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Article *in* International Journal of Pure and Applied Mathematics · October 2018

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International Journal of Pure and Applied Mathematics
Volume 120 No. 6 2018, 329-338
ISSN: 1314-3395 (on-line version)
url: http://www.acadpubl.eu/hub/
Special Issue

http://www.acadpubl.eu/hub/

Design and Implementation of Smart Car Parking System Using Lab VIEW

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October 11, 2018

Abstract

Now a day's more parking space is required as the population of vehicles worldwide continues to increase so the efficient parking management is becoming an important issues. This paper proposes a smart parking system to solve the problem of unnecessary time consumption in finding parking spot in commercial car park areas. Sensors such as IR (infra red) are used in order to detect the entrance or exit of the car at the parking slot. The existing system gives information about the empty slots availability but does not give information about the exact location of parking slot available in such a big area. This is time taking process for the person to search for the empty slot and if the parking area is very big to search for the slot will consume a lot of time which is a major drawback for the pre existing methods. The proposed car parking system takes the help of IR sensors to find the car at the entrance and at the exit area and thus allocates and de-allocates the available parking slots to the vehicles. This system clearly displays

the total parking slots available and indicates the occupied slots and unoccupied slots in display board so that user can check the slots before entering the parking area and can park his car in that slot with in no time without wasting his/her time. The parking slots are continuously monitored and the data is continuously updated in the display board. The demonstration has proven the capability of the system to reserve the parking, gain entry to the parking area and hence eliminates the hassle of searching empty parking lots.

Key Words:: Smart car, parking system, IR sensor.

1 Introduction

Due to advancement in technology man is leading a comfortable life. But at the same time these advancements are becoming troublesome some times. In past times, people used to travel by public transportation but now a days the number of people using their own vehicles such as cars and motor cycles. According to global vehicle ownership and vehicle production statistics, the number of people who have vehicles is steadily increasing. The number of vehicles in the world is expected to exceed 1 billion before 2020, and multilateral efforts are being made in various countries to alleviate congestion due to vehicle growth. In order to reduce the damage caused by illegal parking and parking space shortage problems, many countries try to develop a smart parking system that manages the conditions [1]. Users who own cars also want to know the remaining parking space before reaching the parking location. Many drivers do not know in advance about the number of remaining parking blocks and suffer from parking. Even if there is parking space, if the location information of vacant blocks is insufficient, drivers will experience ineffective movement and waste their time. Therefore, it becomes a critical issue to introduce innovative parking management system that provides the parking lot users with real-time parking status information. To meet this demand, a parking management system has emerged, and researches on parking management system using various methods have been carried out. However, most researches have not sufficiently considered cost and applicability [2][3]. Currently, majority of the existing car parks do not have a systematic system. Most of them are manually man-

aged and a little inefficient. The problem that always occurs at the car park is time being wasted in searching for the available parking spaces. Users will keep on circling the parking area until they found an empty parking spot. This problem usually occurs in urban areas, where number of vehicles is higher as compared to the availability of parking spaces. These ineffective conditions happened because of the lack of implementation in technologies. Various systems have been done to ensure smoothness of traffic in car park areas [4][5]. From manual implementations used in the old systems, they have evolved into fully automated, computerized systems. Car park entrances are controlled by barrier gates whereby parking tickets are used extensively for access purpose. With the growth of technology, these systems have been simplified in many ways [6-8].

2 APPROACH AND METHODS

Due to the increase of vehicle exponentially and thus traffic increased a lot so parking became a big problem in highly populated cites. The major issue of parking comes into picture in case of vehicles like cars which required a big area. The main reason for this is increase in population in cites and also security concerned because of thefts in major cities. So parking our vehicle in a safe place with security is very important. To overcome this problem we have introduced such a system that would solve all these issues and will be intelligent too. We have developed a system using software and hardware module which provides an interface to the user and the parking area so that user can easily get access to the parking slots available. Our approach is cost effective and it covers all the features of a complete intelligent car parking management system [9][10]. This system takes the input from IR sensors when ever car enters or leaves the parking area and sends the information to Lab VIEW through my RIO. Lab VIEW process the acquired information and send the information to the display devices using my RIO. Different LEDs are used in order to indicate the present state of the slot and a display is also present at the entrance which clearly indicates the available and the occupied slots [11][12].

