621296)[Detection using](https://ieeexplore.ieee.org/document/4621296)[Ultrasonic sensor](https://ieeexplore.ieee.org/document/4621296)[In parking assistance system](https://ieeexplore.ieee.org/document/4621296) | 1. **Accurate Detection:** They provide reasonably accurate measurements of the distance between the sensor and the vehicle, enabling reliable detection of parking occupancy. 2. **Complementary Integration:** These sensors can be integrated with other technologies like cameras or magnetic sensors to enhance accuracy and provide redundant detection, ensuring a more robust system. | 1. **Weather and Noise Sensitivity:** Ultrasonic sensors can be affected by weather conditions like heavy rain, snow, or fog, leading to potential false readings. Additionally, they might register false detections due to ambient noise, impacting accuracy. 2. **Limited Range and Coverage:** The detection range of ultrasonic sensors might be limited, especially in large parking areas or when obstructed by certain objects, potentially causing blind spots. 3. **Maintenance Requirements:** These sensors may require periodic maintenance to ensure their proper functioning, as environmental factors can degrade their performance over time. |
| [Parking Line Based SLAM](https://www.mdpi.com/1424-8220/19/21/4811) [Approach Using AVM/LiDAR](https://www.mdpi.com/1424-8220/19/21/4811) [Sensor Fusion for Rapid and](https://www.mdpi.com/1424-8220/19/21/4811) [Accurate Loop Closing and](https://www.mdpi.com/1424-8220/19/21/4811) [Parking](https://www.mdpi.com/1424-8220/19/21/4811)[Space Detection](https://www.mdpi.com/1424-8220/19/21/4811) | 1. **Real-time Data and Optimization:** It generates real-time data on parking availability, aiding in the optimization of parking lot usage, reducing congestion, and improving traffic flow. 2. **Efficient Parking Guidance:** LiDAR-based systems can guide drivers to available parking spots, enhancing user experience by reducing search time and congestion within parking lots. | 1. **Costly Implementation:** LiDAR technology can be relatively expensive to implement compared to some other parking detection systems, which might increase the overall cost of the parking infrastructure. 2. **Vulnerability to Environmental Factors:** Adverse weather conditions such as heavy rain, fog, or snow can affect the performance of LiDAR sensors, potentially leading to inaccuracies in detecting parked vehicles. 3. **Complexity and Maintenance:** LiDAR systems may have a higher level of complexity in their setup and maintenance, requiring specialized knowledge for installation and regular maintenance to ensure optimal performance. |
| [Parking detection system using background subtraction and HSV color segmentation](https://www.researchgate.net/publication/356222258_Parking_detection_system_using_background_subtraction_and_HSV_color_segmentation) | 1. **Real-Time Detection:** These methods often provide real-time detection capabilities, allowing for immediate identification of changes in the parking environment. 2. **Adaptability to Changes:** Algorithms like GMM and adaptive background subtraction can adapt to gradual changes in the scene, making them suitable for dynamic parking environments. | 1. **Sensitivity to Environmental Variations:** Changes in lighting, shadows, or sudden scene variations can impact the accuracy of background subtraction methods, leading to false positives or missed detections. 2. **Initial Training and Calibration:** Some of these methods might require initial training or calibration periods to establish an accurate background model, which could be time-consuming or may need adjustments for different environments.   Top of Form |
| [An Image Feature-Based Method for Parking](https://www.researchgate.net/publication/334907158_An_Image_Feature-Based_Method_for_Parking_Lot_Occupancy)  [Lot Occupancy](https://www.researchgate.net/publication/334907158_An_Image_Feature-Based_Method_for_Parking_Lot_Occupancy) | 1. **Flexibility in Feature Extraction:** These methods can leverage diverse image features like color, texture, shape, or object detection algorithms to identify parked vehicles, providing versatility in detection. 2. **Scalability:** They can be applied to different parking lot sizes and layouts, making them adaptable to various environments without significant reconfiguration. | 1. **Dependency on Image Quality:** Accuracy heavily relies on image quality, which can be affected by factors like lighting conditions, camera angles, occlusions, and image resolution. Poor quality images can lead to misinterpretation of features. 2. **Complexity in Feature Extraction:** Extracting relevant features from images and developing robust algorithms can be computationally intensive and require expertise in image processing and machine learning. 3. **Challenges with Varied Environments:** Changes in weather, different vehicle types, varying parking lot layouts, or unexpected objects in the scene can pose challenges for accurate feature extraction and interpretation. |
