LOW COST CAR PARKING MANAGEMENT SYSTEM WITH IMAGE ANALYSIS AND RFID TECHNOLOGY

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ABSTRACT

Finding an unoccupied parking space in larger car park in a busy environment is a problem for many drivers. Even though, during last four decades, many vehicle parking models were introduced, still the models cannot solve vehicle parking problem satisfactorily. Due to unsatisfactory issues deal with parking systems such as improper (untidy) vehicle parking, insufficient care of security issues and safety aspects of vehicles, improper guidance to available slots in a semi-automated system, it is an essential issue to develop an enhanced system expressed under our topic. In some commercially available systems unavoidable, time consuming errors still exists. Some of the systems are care about security issues but not to give proper guidance to drivers. Some of the systems can give proper guidance to drivers but those systems are not designed to care about security issues. The study was carried out to find a peaceable solution for such issues. Thus, primarily aim of this study is to develop a car parking system which is able to care about both security issues and proper guidance to the drivers at the same time. The developed system is specially designed to use in urban private parking areas and only authenticated vehicles are allowed to enter the parking areas. The system is based on Arduino technology and the identification part is developed using image processing and RFID technologies. Both IN and OUT gates are controlled by servo motors. The display installed near to the main gate shows vehicle owner's name and ID after authentication. If the authentication is failed then the display shows "Unauthorized Access" message.

Keywords: Image processing techniques, Image feature extraction/Identification, Arduino development board, Car parking managements

1. INTRODUCTION

Time and cost are two important factors of human life, whether for an individual or a business organization. As quality of life increases, more and more people are inhabiting to commercial cities. Urban life requires centralized private facilities. With the population

growth and modernization with time, easily accessible and fully automated private parking places are becoming very important aspect as well a time saving attraction for company workers.

Among the various types of parking lots available in literature, multilevel parking, roadside, roadside with ticket and barrier gate and roadside with parking meter, the multilevel parking lot is the most preferred one for the patrons. Efficiency, low cost, safety, proximity, respectively are the main factors effect on patrons who are willing to choose a specific parking lot. Providing sufficient easily accessible parking spaces for workers is a complex issue in most of the urban company complexes. Offering automated and efficient parking lots with a sufficient number of spaces in urban areas as well as paying attention for handicapped drivers are a few of the factors which can be used to increase efficiency of workers and increase the security of company premises.[2]

The developed system is enabled to authenticate vehicles by using image processing technology and RFID technology[1]. After the completion of the authentication, the main LCD display installed near to the main gate shows vehicle owner's name and identity while allowing them to enter the car park. Before entering vehicle to the park, the system also automatically guides drivers about available parking spaces.

