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### A Survey on Automatic Vehicle Parking and Retrieval Using Android Smartphone

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#### Abstract

This paper focuses the construction of the system which assists in parking and retrieving of the car automatically. Unlike previous generation this system drives automatically while parking which is controlled with the help of smart phone. Remote door control is another feature that helps the user to open the car door with aid of smart phone. The system is equipped with an alarm system in case of disturbance situation. The proposed system uses a 3-axis accelerometer which replaces the motion sensor in the existing system and provides a secure means of parking system. This system is going to be implemented using ARM cortex-M3 microcontroller.

**Keywords:** Automatic Parking and Retrieval, Sonar, Graphics LCD, ARM cortex-M3 microcontroller

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#### Introduction

The number of vehicles on road is on the rise throughout the world and as a result the total amount of traffic is increasing rapidly and hence the parking spaces are getting fewer and smaller day by day. The car driver finds very little space to correct a vehicle while parking and the confused nature of today's driving habits makes the situation much worse. In the existing system the user needs to select auto parking mode by means of pushing a button on the dashboard and the system scans the parking area and drives the vehicle to a free space. But it's not enough in this modern world. For such a reason one system is developed for both park and retrieve the vehicle automatically.

This paper aims to construct a system that takes control of the car and drives itself to a nearby parking space automatically. In retrieve mode the car drives itself out of the parking space to a fixed place where the user would normally be available or to the place where the user got out of it before the auto park process started. The user need not be present inside the car like some of the previous generation systems. Instead the park and retrieve system can now be fully controlled from a user standing outside with their smart phone. The paper also aims to design a driverless car that could be started and driven remotely from an android smart phone. Remote door control is another feature that helps the user to open the car door for him when it reaches him. Remote

alert is automatically activated as long as the car is parked. The car is equipped with 3-axis motion sensor. As soon as the car senses an abnormal motion, the car measures the amount of motion and if it is a gentler one, a simple warning alarm is generated and if the motion is violent it triggers much louder warning alarm and sends an alert SMS to the user mobile. All the communication between android smart phone and the car happens via bluetooth. The car unit will be paired with the smart phone via Bluetooth, which helps to remove most of the security issues. A multitasking RTOS running on the microcontroller is used to coordinate each task of the system. Free RTOS is selected because it is open source, extremely efficient and widely supported.

#### Related works

Ho Gi Jung, Yun Hee Lee, and Jaihie Kim, [1] stated that semiautomatic parking slot marking-based target position-designation method. Initially they proposed parking slot marking recognition by placing a finger on each side of the entrance of the target parking slot. Furthermore, they identify the junction patterns of parking slot markings with a neural network-based classifier. Three contributions are: 1) Semiautomatic recognition of parking slot markings. 2) Uniform user interface for target position designation, irrespective of parking slot marking type. 3) Light reflection on a

wet ground surface could be reduced by using a polarizing filter.

Beg, M.S. Fatimah, B, Jain.S, and Muzammil.R, [2] proposed and implemented two new consumer systems: Garage door opening system and Electronic attendance record system. They used Bluetooth for garage door opening system that helps to overcome the inconvenience to move out of the car for unlocking the door and it provides the luxury of keyless opening which is electronically controlled just by enabling the authenticated Bluetooth slave device. The other Bluetooth based application is proposed and implemented for automatic monitoring and recording of attendance of employees in an organization. The applications are developed based on Bluetooth link using host controller interface and asynchronous connection less (ACL) link.

Chunxiang Wang, Hengrun Zhang, Ming Yang, Xudong Wang, Lei Ye and Chunzhao Guo, [3] realized an automatic parking method through a bird's eye view vision system. They used four on-board fisheye cameras around the vehicle to obtain the omnidirectional information of the environment. A polynomial fisheye distortion model is firstly used for camera calibration. An image mosaic method based on the Levenberg-Marquardt algorithm is used to combine four individual images from fisheye cameras into one omnidirectional bird's eye view image. They proposed a method for detecting the free parking space based on the Radon transform. The clustering and filtering based on the shape features of the parking space can alleviate the effects of noises effectively.

Jae Kyu Suhr, Ho Gi Jung, Kwanghyuk Bae, Jaihie Kim, [4] proposed a free parking space detection system by using motion stereo-based 3D reconstruction. An image sequence is acquired with a single rearview fisheye camera and the view behind the automobile is three dimensionally reconstructed by using point correspondences. Metric information is recovered from the camera height ratio and free parking spaces are detected by estimating the positions of adjacent vehicles. They used a de-rotation-based method and mosaic 3D structures by estimating a similarity transformation. This paper makes three contributions. First, we solved the serious degradation of 3D structures near the epipole. Second, we presented an efficient method for detecting free parking spaces in 3D point clouds.

Third, our system did not use odometry due to its unreliability.

Faheem, S.A. Mahmud1, G.M. Khan, M. Rahman and H. Zafar, [5] Stated Intelligent Parking Services used for parking guidance, parking facility management and gives an insight into the economic analysis of such projects. They use Multi-Agent system which is a modeling technique, used for representation of system with elements which show intelligence, autonomy, and degree of interaction either with each other or with environment. Mobile agents can move within the nodes of a network and are made dynamically during the runtime. They are sent to destination systems for performing different tasks with the up to date code and algorithm.

