Automatic Car Parking System

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Abstract:*In the light of number of vehicles consistently rising and parking space is becoming a major issue in urban and semi urban cities so there is a need to design a parking system which will reduce manual work as well reduce the problem of cars parking on streets. The problems associated with parking are common to most of us, we always face difficulty while searching for a safe parking space. This paper attempts to review globally implemented parking management strategies using different technologies. Further by examining a variety of parking management solution from around the world this paper aims to examine the shift in focus of modern parking management strategies. The motivation for this research paper is to identify the positive points of the innovative approaches, which will aid in designing an automatic car parking system.*

Keywords: Radio Frequency Identification(RFID), (Infrared)IR sensors, microcontroller**.**

1. Introduction

An Automatic car parking system is a smart parking system which will play an important role to reduce traffic in the city.Cars parked callously on the streets limit the space,So with a smart parking system this problems can be solved. Moreover, this kind of system will reduce the manual work and save time.Such a system can be used in a large multistory/multilevel building.

The basic structure of an automatic car parking system can be described with the help of following block diagram.
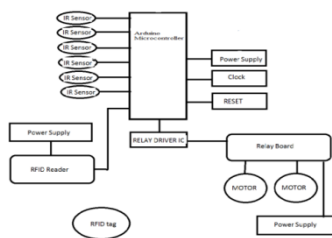

Figure 1: Block diagram of automatic car parking system

Fig 1 depicts the block diagram of an Automatic car parking system.It depicts the interconnection between the various subsystem used in the project. In this paper we have tried to discuss a system using Radio frequency technology(RFID), IR(infrared)sensors, Microcontroller. RFID technology is very useful in automation of vehicle parking system in mall/building.As compared to the other parking system,the advantage of this system is maximum space utilization.It is a safer and much more convenient.

1.1.Power

The power used for functionality of the different components is given by a power supply which is discussed below in fig 2
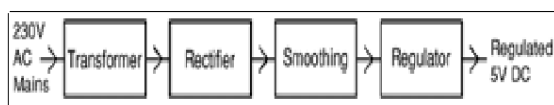

Figure 2: Block Diagram of power supply

The power supply consists of several block ,each block having different functionality.The transformer performs step up or step down the input line voltage.The rectifier converts A.C to pulsating D.C.The smoothing block eliminates the unwanted A.C component,Which will result in a pure DC component.

1.2. IR Sensors

The IR sensors are used to detect the vehicles.IR sensors consists of an IR transmitter and IR receiver.The schematic diagram for IR sensor is shown in Fig 3
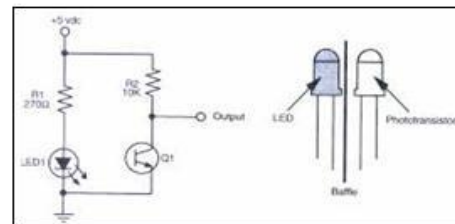

Figure 3: IR Sensors

IR Sensors are used to check the availability of the slot.If the slot is occupied the IR sensor will give a high signal to the microcontroller.Also at the entry gate a pair of IR sensor is used to detect the presence of a vehicle.

1.3. RFID(Radio Frequency Identification)

The RFID will have a reader and a tag.The customer who have already registered will be provided with a tag/card. The card has to be recharge with a certain amount so that at the exit gate,when the customer swipe the card the money will be automatically deducted and the car will be allowed to leave the parking space,without that card the car will not be allowed to leave the parking space. This paper also gives an idea, how a new user can enter into the parking space. If a new user wants to enter the parking space then that user will be provided with a card/token which will be encrypted with slot code on the card at the entry gate. Microcontroller has to be to interface the sensor circuit and RFID module to perform the function related to detection of vehicle and authentication purpose.

1.4. Arduino Board

Arduino board historically consists of an Atmel 8,16 or 32 bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits.An important aspects of the arduino is its standard connectors,which lets users connect the CPU board to a variety of interchangeable add on modules known as shields. A handful of other processors have also been used by Arduino compatibles, Most boards include a 5v linear regulator and a 16MHZ crystal oscillator(or ceramic resonator in some variants).Arduino's microcontroller is also pre-programmed with a boot leader that simplifies uploading of programs to the on chip flash memory,compared with other devices that typically need an external programmer ..This makes using an arduino more straightforward by allowing the use of an ordinary computer as the programmer.Currently,optiboot bootloader is the default bootloader installed on arduino UNO.