| [Radio Frequency Identification (RFID) Based Car Parking System](https://www.researchgate.net/publication/327575252_Radio_Frequency_Identification_RFID_Based_Car_Parking_System/link/5bbfaf61299bf1004c5a5615/download) | 1. **Efficient and Quick Access:** RFID systems offer swift and automated access to parking facilities. Drivers can access parking areas without manual intervention, reducing wait times and congestion at entry and exit points. 2. **Enhanced Security:** RFID tags provide secure access control. Each vehicle is equipped with an RFID tag that communicates with the parking system, allowing authorized vehicles to enter while preventing unauthorized access. | 1. **Initial Setup Costs:** Implementing an RFID-based system can require a significant initial investment in infrastructure, including RFID readers, tags, and associated technology. This cost can be a barrier to adoption for some parking facilities. 2. **Tag Maintenance and Loss:** RFID tags can be subject to wear and tear, requiring periodic maintenance or replacement. Additionally, if users misplace or damage their tags, it can disrupt the access control system. 3. **Limited Compatibility:** RFID systems might face compatibility issues with older vehicles or vehicles lacking RFID technology. Retrofitting older vehicles with RFID tags or readers might be necessary, posing additional costs and logistical challenges. |
| Smart Parking Using Wireless Sensor Network  System  Smart Parking Using Wireless Sensor Network  System  Smart Parking Using Wireless Sensor Network  System  Smart Parking Using Wireless Sensor Network  System  Smart Parking Using Wireless Sensor Network  System  gSmart Parking Using Wireless Sensor Network  System |  |  |
| Smart Parking Using Wireless Sensor Network  System  Smart Parking Using Wireless Sensor Network  System  Smart Parking Using Wireless Sensor Network  System  [Smart parking using wireless sensor Network System](https://www.researchgate.net/publication/330297671_Smart_Parking_Using_Wireless_Sensor_Network_System) | 1. **Optimized Space Utilization:** By monitoring parking space occupancy, these systems optimize parking lot utilization. This can reduce congestion, minimize search time for parking, and enhance the overall efficiency of parking facilities. 2. **Cost-effective Installation:** Wireless sensors are relatively easy to install and require less infrastructure compared to traditional systems. They can be retrofitted into existing parking lots without major disruptions. | 1. **Maintenance Challenges:** Wireless sensors may require regular maintenance to ensure accurate detection, as environmental factors or sensor malfunctions can impact their reliability. Battery life and sensor durability are also factors that need attention. 2. **Initial Investment:** Implementing a WSN-based system involves upfront costs for purchasing and installing the sensors, along with the infrastructure required for data processing and communication. 3. **Technological Interference:** Wireless communication might face interference or signal disruptions, affecting the accuracy of parking space detection and potentially leading to incorrect occupancy information. |
| [Parking Guidance System](https://www.hindawi.com/journals/js/2022/7481064/) [Based on Geomagnetic Sensors](https://www.hindawi.com/journals/js/2022/7481064/) [and Recurrent Neural](https://www.hindawi.com/journals/js/2022/7481064/) [Networks](https://www.hindawi.com/journals/js/2022/7481064/) | **Dynamic Adaptability:** Recurrent neural networks are capable of learning from past data and adapting to changing patterns, enhancing the system's accuracy in predicting parking space availability even in dynamic environments. | 1. **Initial Implementation Costs:** Implementing geomagnetic sensors and sophisticated AI-driven systems involves significant upfront costs, including the purchase and installation of sensors and the development of AI models. 2. **Maintenance and Sensor Reliability:** Geomagnetic sensors may require regular calibration and maintenance to ensure accurate readings. Additionally, sensor malfunctions or environmental factors could affect their reliability. 3. **Complexity in Implementation:** Developing and fine-tuning recurrent neural network models for accurate predictions requires expertise in AI and data science. Complex algorithms might pose challenges in system integration and maintenance. |
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**3. OBJECTIVES**