Mohit Patil, Rahul Sakore, [6] designed a prototype of Smart Parking System based on Reservation (SPSR) that allows drivers to effectively find and reserve the vacant parking spaces. By periodically learning the parking status from the host parking database management in parking lots, the reservation service is affected by the change of physical parking status. In this system, they implement parking reservation policy to balance the benefit of service providers and requirements from the users. Based on the obtained results from the simulation study, they conclude that the reservation-based smart parking system can alleviate traffic congestion caused parking searching and reduce the amount of traffic volume searching for parking.

Bo Xu, Ouri Wolfson, Shuo Ma, [7] introduces and describes multiple indicators, each of which provides an inconclusive clue for a parking or an unparking activity and they proposed a probabilistic fusion method which combines the output from different indicators to make more reliable detections. The proposed indicators and the fusion method are implemented as an Android App called UPDetector. They presented the design and implementation of a parking/unparking activities detection system called *UPDetector*. They described several indicators used by *UPDetector*, and their corresponding features. Mikko Rinne, Seppo Torma, [8] investigated how to derive information about available parking places in the absence of parking sensor infrastructure and tested the method with a dedicated mobile client connected to a network server. They have considered a combined crowdsensing and crowdsourcing approach to parking. The automatic sensor-based solution utilizes primarily two types of sensor inputs: geofences to indicate when a user enters or exits a

parking area and activity recognition to tell, whether the user is currently moving by car or on foot. Sequences of these sensor observations can be used to derive whether the user (a) parked in the area, (b) was unsuccessfully looking for a place or (c) released a parking space.

Kuo-pao Yang, Ghassan Alkadi, Bishwas Gautam, Arjun Sharma, Darshan Amatya, Sylvia Charchut, Matthew Jones, [9] described the architecture and design of Part-A-lot, an automated parking management system. This system is to communicate with the website to find a parking spot before arriving at the destination. This system can be extended to have a feature to count the number of vehicles entering the gate to keep track of number of parking spots available in the parking lot. For security purposes a camera can be integrated into the system to take picture of the vehicle or its registration plate when it enters the gate. The collected information can be used in a distributed or centralized way to evaluate other meaningful metrics such as duration of parking, automatic billing and payment to the benefit of users and administrators.

V.Ramya Krishnan, T Rajesh, [10] discussed about various VANET technologies used such as adaptive cruise control system, advanced diagnostic and control system, the intelligent parking assist system, forward collision avoidance system and electronic stability system. An algorithm to generate a DOUBLE-C curve movement for the collision avoidance mechanism is also presented. DOUBLE-C curve is split into two: DOUBLE-C left curve and DOUBLE-C right curve.

### Results and discussion

So far, in this survey various automatic car parking techniques were used to park four wheelers in a large parking slot by finding a vacancies between the slot. Among these techniques parking slot marking based techniques provides a better solution to locate the empty space in a parking slot quickly as much as possible than the other parking techniques.

### Conclusion

In this survey, all the techniques used for car parking has its own drawbacks. Through these technologies we can able to perform automatic car parking only. But to retrieve the cars from its parked slots is not possible. Since, a new automatic car parking techniques which is composed of both car parking and retrieval is proposed in my future work.

### References

1. Ho Gi Jung, Member, IEEE, Yun Hee Lee, Member, IEEE and Jaihie Kim, Member, IEEE, "Uniform User Interface for Semiautomatic Parking Slot Marking Recognition", *IEEE TRANSACTION ON VEHICULAR TECHNOLOGY*, VOL. 59, NO. 2, FEBRUARY 2010.
2. Beg, M.S. Fatimah,B, Jain.S, and Muzammil.R, "Bluetooth Based Implementations for Realizing new Consumer Systems",*Multimedia, Signal Processing and Communication Technologies*,pg 250-253, 2009.IMPACT'09.
3. Chunxiang Wang, Hengrun Zhang, Ming Yang, Xudong Wang, Lei Ye and Chunzhao Guo, "Automatic Parking Based on a Bird's Eye View Vision System", Hindawi Publishing Corporation *Advances in Mechanical Engineering*, Volume 2014, Article ID 847406, 13 pages.
4. Jae Kyu Suhr, Ho Gi Jung, Kwanghyuk Bae, Jaihie Kim, "Automatic free parking space detection by using motion stereo-based 3D reconstruction", *Machine Vision and Applications* (2010) 21:163–176.
5. Faheem, S.A. Mahmud, G.M. Khan, M. Rahman and H. Zafar, "A Survey of Intelligent Car Parking System", *Journal of Applied Research and Technology* , Vol. 11, October 2013.
6. Mohit Patil, Rahul Sakore, "Smart Parking System Based On Reservation", *International Journal of Scientific Engineering and Research (IJSER)*, ISSN (Online): 2347-3878, Volume 2 Issue 6, June 2014.
7. Shuo Ma , Ouri Wolfson, Bo Xu, "UPDetector: Sensing Parking/Unparking Activities Using Smartphones", *SIGSPATIAL '14*, November 04-07 2014.
8. Mikko Rinne, Seppo Torma, "Mobile crowdsensing of parking space using geofencing and activity recognition", 10th ITS European Congress, Helsinki, Finland 16–19 June 2014.
9. Kuo-pao Yang, Ghassan Alkadi, Bishwas Gautam, Arjun Sharma, Darshan Amatya, Sylvia Charchut, Matthew Jones, "An Automated Parking Management System", *Computer Science and Information Technology* 1(4): 276-279, 2013.

10. V.Ramya Krishnan T Rajesh, "VANET Based Proficient Collision Detection and Avoidance Strategy for Cars using DOUBLE-C Curve Movement Algorithm", International Journal of Computer Applications & Information Technology Vol. I, Issue II, September 2012 (ISSN: 2278-7720) P a g e | 81.