2.0 EXPERIMENTAL

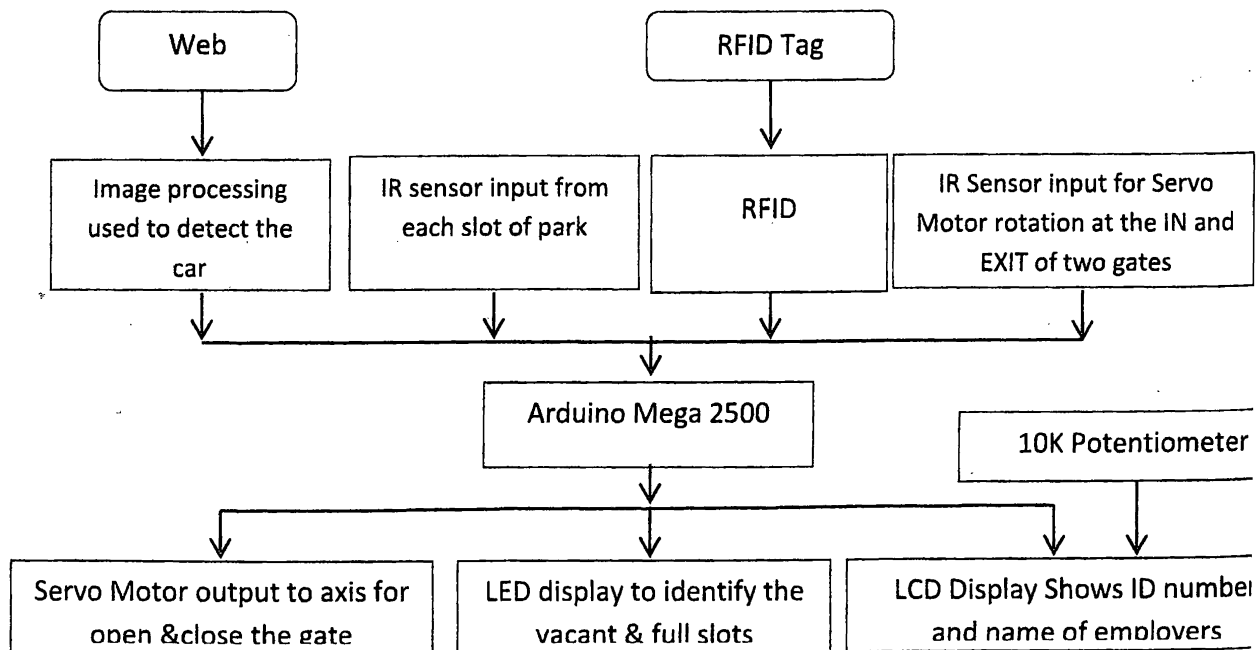

Figure 1: Block diagram of the car parking management System.

The simulated block diagram of the parking system is shown in figure 01.The RFID reader was connected to the Arduino Mega using pin 18, 19 to receive RFID tag input through serial monitoring. Arduino Mega was programmed using C language. Output of RFID reader was displayed in both serial monitor display of Arduino and LCD display. LCD display was used to show both name and tag ID of person has reached to entrance of the parking management system. Web camera output through the image processing was used to identify the vehicle reaching .The OpenCV software was used for image analysis.IR sensors were connected to Arduino mega using pin 2, 3, 4, 5, 6, 7 to get inputs and they were displayed in LED display. LED display has two colors of LEDs, they were green if vacant places are available and were red if the car park is full. IR sensors also used in entrance and exit point of gates.[3] Those IR Sensors were connected to Arduino mega using pin 23, 24. Servo motors were connected to pin 9, 10 of Arduino Mega and it was powered using Output of Arduino.

The PCB design of the developed system is shown in figure 02.The sketch was developed using proteus 8 Professional IDE.
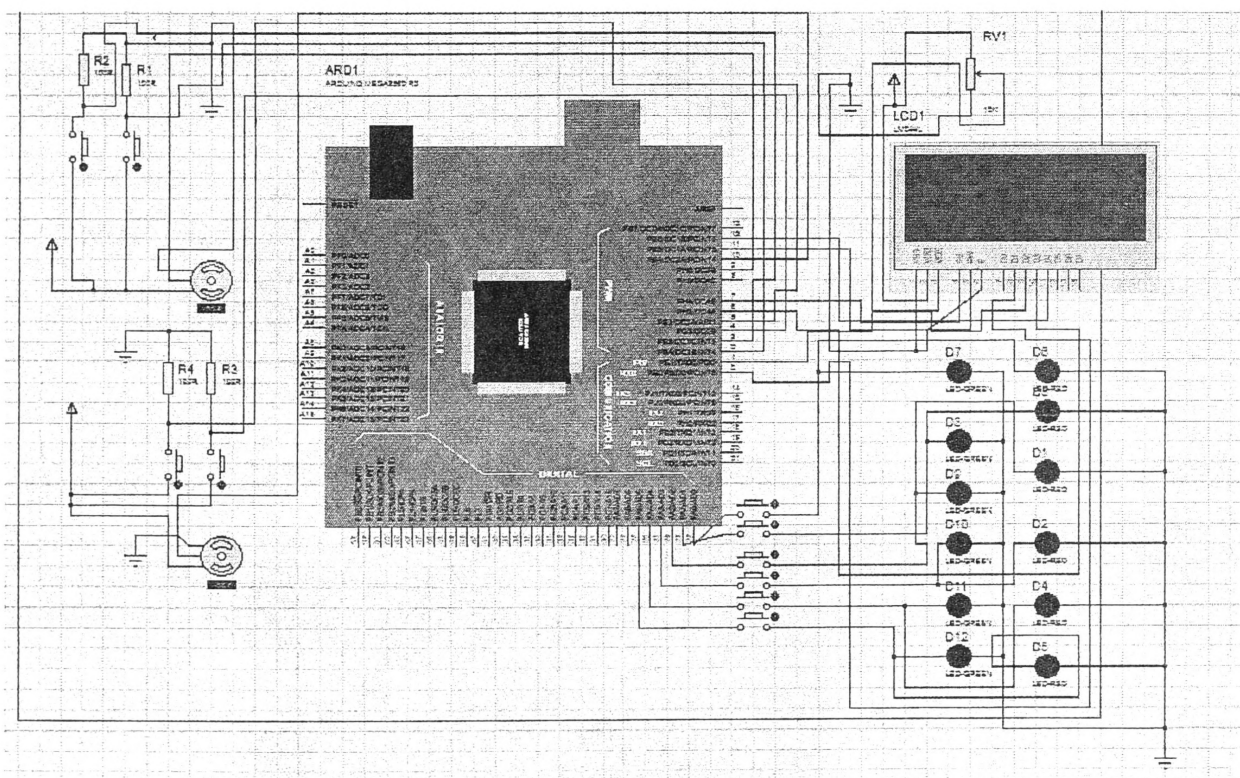