3 SYSTEM DESIGN AND IMPLEMENTATION

In the parking slot, we can see a variety of parked vehicles. As a result of analyzing these parked vehicles, we can classify them into three types of vehicles (Figure 1). The first type of vehicles is a normally parked vehicle, which is correctly parked within the boundary of the parking block and does not interfere with the path of the smart car and other vehicles. The second type of vehicles is an illegally parked vehicle, which is parked in location where it should not be parked. This vehicle may not interfere with the route of smart car, but it can interfere with the route of other vehicles. So it should take steps to notify the administrator. The last type of vehicles is a poorly parked vehicle, which is parked but not properly in a parking block, thus can interfere with the path of the smart car and other vehicles. If a vehicle that is not properly parked disturbs smart car, the smart car should be wise to change route and avoid the vehicle. The smart car intelligently categorizes these three types of vehicles and informs the manager of this information.

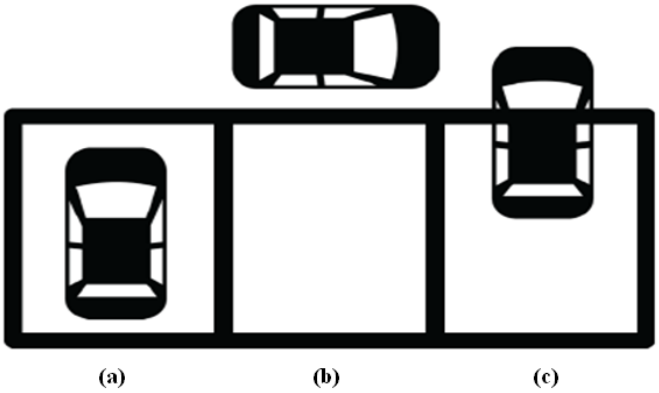

Figure 1: Parking types
(a) correctly parked vehicle
(b) illegally parked vehicle
(c) Poorly parked vehicle

Smart car basically moves along the internal lines of the experiment environment. The experiment environment consisting of parking

block lines can be divided into internal lines and external lines. For route determination, smart car should be intelligently able to distinguish between internal lines that should be followed and external lines that should not be followed. In this case, we can see that the smart car follows only the straight lines and the right and left lines respectively in order to follow the internal lines. While moving through the route, the smart car must be able to identify its location. In other words, smart car should be able to figure out the block it belongs to. To count the number of blocks it crossed, if the smart car detects a line on the left side, it determines that it is a new block and knows how many blocks it has crossed so that it can know the blocks it belongs to. If administrator inputs the number of blocks in the parking slot, smart car knows which block it is located using modulo operation. This allows smart car to figure out the route to follow and its location in the experimental environment. Figure 2 shows the proposed parking layout to demonstrate the functionality of the access system. The parking layout consists of eight parking lots as well as one barrier gates for entrance and exit. The main controller is located at the entrance to the parking area.