2. Literature Review

The smart parking system implemented mainly in the Europe, United States and Japan is developed with the incorporation of advanced technologies and researches from various academic disciplines [1].Now-a-days ,there is a rapid growth in parking system. Manpower is needed for each car parking slot to select a parking slot manually and give direction to drive properly into slot [1]. So, there is a need to develop an automatic parking system which will reduce manual work as well as will be useful for careful parking of cars and other vehicles[2]. Parking system routinely experience parking related challenges, especially in the urban and metropolitan areas. While doing a survey we have found that this automatic car parking system has been proposed by various researchers using different technology.In some paper some researchers have proposed this system using Around View Monitor(AVM). In their paper they have discusses fusion of AVM and ultrasonic sensor, used to detect the vacant parking slot in the automatic car parking system. The AVM provides a virtually 360 degree scene of the car in bird's eye view. The AVM helps the driver to maneuver into parking spots. Through the bird's eye view, a driver can check for obstacle around the vehicle. First, the parking slot marking detected in the AVM image sequence. A tree structure-based method detect the parking slot marking using individual AVM image sequence and image registration technique. Second, empty slot is detected using ultrasonic sensors. The probability of parking slot occupancy is calculated utilizing ultrasonic sensor data acquired while the vehicle is passing by parking slots, and finally the selected empty slot is tracked and the vehicle is properly parked in selected parking slots[2]. Some other researchers have discuss this system using another technology i.e. GSM Technology. The functionality of the technology is that user sends a message to the GSM modem which is placed at the parking end. The GSM modem will send a conformation message to the user whether the slot is vacant or not. If it is vacant then the user has to message the exact time and duration he/she wants to park the vehicle in the parking slot. Then the GSM modem will send a password and the parking lot number to access the reserved parking lot. Once the conformation message has been send, the counter for the reservation time will automatically start for sending message [3].Another paper attempts to discuss this system using FPGA Technology.In their paper they have discuss how to implement an automatic car parking system using FPGA technology ,where the access in the parking which is made by barrier, if there are vacancies with the lifting of the barrier a ticket is issued with a client code and there starts a timer for measuring the time left in the parking. The analog signals transferred through a digital analog converter as input signals in the FPGA.To work with FPGA Xilinx software has to be used [4]. Another paper discusses a system using some digital key along with some robotic technique. when a car enters the entry of the automated car parking system, an IR detection subsystem detects the presence. Then the driver is promoted to enter a valid key and to choose the option of either parking or retrieving the car. Each key is checked for accuracy and assigned a designated parking slot .Upon entering the correct key, car is picked up along with the pallet from the stack system and placed in the designated spot .When drivers return to pick up the car he enters the valid key for which the system will check in its database and the car is return back to the drive way. The stack system will pull down the pallets to make room for incoming pallet. The system includes robotic lift with motors for picking the car and placing it in the designating spots [5]. Another paper discusses a system where microcontroller 89S51 has been used,In their paper they have discussed a system which is automated with the user being given a unique ID corresponding to the trolley being allocated to him/her.

The idea is to park and move cars with no disturbance to the already parked cars in their system[6].some other researchers have discussed this system using RFID.According to their system,The vehicle owner has to first register the vehicle with the parking owner and get the RFID tag. When the car has to be parked, the RFID tag is placed near the RFID reader, which is installed near the entry gate of the parking lot. As soon as the RFID tag is read by the reader, the system automatically deducts the specified amount from the RFID tag and the entry gate boomer opens to allow the car inside the parking area. At the same time, the parking counter increments by one. Similarly, the door is opened at the exit gate and the parking counter decremented[7].After doing study on various system using various technology, we have tried to discuss a system using Radio frequency technology(RFID), IR(infrared)sensors, Microcontroller. RFID technology is very useful in automation of vehicle parking system in mall/building.

3. Conclusion

The paper discusses the importance of using a RFID based parking management system along with Infrared sensor(IR). This system will facilitates a faster user authentication and hence reduce waiting time and increases the efficiency of the parking space.. It restrict the exit of a vehicle without payment. It also enables the user to access the availability of the parking space and will give wait signal until the space is not available for parking. This paper discusses about the slot availability details by using an IR sensor RFID system and a updated periodically database, Entry point and exit point will be under control by IR sensors and RFID readers, labels and

barriers respectively. Personnel cost will be reduce considerably using this technology.

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