Figure 2: PCB design of Car Parking management System

3. RESULT AND DISCUSSION

Identification results were displayed on LCD as the tag ID number and name of employers with the use of function serial monitoring. LCD and the serial monitoring results were represented as in figure 03, 04 respectively. IR sensors were used to identify the vacant slots. LED's were represented the result of availability of slots. RFID reader is used to read the RFID tag as shown in figure5. Servo motor controlling was used as a purpose of opening and closing the gate.
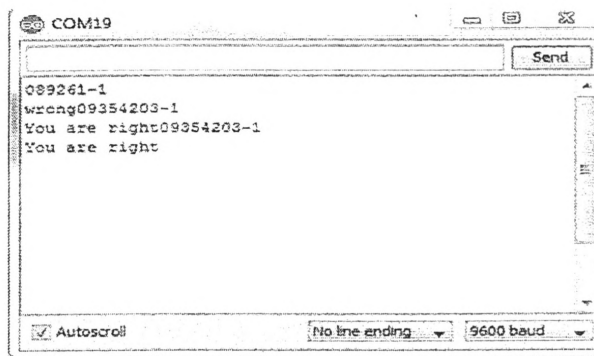

Figure 3: Serial monitor window
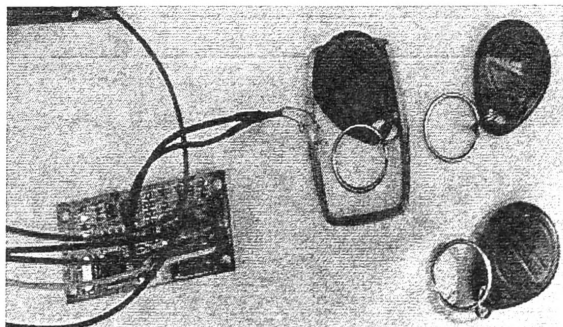

Figure 4: LCD display resulting message
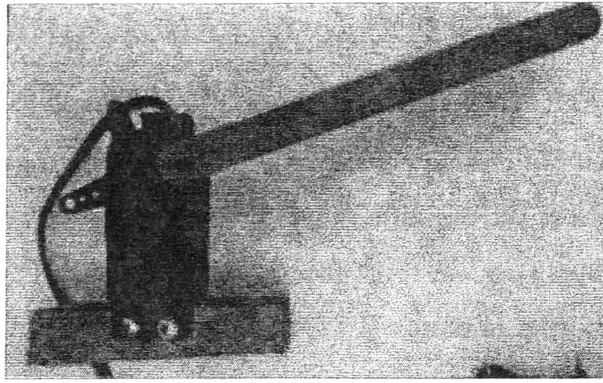

Figure 5: RFID reader and tag

Figure 6: Servo motor controlled gate

Here, IR sensors were used for detecting the vacant and full slots of the car parking system. Arduino Mega was used as the main development board to control system of the parking management system[5].IR sensors were also used to activate the rotation of the servo motors. RFID reader was used to read RFID tag using serial monitoring, it could read the 4 byte number in four times and it was displayed on the serial monitor window.

4. CONCLUSION

The main goal of this project was to design and implement a low cost car parking management system using image analysis techniques and RFID technology. The developed system can function to guide vehicles to available slots and it also enables to do the authentication part by using RFID and image processing technologies. The IR sensors used in the system can detect available vehicle slots. If the project need to be developed as an industrial application, only the IR sensors should be replaced by proximity or Industrial IR sensors. Using these sensors, the sensitive range of detection can be enhanced. All the coding of the project was written by using C language.

ACKNOWLEDGMENT

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