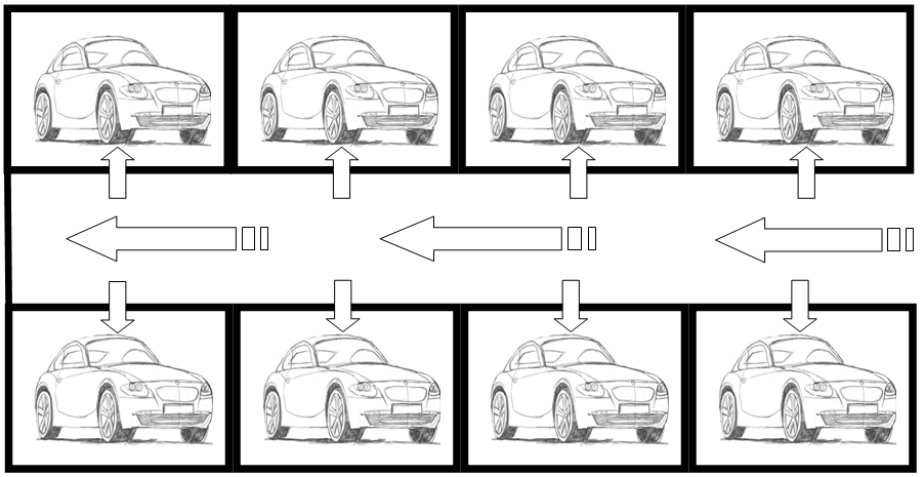

Figure 2: Proposed Parking Layout

4 MODELLING AND SIMULATION

The proposed model and its experimental hardware setup is depicted in Figure 3. Whenever a car enters the parking area, a display board is present at the entrance which clearly gives information about the total parking area. It clearly gives information about every slot with led indication and text message.

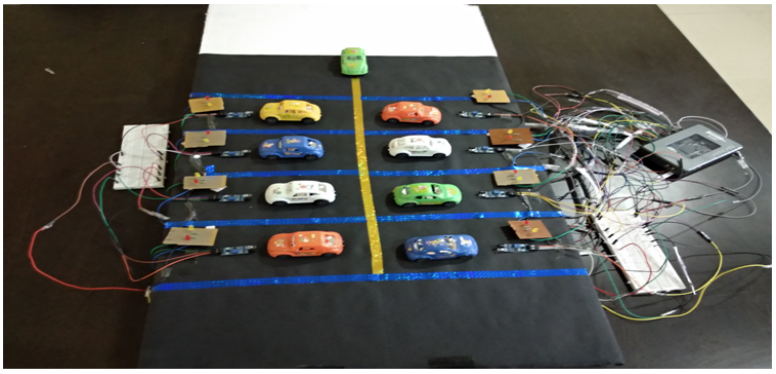

Figure 3. Proposed model and its experimental setup

In every parking slot an IR sensor is present and these sensors are connected to myRIO and whenever a car enters or leaves the parking area, the data is continuously updated. In this projects sensors are used as input devices and leds are used as output devices. When a car enters or leaves the parking slot, respective led will glow immediately. If all the parking slots are occupied then a text message with no parking slots available is displayed. IR sensor detects the car and sends the data to LabVIEW through myRIO. In LabVIEW case structure is used with true and false conditions, depending on the sensor state the respective condition is executed which is depicted in Figure 4. IR sensor has two parts a transmitter and a receiver, whenever a car is detected in the parking slot the receiver will receive the signal and transmit it to the LabVIEW through myRIO, since the sensor is connected directly to one of the port of the myRIO. The labVIEW will manipulate the data on display board which was received from my RIO and thus indicate the status of the slot using leds. IR sensor detects the object, even the object is present or not it is continuously monitored by myRIO and by means of my RIO the data is sent to Lab VIEW. The case

loops in LabVIEW are verified and checks whether the slots are empty or not. If the slot is empty text message with empty slots are available and red led will glow. If some slots are filled then the filled slots are indicated with green color. If the entire slots are full a text message with no empty slots available will be displayed and green leds will glow which is shown in Figure 5.