Smart Parking involves the use of low cost sensors, real-time data and applications that allow users to monitor available and unavailable parking spots, but all these methods are very costly and some of them are not environment friendly and few of them are not that much accurate ,so we came up with very simple, cost-effective, real-time, solution. Our main goal is to automate and decrease time spent manually searching for the optimal parking floor, spot and even lot. Some solutions will encompass a complete suite of services such as online payments, parking time notifications and even car searching functionalities for very large lots. The main objectives of the project are……………

**i. Capture and detect existence of vehicle at parking lot using image processing technique**.

**ii. Count, display available parking space and the location of the available parking spaces in the parking lot.**

**Other objectives are:-**

**Optimized parking** – Users find the best spot available, saving time, resources and effort. The parking lot fills up efficiently and space can be utilized properly by commercial and corporate entities.

**Reduced traffic** – Traffic flow increases as fewer cars are required to drive around in search of an open parking space.

**Reduced pollution –** Searching for parking burns around one million barrels of oil a day. An optimal parking solution will significantly decrease driving time, thus lowering the amount of daily vehicle emissions and ultimately reducing the global environmental footprint.

**Decreased Management Costs –** More automation and less manual activity saves on labor cost and resource exhaustion.

**Enhanced User Experience –** A smart parking solution will integrate the entire user experience into a unified action. Driver’s payment, spot identification, location search and time notifications all seamlessly become part of the destination arrival process.

**EXPERIMENTAL DETAILS/METHDOLOGY**

There are two (2) types of system requirement specification and those are

Software Requirements

Hardware Requirements

**Software Requirements**

1. Operating system: WINDOWS XP/7/8/10

2.Tool used: vscode

3. Database: MYSQL

4.python

5. CV2 Module

• OpenCV-Python is a library of Python bindings designed to solve computer vision problems.

• Syntax: cv2.VideoCapture(). cv2.VideoCapture() method load and save and read video.

**Hardware Requirements**

1.Processor: Intel i3

2.Speed: 1.1 GHz

3.RAM: 2 GB (Minimum)

4. Disk space: 2 GB (Minimum)

5. Monitor, Keyboard, Mouse

**4. METHODOLOGY**

This project, vehicle parking management system using image processing aims to create a better environment for a vision-based vacancy parking area detection, providing a modern and innovative solution for temporary parking places. For example, dust ground, cemented flooring where no specific parking systems are used. The prime objective is to have the maximum number of cars which can be parked in an organized manner into the temporary lot.

This project’s aim is to detect and recognize the real time vacant parking space. It comprises of a camera mounted on roof top of any nearby building or some supporting pole at certain angle where it covers the maximum area of parking lot which is being used for taking the input. The images obtained from the live stream are then fed to the processing module, which detects the region of interest (ROI) consisting of the area to be covered for parking spaces. A car detection Module is used to detect the cars within ROI using Neural Network. This module tracks and detects the parking space in an image. The parking space detection module generates virtual lines for parking which will be visible to user on an app assisting in vehicle parking. Due to human error if someone parked the vehicle between the lines or parked the vehicle in wrong manner, the output will be shown at the admin side of Application with the count of wronged parked Car. Two application interfaces have been developed, the user interface and the admin interface. Whenever the user opens the application, he will be able to see the image of the parking lot and number of vacant spaces in the parking lot.

1. **OUTCOMES**

**6. TIMELINE OF THE PROJECT/ PROJECT EXECUTION PLAN**

* Review-0 🡪13-Oct-2023🡪 PROJECT OVERVIEW
* Review-1🡪10-Nov-2023 🡪DEVELOPING USER INTERFACES
* Review-2 🡪30-Nov-2023 🡪DEVELOPING DATABASE TO STORE FARMER RELATED DETAILS.
* Review-3🡪30-Dec-2023🡪DEVELOPING THE BACK-END PART AND

INTIGRATING ALL THE COMPONENTS

**7. CONCLUSION**

The Final Version of our Project is a mobile Application offering a start-up product in management sector that aims to address the parking difficulty issues at some mega-events where vehicles have to be parked in temporary parking area. The vision-based parking management system features to have maximum parking within the ROI and to facilitate the user with the best. The user can have a real-time parking lot update in order to see if there any vacant space available to park the car or not. Since most people are in hurry and park the car in the wrong way. In order to track it out, we have an admin application where the admin can check into the system for any wrong parking, the total number of vacant spaces, the number of correctly parked cars, and other details

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