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Parking Space Detection Using Image Processing

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ABSTRACT: Technology advancements bring about changes in our day-to-day lives. Humanity is moving toward automation as we get closer to technology, however there are many situations when using machines is not economically viable. In this situation, a streamlined method is required to complete the assignment effectively. For example, let's think about a parking system for cars. It provides a useful solution for counting the number of cars in a parking lot and determining how many spots are available. Finding a parking spot in urban areas can often be an arduous and time-consuming process.

KEYWORDS: Image processing, Visualization, Wireless Communication, space detection, Deep Neural Network,Computer Vision, Neural Network-Based Parking, Vehicle Detection, Parking Spot Detection.

I. INTRODUCTION

Our everyday lives are continuously being shaped by technological advancements. Humans are moving toward automation as we approach this period, yet cost- effectiveness prevents machine adoption in many locations. To go right to the point, in order to do activities quickly, a simplified approach is necessary. Let's use a car parking system as an example of this. It serves as a simple solution, making it easier to determine the number of cars in a parking lot and the quantity of empty parking spaces. In urban areas, searching for a parking space often takes time and causes stress.

Efficient vehicle park steerage structures could help drivers in their look for an available parking space. Photo processing base structures are a reasonably priced opportunity to structures employing different sensor sorts and their camera input can be used for numerous duties inside the machine. Present day structures detecting vacant parking spaces are either very high-priced because of their hardware requirements or do not provide an in depth occupancy map. Now an afternoon, the parking machine has accelerated.

In order to encourage prudent and helpful parking, it is necessary to build an automatic parking space detecting system. By using an automated and methodical parking system, human labor may be reduced and the system can operate more effectively to prevent delays and waste of time. To far, a variety of parking system approaches have been used, including infrastructure-based, free space-based, user interface-based, and parking slot marking-based approaches. The most effective parking spot marking-based strategy is demonstrated by AVM. 360-degree views of the system's surroundings are provided by AVM. Systems including user interface-based, free space-based, parking slot marking-based, and infrastructure-based approaches have all been used up to this point. The most effective parking spot marking-based strategy is demonstrated by AVM.

A. *Image Processing in Parking Space Detection*

Image processing technology is a disruptive force in parking spot detection as we strive to create more intelligent and efficient urban settings. Using cutting-edge computer vision techniques, it is possible to identify parking spots using image processing and transform both static and dynamic photos into useful data. This innovation has completely changed the way we manage and improve parking assets, making urban mobility more environmentally friendly and accessible than before.

At its core, image processing is the process of analyzing and modifying digital images in order to extract meaningful information. When it comes to parking space recognition, image processing powers enable us to automatically identify and monitor the state of use of parking spaces in parking lots, buildings, or on city streets. By employing a combination of cameras, sensors, and advanced algorithms, this system captures real-time data regarding available parking spaces, making it an effective tool for drivers and city planners alike.

The allure of image processing for parking space recognition is its ability to improve urban mobility while reducing related issues. For drivers, it provides the invaluable convenience of quickly and simply finding empty parking spaces, removing the stress of endless searching. By efficiently guiding vehicles to available parking places, it contributes to reducing fuel use, traffic congestion, and environmental pollutants on a larger scale.

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B. Literature Survey

The counting is completed with the use of induction loop sensors. Even while sensors are now much more affordable to operate, more resistant to environmental factors, and capable of properly identifying objects, their installation presented difficulties and caused damage to roads.
Moreover, there were challenges in maintaining these sensors [2]. Moreover, it is not practicable to determine the precise locations of vacant parking spaces because the tallying method frequently provides only broad information.

Numerous methods and strategies have been developed to lessen the difficulties related to parking in areas with high population density. A method has been suggested in one such solution [1] to count the cars at a specified checkpoint, making it easier to calculate the number of parking spaces that are available. The counting procedure is completed by the deployment of induction loop sensors. Even while sensors are now much more affordable and have better precision and are less sensitive to environmental factors, their installation presented difficult obstacles and caused damage to roads. There were also significant issues with maintenance [2].

Furthermore, since the counting process usually produces only aggregate data, it is impossible to precisely identify vacant parking spaces. One of the disadvantages of visual technology is that its accuracy is heavily dependent on where the camera is positioned.

