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Parking Availability Tracking and Visibility for Smart Cities

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ABSTRACT:

In the constantly urbanizing landscape of modern smart cities, efficient parking space management has become a top priority. The present parking infrastructure frequently struggles to satisfy rising demand, resulting in traffic congestion, pollution, and dissatisfied citizens. To address this issue, a Parking Availability Tracking System that can intelligently manage and optimize parking resources inside the City is urgently needed. Congestion and parking are linked since finding an empty parking space causes additional delays and increases local circulation, which is analyzed and used to advise people about available parking spots via mobile apps. As the number of cars on the road increases, parking spaces become rarer.

INTRODUCTION :

In an era of rapid urbanization and growing populations, finding parking in open places has become a daunting task. However, the introduction of modern parking technique offers a ray of hope, providing creative solutions to reduce congestion, improve convenience, and optimize space management.

Inadequate parking is a major contributor to traffic congestion. Congestion and parking are linked as hunting for a free parking spot causes delays and increases local traffic. With increasing car ownership, parking lots at airports, universities, retail centers, and other open locations can be challenging to find a spot. There is a greater issue with parking spots during holidays and certain festivals. Insufficient parking can negatively impact drivers' enjoyment of life and increase their risk of accidents. Manually identifying parking spaces is common in most parking lots. However, during holidays and festivals, drivers can often find a spot. Finding a parking spot in a densely populated city can be a time-consuming and challenging procedure. The Internet of Things (IoT) has transformed smart parking systems to handle issues and improve administration. Using the Internet of Things, the project creates and implements a successful cloud-based smart parking system solution to lessen the traffic of those looking for parking.

LITERATURE SURVEY :

The dataset of Birmingham parking sensors is used to assess the performance of Long-term memory networks that are deep. Three types of experiments are carried out to predict the availability of free parking space based on location, weekdays, and working hours. The experimental results show that the proposed model outperforms the best prediction models currently available [1] .This unique algorithm enhances the effectiveness of a cloud-based smart parking system and creates a network architecture using Internet-of-Things technology. This study proposes a system that automatically locates free parking spaces at the lowest feasible cost. The system uses novel performance measures to determine the user parking cost, taking into account the distance and quantity of vacant spaces in each car park. This amount will include both finding a parking place upon request and suggesting a new one if the present one is full. Simulation findings indicate that the system improves parking success rates and reduces user wait times. In addition, the proposed system was successfully implemented in the real world.

Car parking is a major contributor and has been a significant issue in urban communities with limited parking spots [2]. We present an IoT-based smart parking system for large parking lots that can be used to efficiently manage the parking system by providing information on the nearest parking slot available via the mobile application and thus reducing parking seeker congestion. To efficiently manage the parking system, a successful cloud-based smart parking system solution based on Internet of Things technology has been developed to guide the user to the closest available parking spot.

Building parking spaces is costly, enforcing fines is challenging, and drivers spend a significant amount of time searching for available lots. Accurate quantification can help developers and municipalities allocate space more effectively, while real-time measurements can save time and resources for drivers and parking enforcers [3].

This investigation presents a real-time video system suitable for the Internet of Things and smart city applications. We use deep convolutional neural networks and a unique vehicle tracking filter to eliminate noise from video sequences caused by occlusions and identification failures. Our technique outperforms pure image-based instance segmentation and is equivalent to industry benchmark systems using more expensive sensors like radar. Our technology has the potential to grow to a city-wide scale and provide more detailed output than typical binary occupancy figures. Deep learning

methods, particularly CNNs, have produced numerous promising results in a wide range of computer vision applications. However, few studies have focused on developing suitable deep learning methods for inferring parking space status [4].

The custom tailored deep convolutional and contrastive network with three contributions to address the issues. We started with a Siamese architecture to learn the contrastive and robust feature descriptor. This helps to mitigate the effects caused by the various types of inter-object occlusion. Second, we used a convolutional Spatial Transformer Network (STN) to transform a 3-space input patch adaptively based on vehicle size and parking displacement. STN also aids in the resolution of the perspective distortion issue. Third, a multi-task loss function was created to train the network while simultaneously taking into account the accuracy of inferring the target space's status and the semantic smoothness of high-level features. Thus, errors caused by inter-object occlusion could be reduced. To validate the proposed network, we visualized and analyzed the learned features' functionality. Experiments and evaluations have demonstrated the robustness of our system in determining parking status. The current real-time system in public parking lots demonstrates the effectiveness of the proposed deep network[5].

In recent years, there has been a surge in interest in developing self-parking systems in the automotive industry. A key and still unresolved issue for such systems is how to accurately and efficiently detect and localize parking-slots defined by regular line segments near the vehicle [6].

There are many vehicles in the world, and the number of vehicles is rapidly increasing. The smart parking system was created to alleviate the parking issues caused by this. One of the most important aspects is the parking planning. An effective parking planning strategy allows for more efficient use of parking resources [7].

