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Iot Based Platform For Real Time Smart Parking And Billing

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Abstract: Today, the parking industry is being transformed by new technologies that are allowing cities to reduce rates of congestion significantly. This paper describes an Internet of Things (IoT) based parking sensing System that deploys a robust outdoor vehicle localization and recognition methodologies. Although parking occupancy monitoring systems have made a considerable progress, smart parking payment is rarely studied in smart parking research. This paper proposes a new low-cost sensor system allowing real-time parking occupancy monitoring along with parking payment without requiring any user/driver interaction. The proposed on-board by using JETSON NANO DEVELOPER KIT. It has benefits in terms of detection and payment reliability, and reduced expense by reducing the system complexity, infrastructure investment and battery replacement expense. In this that kit will record the vehicle entry and show the parking slots available. Later It will note down parking entry time and exit time and generate bill automatically. In this multiple areas parking slots data will be displayed by person in a single place. Camera will capture the input and bill will be displayed by machine . Total work is done by using JETSON NANO KIT and operated through 5v of DC voltage to the kit.

Index Terms – Vehicle Localization, IoT, Parking

I. INTRODUCTION

The Internet of things (IoT) describes physical objects (or groups of such objects) with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks. Internet of things has been considered a misnomer because devices do not need to be connected to the public internet, they only need to be connected to a network, and be individually addressable.

Many different IoT devices are becoming developed for consumers, businesses, industry, agriculture, healthcare, and the public sector. A few examples include:

- Wearable devices that monitor people's health and fitness.
- Smart thermostats that keep homes comfortable while also saving energy.
- Connected street lights that adjust based on time of day, season, and weather conditions.
- Smart farming systems that monitor precise weather, soil, and crop conditions.

The "Internet of Things" is the result of advances in technology and manufacturing that have made it feasible to incorporate computing and networking features into almost any device:

Computing parts (such as processors, sensors, batteries, etc.) have become much smaller, more powerful, more energy-efficient, and more affordable.

Wireless networking (such as cellular, Wi-Fi, Bluetooth, etc.) has become much faster, more energy-efficient, and more widespread. While IoT devices can use a wired network connection (such as Ethernet), a wireless connection makes it much easier for devices to connect to the internet or another network.

II. LITERATURE SURVEY

[1] Q.-J. Kong, Z. Li, Y. Chen and Y. Liu, "An approach to Urban traffic state estimation by fusing multisource information", IEEE Transactions on Intelligent Transportation Systems, vol. 10, no. 3, pp. 499-511, 2009.

This paper presents an information-fusion-based approach to the estimation of urban traffic states. The approach can fuse online data from underground loop detectors and global positioning system (GPS)-equipped probe vehicles to more accurately and completely obtain traffic state estimation than using either of them alone. In this approach, three parts of the algorithms are developed for fusion computing and the data processing of loop detectors and GPS probe vehicles. First, a fusion algorithm, which integrates the federated Kalman filter and evidence theory (ET), is proposed to prepare a robust, credible, and extensible fusion platform for the fusion of multisensor data. After that, a novel algorithm based on the traffic wave theory is employed to estimate the link mean speed using single-loop detectors buried at the end of links. With the GPS data, a series of technologies are combined with the geographic information systems for transportation (GIS-T) map to compute another link mean speed. These two speeds are taken as the inputs of the proposed fusion platform. Finally, tests on the accuracy, conflict resistance, robustness, and operation speed by real-world traffic data illustrate that the proposed approach can well be used in urban traffic applications on a large scale.

[2] G. Alessandretti, A. Broggi and P. Cerri, "Vehicle and guard rail detection using radar and vision data fusion", IEEE Transactions on Intelligent Transportation Systems, vol. 8, no. 1, pp. 95-105, 2007.

This paper describes a vehicle detection system fusing radar and vision data. Radar data are used to locate areas of interest on images. Vehicle search in these areas is mainly based on vertical symmetry. All the vehicles found in different image areas are mixed together, and a series of filters is applied in order to delete false detections. In order to speed up and improve system performance, guard rail detection and a method to manage overlapping areas are also included. Both methods are explained and justified in this paper. The current algorithm analyzes images on a frame-by-frame basis without any temporal correlation. Two different statistics, namely:

frame based and 2) event based, are computed to evaluate vehicle detection efficiency, while guard rail detection efficiency is computed in terms of time savings and correct detection rates. Results and problems are discussed, and directions for future enhancements are provided

[3] P. N. Pathirana, A. E. K. Lim, A. V. Savkin and P. D. Hodgson, "Robust video/ultrasonic fusion-based estimation for automotive applications", IEEE Transactions on Vehicular Technology, vol. 56, no. 4, pp. 1631-1639, 2007.