An unguided visual system was proposed by Thomas Fabian as a way to track parking space usage. The suggested gadget has a low computational complexity and works at a lower frame rate per minute. He argues that shadows and obstructions are the primary causes of photogram recognition difficulties [6]. Advanced clustering methods are used to enable self-exploration.

According to a method presented by H. Ichihashi and colleagues, vision-based parking place identification systems often struggle with changes in atmospheric conditions and lighting circumstances, such as raindrops collecting on a camera lens during a deluge or extremely low light. As a result, rather than outside parking lots, cameras are frequently used for vehicle recognition inside parking structures [7].

A new method for manually imprinting a circular brown hue patch within each parking space was presented by R. Yusnita et al. When the gadget is first turned on, every section seems spherical. Drivers are granted entry to the designated region upon patch discovery, though, as it is deemed empty [8]. This system assumes that areas with automobiles obstruct patches, indicating traffic. The device navigates the parking lot with efficiency, however it becomes difficult to use in severe weather. Using a combination of color histogram analysis and vehicle attribute detection, N. Proper developed an effective parking space identification system as an alternate approach [9].
A photo-centric approach was presented by Najmi Hafizi to determine vacant spots in the outside parking area. Using a low-resolution web camera to take pictures of the parking area is a cost-effective method. After the photos are taken, they are processed in an initial step. Two ROI analyses are then performed on different sections of the parking lot to improve driver recognition accuracy.

SR. NO	TITLE	NAME	YEAR	Finding Out
1.	Parking Lot Occupancy Tracking Through Image Processing	Marcos Lopez1,Terry Griffin1, Kevin Ellis1,Anthony Enem1, and Christopher Duhan1	2018	Although research has been done to help users find empty parking spots, these methods usually need costly and difficult-to-maintain strategies.

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2.	Automatic Parking Space DetectionSystem.	Nazia Bibi	2017	Parking-slot detection using vision is still a difficult issue that has to be addressed.we gathered and classified sizable dataset of surround view images.

Table I Literature Survey

II. PROPOSED METHODOLOGY

The methodology for Parking Space Detection using Image Processing technology would involve the following steps :

A. Algorithm 1/Pseudo Code Image Processing:

Step 1: Image processing in computer science refers to the manipulation of digital images using computer techniques. Digital imageprocessing hasinteroperability and availability: This would require a thorough analysis of the current EHR system and identification of its limitations.

Step 2: Extract each feature as a hot vector or input neuron from testFeature(m) using below equation.Step 3: create the number of convolutional benefits and image processing is the subfield of it.

It permits the application of a much wider variety of algorithms to the input data and can prevent issues like the accumulation of noise and signal distortion during processing. Digital image processing can be described as a multidimensional system because images can exist in atleast two dimensions and possibly more.

B. Architecture

We create a mechanism for locating parking spaces.We employ the DNN algorithm in this.Using DNN and image processing, locate open slot.Initially, we compare a single image to the prior dataset.Find out how many vehicles are shown on that image and whether or not there are slots available.When this process is finished, the browser will display the results, including the number of slots and whether parkingspaces are available.

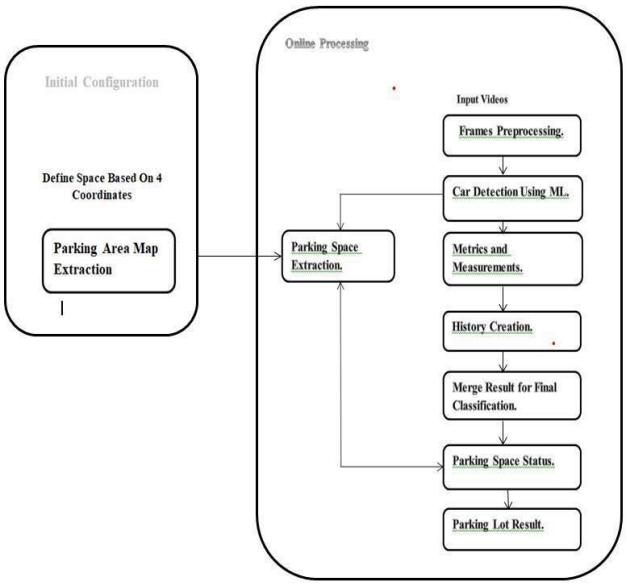

Fig. 1 Architectural Diagram

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i. *Input Video: We Video as a Input.*
ii. *Initial configuration: We capture the images in area of parking.*
iii. *Output: Result will be displayed on web browser like chrome ,mozilla firefox, Microsoft edge etc.*
iv. *Data Design In this project we use parking area dataset. Parking Slot has Name,Number,Size.Which is on available on Internet. Internal Software Data Structure We use CV 2 for accessing camera. OpenCV Python Library is available directly to access camera.*
v. *Global Data Structure For Space detection we require huge amount of data and continuous recording. Because when we make real time system it requiring currently available data.*