A Modern Parking technique which incorporates Ultra-High Frequency (UHF) RFID with IEEE 802.15.4 wireless sensing technology. Using an exclusive software program, the system can collect information about parking lot occupancy and direct cars to the nearest available spot. This program additionally employs an NFC-based e-wallet system to allow customers to pay for parking. Furthermore, on a Centralized server, a software application built using Restful design Java and the Google Cloud Messaging strategies has been executed for controlling alert events (such as the inappropriate use of the reserved area or deadline of the paid time) [8].

In our daily life, finding an automobile in a vast parking lot is difficult. This describes an innovative smartphone-based car-searching method for huge parking lots. The new strategy involves placing QR codes in each location to designate parking slots. Furthermore, the method known as shortest path is employed to determine the optimal car-searching route. Given that several parkers with weak senses of heading may become bewildered in the parking area, an immediate navigation technique for parkers to seek for their automobile is presented, in accordance with the indicators that are embedded in devices and the pedometer concept. The novel approach is tried in a big indoor parking lot, and the findings suggest that the recommended car-searching system is effective [9].

The concept of employing IoT and cloud-based technologies for city automobile parking services. The suggested system is presented in broad strokes. Our plan modernizes the outdated parking system by utilizing the resources of IoT and incorporating cutting-edge electrical sensors and computers. An intelligent automobile parking system using the Internet of Things is detailed. To provide a good parking experience for mobile customers, a range of software solutions are proposed, including Python, PHP online gateway integrated MySQL database, storage on the cloud, and mobile applications. Furthermore, data collected by detectors, image recognition photographic equipment, and mobile devices are utilised for getting insights by being stored in a public cloud foundry and analysed using Hadoop [10].

LIMITATIONS :

This study has certain drawbacks. The main drawback of this research is that a decision help system forecasts parking lot availability simply on its assumptions of parking occupancy data. Additionally, it takes into consideration neither weather conditions nor social events. Weather circumstances, social gathering data, and site occupancy data will all be considered in future study. Second, the suggested method was created entirely with parking lot information in mind. To mitigate the impact of prediction uncertainty, additional research will be conducted on the quantity of roadside parking spots and traffic congestion statistics [1] .

The study has a few limitations. The distributed systems model is challenging to create, implement, and manage. The network-based simulation requires a high level of professional expertise and understanding to construct and manage documents and collections, and traversing the network structure via pointers and links as well. Our system is unsecure, and our recommended system should be widely applied in the actual world [2].

It can't be accessible from a distance, and the application cannot guide the user if they walk in the incorrect direction [3].

It was revealed that a simple Mask-RCNN application produced a noisy measurement of lot use. The validation findings suggest that approaching the parking measuring issue as a video challenge rather than an image one increases accuracy dramatically. When contrasted with pure image-based approaches, our system can better predict vehicle occupancy by incorporating information from previous and subsequent video frames. Furthermore, SFMTA evaluation findings back up the notion that our system beats advanced commercial systems with more expensive sensors. Future research ought to contrast different types of sensors on identical parking lots and at equal times in order to confirm our system's performance in relation to other approaches [4].

The trained network is overfitted because to the model's crowded and scattered features, as discussed in this research. The study addresses two new issues: irregular vehicle sizes and unpredictable parking displaced objects. To a certain extent, the range of automobiles and the preponderance of parking shifts may be restricted. However, a limited space contributes to the occlusion issue and drastically lowers performance. Although the suggested method can correctly predict the space situation in many difficult situations, several difficulties need to be tackled in the future. The concerns include low contrast sensory patches, uneven datasets for training, and network model repetition [5].

Deep PS does not work perfectly in poor imaging conditions. It isn't yet perfect. When imaging circumstances are inadequate (for example, surrounding trees cast heavy shadows), a true candidate may be missed (false negative).There are two primary causes for the lack of real candidates. For starters, a real marking-point has a lower confidence score than the stated threshold. Second, a legitimate entrance-line applicant may be incorrectly categorized as "invalid" by the regional photographic pattern classification model. In a functional self-parking system, erroneous positives are more bothersome

than false negatives. DeepPS may occasionally produce a false positive. The main cause is that the DCNN algorithm may (though rarely) misclassify the local picture pattern established by two marking-points having an extremely high certainty level [6].

In some circumstances, there aren't enough parking places to handle all of the queries in the wait. To distribute parking places properly, we should follow the principle of the first first-come, first-served concept. There are no ways for deciding the number of parking requests to be maintained in the line. There are no viable methods for constructing a subset of parking spots available so as to minimize waste and operating time. They are all inherently unstable [7].