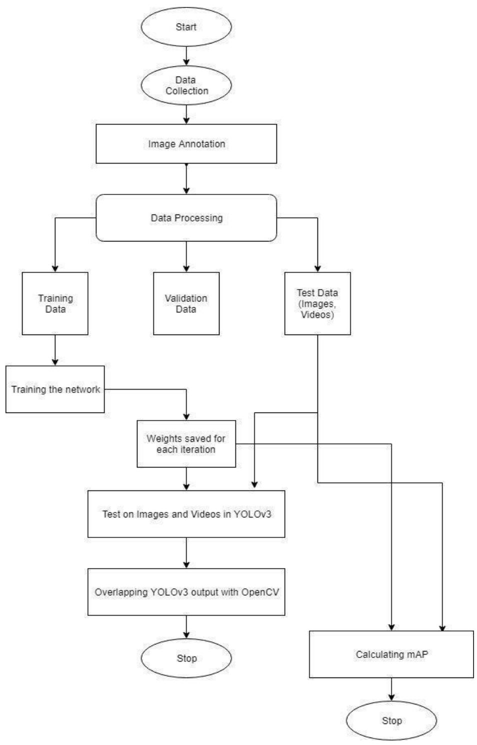
In this paper, we use recently developed robust estimation ideas to improve object tracking by a stationary or nonstationary camera. Large uncertainties are always present in vision-based systems, particularly, in relation to the estimation of the initial state as well as the measurement of object motion. The robustness of these systems can be significantly improved by employing a robust extended Kalman filter (REKF). The system performance can also be enhanced by increasing the spatial diversity in measurements via employing additional cameras for video capture. We compare the performances of various image segmentation techniques in moving-object localization and show that normal- flow-based segmentation yields comparable results to, but requires significantly less time than, optical-flow-based segmentation. We also demonstrate with simulations that dynamic system modeling coupled with the application of an REKF significantly improves the estimation system performance, particularly, when subjected to large uncertainties

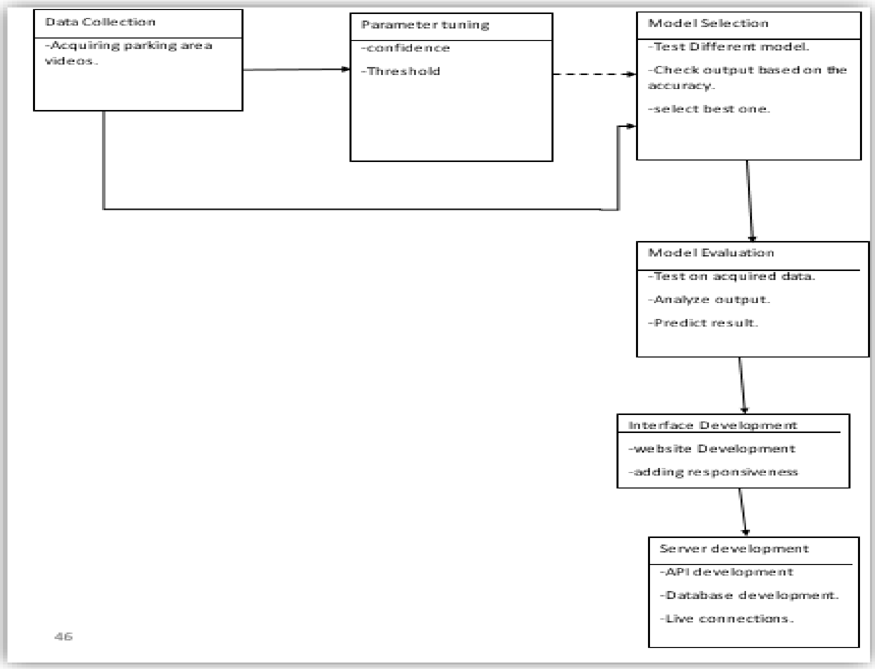
[4] Chao Long, Shuai Meng, "Wireless sensor networks: Traffic information providers for intelligent transportation system," 2010 18th International Conference on Geoinformatics, 2010, pp. 1-5.

Effective intelligent transportation system depends on the abundance of timely road information. This paper first presents the role of road information by taking dynamic route guidance system as an example; and then explains the necessary of importing wireless sensor networks as road information providers. We illustrate the principle of using magnetic sensors to detect vehicles and how the road information is achieved by in-network aggregation. We also provide several scenarios of making use of the real time road information.