III. IMPLEMENTATION RESULT

i. *It will display available number of parking slot with its location.*

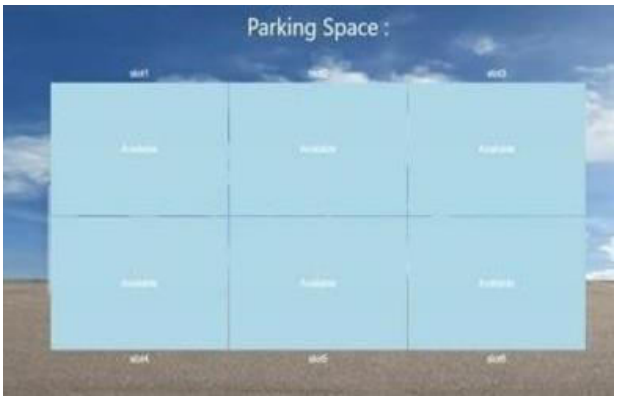

Fig. 2 Parking Availability slots shows

Fig. 3 It shows on mobile phone and laptop the live recording and detecting a car which is unavailable parking slot

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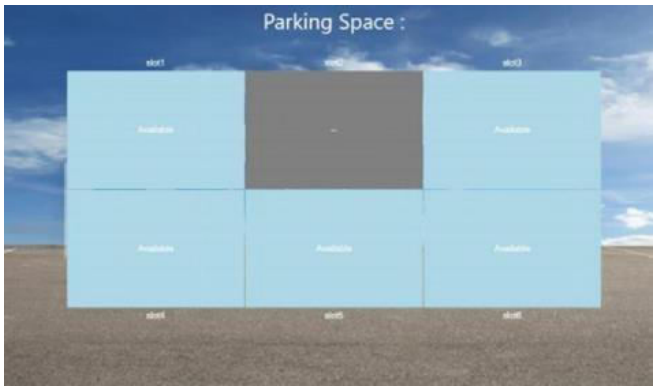

Fig. 4 Gray indicates unavailable parking slot

IV. CONCLUSION

Customers are helped in their search for available parking by the current technology, which recognizes parking spaces and spots for vehicle installation. We are currently developing a real-time system with the aim of improving the project's accuracy going ahead.

The main contribution of this work is to improve the identification of empty parking spots in order to potentially reduce traffic jams in parking lots. The method of booking and locating parking spaces is expedited by combining image processing with a machine learning model in the parking area.

A. FUTURE SCOPE

i. Real-Time Parking Direction: Leading the way in the implementation of real-time parking direction systems that reduce the time and stress involved in finding parking by guiding drivers and determining available spaces.
ii. Multi-Level and Indoor Parking: Extending the system's capabilities to include multi-level parking structures and enclosed parking areas, which bring unique layout and lighting challenges.
iii. Elevated Precision: An ongoing effort to improve parking space recognition precision by utilizing state- of-the-art DNN models and optimizing image processing algorithms.
iv. Usage analytics is the process of using collected data to analyze parking occupancy and provide insightful information that can be used to improve parking facility management and urban planning.
v. Fusion of Safety and Surveillance: combining the system with security and surveillance tools to
vi. Integration with the Internet of Things (IoT): The process of integrating the system with the IoT to promote improved connectivity and data exchanges between cars, parking lots, and public infrastructure.
vii. Eco-Friendly Operations: Applying sustainability concepts by adding sensors and controls that allow parking facilities to adjust lighting, ventilation, and energy use based on occupancy.
viii. Advanced User Interfaces: The development of voice- activated systems and user-friendly interfaces to engage with the parking spot detection setup.
ix. Collaboration with autonomous vehicles: merging with them to give them the ability to park and navigate on their own.

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