The SPS offers two mobile apps: the Automobile App and the Policemen App. They are being deployed on the operating system Android, which fully supports the technology of NFC. Furthermore, the SPS employs the payment services provided by the IDA-Pay network. As a consequence, the driver's mobile device additionally needs to have the IDA-Pay software installed. Our next project will include an extension of the application that allows the user to boost their paid charge [8].

Pedometers don't track movement duration, intensity, or frequency. Some constraints exist, such as single-technology positioning, and no one technology can deliver optimal outcomes [9].

Since there are currently no methods yet, one will have to be developed and evaluated in the future. Furthermore, it should be utilized in a simulated environment in the future [10].

CONCLUSION :

Finally, implementing an creative parking system in common areas offers a possible answer to the problems connected to conventional parking management. This new technology uses powerful detectors, real-time data interpreting, and user-friendly applications to maximize parking efficiency and improve the ultimate parking experience. There are various advantages to using an intelligent parking structure in public areas. For starters, it considerably lowers the time and labour drivers spend hunting for parking places, causing a more efficient traffic flow and less congestion. Furthermore, by lowering wasteful fuel use and emissions connected with driving circling, the method supports environmental sustainability.

Furthermore, the use of smart parking technologies enhances overall mobility in cities and accessibility. It delivers vital data insights to city planners, enabling informed decision-making and promoting urban development. The system's versatility and adaptability make it a feasible option suitable for various open locations.In future versions, the application for smartphones may be connected to a Navigation system, directing users to adjacent parking spots. In the smartphone application. Additionally, a suitable algorithm can be developed to allow parking seekers to reserve their spots.

Investigate how new technologies like 5G networks and computing at the edge could enhance immediate refining of records and interaction among parking infrastructure and consumers. Create simpler and easy to use smartphone applications with features such as transportation to the allotted parking area, real-time traffic developments, and customizable parking preferences. To accommodate the increasing trend of electric transportation, incorporate sustainability elements like EV charging station administration into the intelligent parking system. Partner with smart city programs to connect parking structures with larger urban amenities, such as traffic control, transit, and monitoring of the environment, to offer a more comprehensive and linked urban experience.

SOLUTION :

To overcome these concerns, we might add a further image pre-processing module to our network and apply end-to-end training to maximize the accuracy of an input patch. However, so as to free up human resources for unsupervised training, we may be unable to construct a generalized and prejudiced network from a semi-supervised and imbalanced dataset with few labels. Therefore, our system's next step would be to acquire how to network for a fresh parking area through transfer learning.

REFERENCES :

1. Ali, G., Ali, T., Irfan, M., Draz, U., Sohail, M., Glowacz, A., ... & Martis, C. (2020). IoT based smart parking system using deep long short memory network. Electronics, 9(10), 1696.
2. Pham, T. N., Tsai, M. F., Nguyen, D. B., Dow, C. R., & Deng, D. J. (2015). A cloud-based smart-parking system based on Internet-of-Things technologies. IEEE access, 3, 1581-1591.
3. Ramasamy, M., Solanki, S. G., Natarajan, E., & Keta, T. M. (2018, December). IoT based smart parking system for large parking lot. In 2018 IEEE 4th International Symposium in Robotics and Manufacturing Automation (ROMA)
4. Cai, B. Y., Alvarez, R., Sit, M., Duarte, F., & Ratti, C. (2019). Deep learning-based video system for accurate and real-time parking measurement. IEEE Internet of Things Journal, 6(5), 7693-7701.
5. Vu, H. T., & Huang, C. C. (2018). Parking space status inference upon a deep CNN and multi-task contrastive network with spatial transform. IEEE Transactions on Circuits and Systems for Video Technology, 29(4), 1194-1208.
6. Zhang, L., Huang, J., Li, X., & Xiong, L. (2018). Vision-based parking-slot detection: A DCNN-based approach and a large-scale benchmark dataset. IEEE Transactions on Image Processing, 27(11), 5350-5364.
7. Zhao, X., Zhao, K., & Hai, F. (2014, June). An algorithm of parking planning for smart parking system. In Proceeding of the 11th World Congress on Intelligent Control and Automation (pp. 4965-4969). IEEE.
8. Mainetti, L., Palano, L., Patrono, L., Stefanizzi, M. L., & Vergallo, R. (2014, September). Integration of RFID and WSN technologies in a Smart Parking System. In 2014 22nd international conference on software, telecommunications and computer networks (SoftCOM) (pp. 104-110). IEEE.

9. Li, J., An, Y., Fei, R., & Wang, H. (2016, June). Smartphone based car-searching system for large parking lot. In 2016 IEEE 11th Conference on Industrial Electronics and Applications (ICIEA) (pp. 1994-1998). IEEE.
10. Hans, V., Sethi, P. S., & Kinra, J. (2015, October). An approach to IoT based car parking and reservation system on Cloud. In 2015 International Conference on Green Computing and Internet of Things (ICGCIoT) (pp. 352-354). IEEE.