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An IoT-Based Intelligent System for Real-Time Parking Monitoring and Automatic Billing

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Abstract: *This paper describes about an internet of things (IoT)-primarily based totally parking sensing gadget that deploys a strong outdoor automobile localization and reputation methodologies. Although, parking occupancy tracking structures have made a sizable progress, clever parking fee is not often studied in clever parking research. This paper proposes a brand new low-cost sensor gadget which the permitting real-time parking occupancy tracking at the side of parking fee withmout requiring any user/driver interaction. The proposed on-board automobile transceiver device (VTD) sensor, might be deployed while not having to put in new additives on every parking lot. It has blessings in phrases of detection and fee reliability, and decreased price by decreasing the gadget complexity, infrastructure investment, and battery alternative price. A strong automobile reputation and parking occupancy tracking is finished the use of two-fold sensing approach. It is a chain of movement detector and global navigation satellite tv for pc gadget (GNSS) sensing techniques. The sensor is induced while the automobile is inside a parking area way to a proposed radio frequency (RF) wake-up technique. As consequence, the strength intake is optimized and the VTD has a energy saving scheme with a energy intake as low as 20 µW at three V supply. The VTD may be seamlessly included into the wise vehicular ad-hoc networks (inVANETs)..*

Keywords: Parking Sensor, Low-Power Sensor, Internet of Things (IoT), RF Wake-Up Sensor, Smart Parking, Smart Billing, inVANETs

I. INTRODUCTION

Today, the parking enterprise is being converted with the aid of using new technology which are permitting towns to lessen quotes of congestion significantly. Sensor networks that experience automobile occupancy are supplying the primary intelligence at the back of smart parking systems. This technology is now viable to realize in real-time the vicinity of free parking areas and also to assist drivers to get to their ultimate destination, So Thanks to the Smart Parking technology. A range kind of automobile detectors has been used in parking facts acquisition. These automobile detectors in particular encompass the inductive loop, acoustic sensor, infrared sensor, or ultrasonic sensor. System using video digital digicam sensor technology had been proposed to gather the facts in automobile parking field. Although, parking occupancy tracking structures have made a substantial progress, clever parking price is rarely studied in clever parking research. Yet, there are agencies running at the patents of parking structures for payments .However, a video digital digicam sensor is at risk of terrible weather and midnight operation. Furthermore, it's miles expensive, and can generate a huge quantity of records that may be hard to transmit in a wi-fi network It is due to the lack of sufficient parking space. Now a days the vehicles in a every family are greater than the family members, and due to this the vehicles are also increased in every country, which leads to the parking scenario which is unhappily falling short to the current requirements in the country. introduced a parking system that uses low-cost IoT sensors, data aggregation for offering efficient routing for incoming vehicles to be parked. An algorithm called as ADMM (Alternating Direction Method of Multipliers). This algorithm was introduced by authors for which balancing the demand across multiple parking lots and deals with the cost minimization problem parking assignment. The reading from or sensor needs which will result in

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wearing out the battery. The modules in the system guide drivers to the parking place through the shortest route while protecting the vehicle from any collision and displaying park reservation information. A parking system called as Parking Rank was proposed by authors. In this paper, we propose a smart sensor system which allowing outdoor parking monitoring and the payment without requiring any user/driver interaction. It will be deployed without having to install the new components on each parking lot. The proposed sensor has some benefits in terms of detection and payment reliability, and reduced expense by reducing the system.

II. Literature Survey

The proposed sensor system architecture for parking lot monitoring and payment. The system employs three integrated techniques; i.e. 1) the radio frequency (RF) wake-up sensor, 2) motion detector wake-up sensor, and 3) positioning sensing technique. The vehicle transceiver device (VTD) consists of processor, a power management unit, a radio transceiver, an RF wake-up sensor, and global navigation satellite system (GNSS). Once the vehicle enters a strong RF field transmitted by the parking enable device (PED), which defines the parking entrance/exit, the VTD wakes up and triggers the accelerometer. Once the vehicle is stopped on a parking lot, the radio transceiver module is powered up and forwards the vehicle ID and position to the cloud-based server. The parking occupancy in then updated and start time is recorded.

III. Proposed Parking Sensor System Architecture

3.1 Actual Parking Meter

At present, most outdoor parking lots are paid in the following way: the driver inserts coins, a personal card at the parking meter, or a mobile phone is used for payment. (Fig. 1). The ticket machine prints a ticket. That ticket will be driver displays in the vehicle. When the time is to expire, the driver can extend his stay by inserting coins or a personal card at the parking meter. In addition, pay-by-mobile phone and real- time parking reservation systems and smart phone applications are used for parking lot reservation and payment.

Figure 1: Actual parking meters.

3.2 Image Processing for Vehicle Type Detection

The incoming vehicles are recognized using Image processing. To identify the vehicle YOLOv3-tine model was trained. The YOLOv3-tiny algorithm was used for training the object detection model. YOLO is a deep learning-based object detection algorithm that is trained using the COCO dataset. 80 types of labeled objects present in the COCO data set. There are several kinds of object detection algorithms such as Histogram of Oriented Gradients (HOG), Single Shot Detector (SSD), YOLO (You Only Look Once) [40], Region-Based Convolutional Neural Networks (R-CNN), etc.

Figure 2: Vehicle detection using YOLOv3-tiny.

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III. Conclusion

A novel sensible parking sensor machine become presented. It permits actual time parking tracking together with parking price without requiring any user/motive force interaction. Thanks to the proposed revolutionary approach, the sensor machine has blessings in phrases of detection and price reliability and reduces prices via way of means of decreasing machine complexity, making an investment in infrastructure and changing batteries. Additional validation assessments are being performed to further optimize the machine.

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