III. METHODOLOGY
IV.

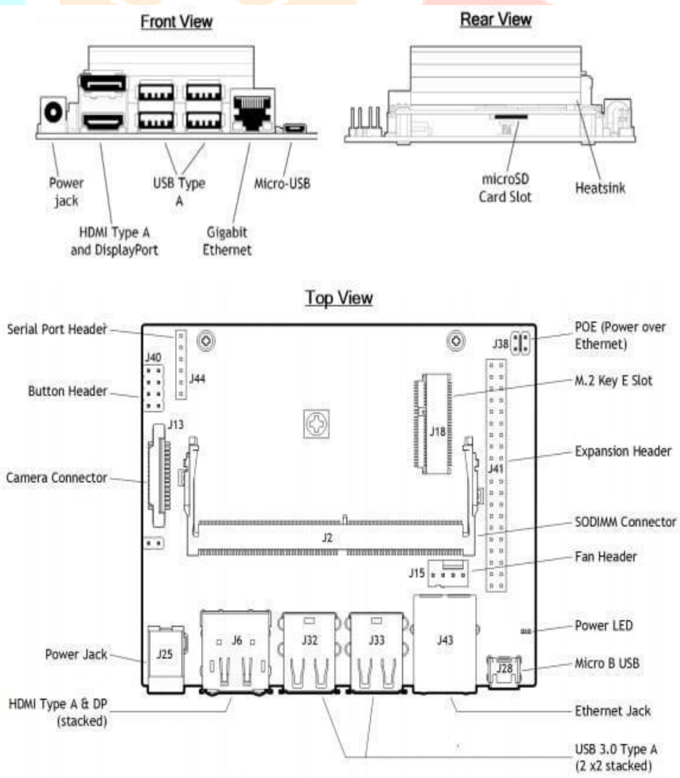
In this this, training and finding a car in the parking space is done using convolutional neural networks. In the proposed method, this would like to collect the images of cars parked in the outdoor parking lot and create a dataset with all the images so that the neural network can detect the car present in the parking space or not accurately.

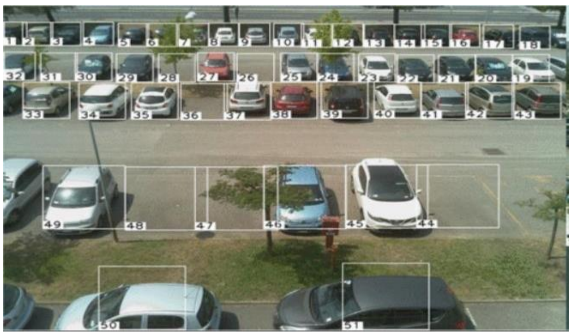


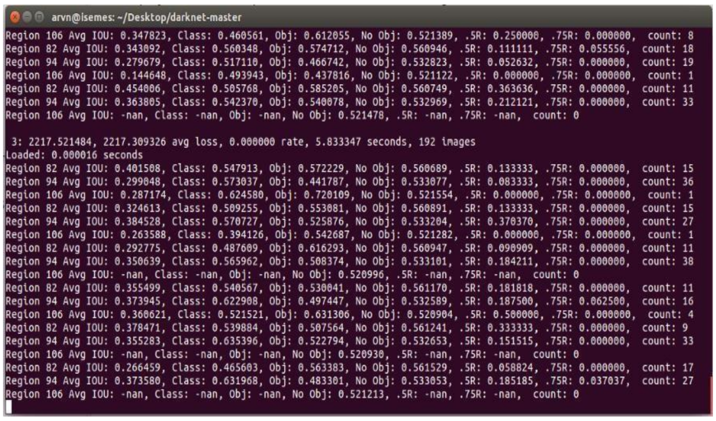


IV. RESULTS AND DISCUSSION

The software model is generated with Yolo v8 Network and is dumped on to the Jetson Nano Platform







V. CONCLUSION

In this project we used YOLOv8 (You only look once) algorithm for car parking detection occupancy is done by collecting the data from different environments in real-time scenario from five parking lots. We trained YOLOv8 for detecting parking space is occupied or vacant. Later, It is performed and tested on images including the videos at five parking lots on YOLOv8 detector and on OpenCV by overlapping the output of YOLOv8 detector. It gives a good accuracy and gave a good result.

After the continues trials and training of the system, we have succeeded to detect and predict the empty parking slots and parking lots. It will help the members of people to park their cars without wasting any time. The Application has been developed using YOLOv8. It solely performs the basic task of providing information about free slots. It was tested in few zones of parking. This application can be developed further to enhance the parking zones. The software can be deployed as a single entity that will manage the whole city parking. It can cover all the zones of city.

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[3] G. Alessandretti, A. Broggi, and P. Cerri, “Vehicle and guard rail detection using radar and vision data fusion,” IEEE Transactions on Intelligent Transportation Systems, vol. 8, no. 1, pp. 95–105, 2007.

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