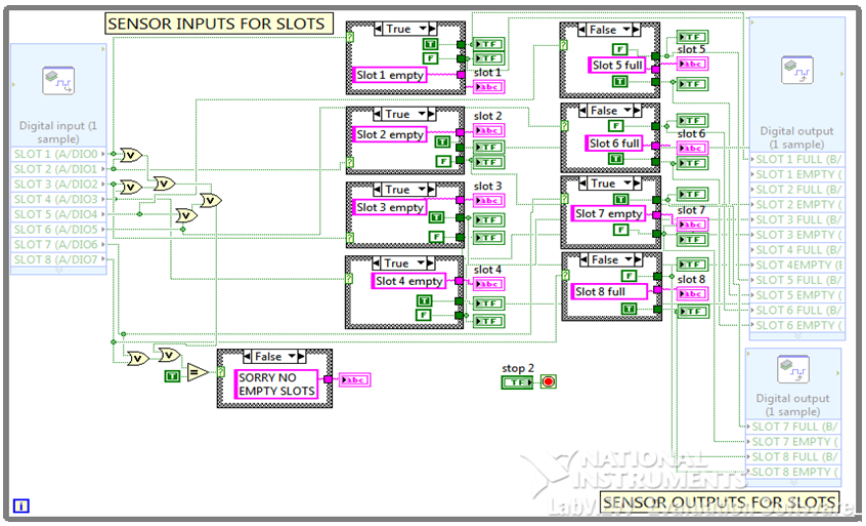

Figure 4: VI Implementation of Smart Car Parking System

Figure 5: VI front panel simulated result

5 Conclusion

This work describes a smart car parking system based on wireless sensors. The system benefits of smart parking go beyond avoiding the needless searching of empty slots in the parking area. It also enables cities to develop fully advanced and intelligent transportation system for easy access to the parking. Developing smart car parking system within a city requires LabVIEW for data processing, myRIO for acting as an interface between parking slots and display, IR sensors are used in order to know the status of the parking slots, display board is used to display the total available and occupied slots along with a message and led indications at the entrance itself. This system is fully automated and doesnt need any supervision at the parking area, which results in the reduction of the human efforts and doesnt need any man power.

References

[1] LEE, Sangwon; YOON, Dukhee; GHOSH, Amitabha. Intelligent parking lot application using wireless sensor networks. In: Collaborative Technologies and Systems, 2008. CTS 2008. International Symposium on. IEEE, 2008. p. 48-57.

[2] TANG, Vanessa WS; ZHENG, Yuan; CAO, Jiannong. An intelligent car park management system based on wireless sensor networks. In: Pervasive Computing and Applications, 2006 1st International Symposium on. IEEE, 2006. p. 65-70.

[3] BENSON, Jonathan P., et al. Car-park management using wireless sensor networks. In: Local Computer Networks, Proceedings 2006 31st IEEE Conference on. IEEE, 2006. p. 588-595.

[4] SRIKANTH, S. V., et al. Design and implementation of a prototype smart PARKing (SPARK) system using wireless sensor networks. In: Advanced Information Networking and Applications Workshops, 2009. WAINA'09. International Conference on. IEEE, 2009. p. 401-406.

[5] YAN, Gongjun, et al. SmartParking: A secure and intelligent parking system. IEEE Intelligent Transportation Systems Magazine, 2011, 3.1: 18-30.

[6] WEI, Lin-Xian, et al. iPark: Parking Management System Based on Arduino and Cloud Platform. In: ITM Web of Conferences. EDP Sciences, 2017. p. 01004.

[7] WU, Xiaoling, et al. A parking management system based on background difference detecting algorithm. In: Heterogeneous Networking for Quality, Reliability, Security and Robustness (QSHINE), 2015 11th International Conference on. IEEE, 2015. p. 246-250.

[8] KIANPISHEH, Amin, et al. Smart parking system (SPS) architecture using ultrasonic detector. International Journal of Software Engineering and Its Applications, 2012, 6.3: 55-58.

[9] ZHOU, Huayu; LI, Zhihua. An Intelligent Parking Management System Based on RS485 and RFID. In: Cyber-Enabled Distributed Computing and Knowledge Discovery (CyberC), 2016 International Conference on. IEEE, 2016. p. 355-359.

[10] LIN, Sheng-Fuu; CHEN, Yung-Yao; LIU, Sung-Chieh. A vision-based parking lot management system. In: Systems, Man and Cybernetics, 2006. SMC'06. IEEE International Conference on. IEEE, 2006. p. 2897- 2902.

[11] AL-KHARUSI, Hilal; AL-BAHADLY, Ibrahim. Intelligent parking management system based on image processing. World Journal of Engineering and Technology, 2014, 2.02: 55.

[12] Pala Z., Inanc N., Smart Parking Applications Using RFID Technology, 1st Annual Eurasia RFID Conference, September 2007, Turkey.