DESIGN AND FABRICATION OF SMART PARKING SYSTEM FOR BICYCLE

Muhammad Al-Ruhaili and Dinesh Keloth Kaithari*
Mechanical and Industrial Engineering Department, Caledonian College of Engineering, Muscat, Oman
*dineshkk36@yahoo.co.in

Abstract—Most of industries in our area lack of reliable information about the occupancy of on-street parking places in the inner districts of large cities that causes unnecessarily high amount of time for searching parking place. The present work is to design, fabricate and test model for smart parking system for bicycle service for on street spaces that has daily entries and exits and helps to reduce parking time. The parking system has sensor by the name IR sensor that does a line-scan for the empty parking space. After that the empty parking space comes to the customer point, returns back to the parking point after loading the bicycle. This method reduces loss of time. It is important to learn the various steps involved in completing the project such as design methods, fabrication details and testing methods. Location of the project is another important aspect. Location is identified as Sohar port.

Keywords: Smart parking, IR sensor, Micro controller, Stepper motor and PROTEUS.

I. INTRODUCTION

The lack of reliable information about the occupancy of on-street parking places in the inner districts of large cities causes an unnecessarily high amount of parking search traffic. Previous intimation to the customer will help navigate driver to the next available parking space. Manual parking results in loss of time to park bicycle and moreover lot of human effort is wasted. A service that informs users early about the situation at the destination will support them to find other alternatives such as public transport modes. Multi floor parking can reduce the land area and employ user friendly technology. The main aims of this project focus on (i) short distance parking (ii) high technology parking (iii) reduce time (IV) High security. On completion of project a smart bicycle parking system will be developed that uses less land area due to multi floor parking facility with reduced parking time combined with user friendly technology. Moreover early intimation is available to the customer about the parking space. Use of smart parking technology can be employed in different places such as airport, market, companies etc.. Public awareness of this technology can reduce the difficulties in identifying parking space that results in loss of time. Even though initial cost is high the project is justified in terms of user friendly technology that saves lot of time. Moreover the parking system is safe.

II. METHODOLOGY, DESIGN AND EXPERIMENTATION

Smart parking system for bicycle consists of two main parts: Software design and Hardware Implementation. Software design of a Smart Parking System for Bicycle is carried by two major software programs: Mikro-Basic program software and PROTEUS design program.

A. Mikro-Basic Program

MIKROBASIC is used for programming the microcontroller (PIC16F887) and PROTEUS is used for drawing the circuit. MIKROBASIC has the advantage of developing applications easily that can compile PIC microcontrollers. It is very user friendly to point and click in windows. It features many built in routines and a fast reliable tool for engineers. It can write your basic source code using the built-in code editor with parameter assistants, code folding, syntax highlighting, spell checker, auto correct, code templates and more. mikroBasic PRO libraries can dramatically speed up the development such as data acquisition, memory, displays, conversions, communication etc. It can monitor your program structure, variables and functions in the code explorer as well as generate comments. It has human readable assembly and standard HEX compatible with all programmes. It uses the integrated mikro ICD (In-Circuit Debugger) real-time debugging tool to monitor program execution on the hardware level. One can inspect program flow and debug executable logic with the integrated software...
simulator. Hence the following flow chart in figure 2.1 describes the relationship.

![Flow chart](image)

**Figure 2.1 flow chart.**

### B. Proteus

PROTEUS is software tool mainly used for electronic design automation. The software consists of a library tool option in which the designer can select the electronic components for the circuit and modify the values. Using this software the circuit will be designed to interface between the controller of stepper motor, servo motor and LCD.

### C. Design

The most significant part of software design is the software requirements analysis. It is one part of the software development procedures that lists specifications used in software engineering in order to meet programmer requirements. MikroBasic is a full-featured Basic compiler which makes microcontroller based project development appropriate for everyone. Popular basic programing language is the best choice for beginners and students due to the simple syntax and clear code. Following figures shows the step by step procedure for the software design.

PROTEUS is a Virtual System Modeling (VSM) that integrates circuit simulation, microprocessor models and animated components to simulate the complete circuit design. It is the perfect tool for engineers in order to test their microcontroller designs before fabricating the physical prototype in real time. The software allows users to react with the design using LED and LCD displays, switches and buttons if attached to the PC. PROTEUS software is used for microprocessor to simulate, schematic capture and design of printed circuit board for an electronic circuit. PROTEUS PCB design includes the ISIS schematic capture and ARES PCB layout programs in order to provide easy, powerful and intelligent way to use series of tools for professional PCB Design. PROTEUS PCB design products include an integrated shape based on basic SPICE simulation capability and auto router as standard. Following are the steps involved in PROTUES circuit design software.

Finally, double click on the controller to edit the controller type, select the frequency value (8MHz) and load the program to the chip. Select Ok and then run the simulation from play button available at the bottom of the window.

PCB’s are essential for constructing electronic systems where the electronic components are fabricated. While designing the PCB, some of the component will not be recognized by the ARES software. Thus they must be replaced by connection devices containing the same number of pins as the main components (voltage regulator, Keyboard, GSM modem, servo motor etc…). Figure 3.10 shows the final PCB design for the smart door lock system.

Hardware design allows the designer to understand how the components are incorporated into system architecture. Clear identification of a hardware design allows the engineers to work effectively towards developing and manufacturing of new machines, devices and components. After completing software design and testing, hardware design takes a part in the project’s fabrication.

Finally, after completing the testing of hardware components, solder the component on the PCB as shown in figure 3.12 below.

### IV. RESULTS AND ANALYSIS

#### A. Software Results
The design has been created and it has been divided into three main parts which are mechanical part, electronic part and controlling part. The mechanical part has been designed by wood model to accurate size. The electronic part is very sensitive system. The controlling part is the programming part for controlling operation of the system.

B. Hardware Results

System designed in such a way that LCD display will be provided for empty and full parking. If the empty parking is available then push button to which parking are available. Entry gate will be opened, parking platform will rotate and empty parking space will be ready to put the bicycle. After loading the platform returns back to the original position. Hence following in figure 4.1 show final assembly of the prototype after completion of the work with various components and how they are inter connected.

V. CONCLUSION

In conclusion the project's results provide public awareness about this technology in reduction of difficulties related to identification of free parking spaces. Even though the initial cost is high, the project uses friendly technology that saves time to users. Moreover, the parking system is considered as a safe system.

Figure 3.1 selection of the controller type.

Figure 3.2 Starting new project on mikrobasic.
Figure 3.3 Selection of frequency for controller.

Figure 3.4 Selecting of Edit Project window.
Figure 3.5 Editing of microcontroller specifications

Figure 3.6 Opening new window in PROTEUS software.
Figure 3.7 Components selected for the circuit design.

Figure 3.8: Connection of the circuit components.
Figure 3.9: Opening new window in PROTEUS software.

Figure 3.10 Final PCB design.
Figure 3.11 Collection of components for hardware test.

Figure 3.12 Final PCB for Smart Lock Door System.
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REFERENCES


Figure 4.1: Final assembly of prototype


