Circular Car Parking Using Pic Microcontroller

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Abstract: Automation is the one of the most promising sector with advent of technology. Due to the increasing population in urban settlements, the vehicle traffic has also increased in these settlements. In this study, in order to overcome these problems, a circular multi-stored automatic parking system model that is fully controlled by PIC (Peripheral Interface Controller) microcontroller is built. The vehicle recognition as well as the parking slot detection is efficiently carried out by ultra-sonic sensors and infra-red sensors. The results obtained have showed that the model can provide significant contributions to the solution of problems resulting from parking.

Keywords: PIC microcontroller, Sensors, Parking lot automation, Vertical moving rods.

I. INTRODUCTION

A. Automatic parking lot System [1] is one of the most efficient solution proposed to reduce the time consumption as well as the space inadequacy. The parking lot system represents multi-storage is composed of modules with advanced technologies where the structures are completely automated. Inadequacies can cause serious problems such as traffic congestion and pile-ups, increased fuel consumption, pollution and wastage of time. In this system, the whole process is performed automatically through hardware which are controlled by software and mechanical structure that helps to overcome some problems mentioned above which are completely removed while the rest is minimized.

B. Advantages [2] of Automatic parking lot systems

When compared with fully automated parking system, a conventional parking lot requires 50 % more volume space. This model helps to give the developer lots more options such as adding more spaces, utilizing more area for non-parking purposes or green spaces. The possible location for a circular automated parking lot are virtually unlimited. They can be constructed above ground, under-ground, freestanding or integrated inside the existing buildings. They nearly reduce 85% of CO_2 emission by eliminating the need for cars to drive and idle while searching for parking spaces. This parking lot gives main priority for safety and security for cars and drivers. They inherit much safer and more security because they remove.

II. METHODOLOGY

The significant hardware modules used are:
1. PIC micro-controller driving and pedestrians from the parking area due to full automation technology

2. Sensors – Ultra-sonic senso r(HC-SR04)Infrared sensor (IR)
3. 12 Relay (HE JQC3FC)
4. 2 DC motors (12 V DC)
5.1 DC Motors (5 V)
5. 12 V DC adaptor.
6. LCD display.
7. Mechanical structure.

A. PIC Microcontroller (16F877A)

It is an micro-controller designed with innumerous built in features making it an efficient processing unit for Automation. It is a 40pin controller with 2 to 5.5V operating voltage. It has Flash memory type (14kb) and RAM memory of 368 bytes. The data EEPROM is about 256 bytes and the CPU speed is 5MIPS.

B. Sensor

a. Ultra-Sonic Sensors (Hc-Sr04)

Ultras-sonic sensor also known as distance sensor, are used to find solution for non-contact distance measurement function. It is able to measure distances from 2cm to 400cm with an accuracy of about 3mm. this module includes transmitter, receiver and its control circuits. It has four pins: Supply, ground, Trigger and Echo pin. A Supply of 5V is given.

b. Infra-Red Sensor

IR sensors works by using a specific light sensor to detect a select light wavelength in the Infra-red spectrum. The Infra-Red (IR) sensors are commonly used for the purpose of detecting motion or disturbances in its described area of vision. They work on the idea that any object releases infrared radiation during movement. With the help of the piezoelectric sensor setup used in it, the variations in IR output caused by movement of the object can be detected and manipulated to act as a secure aid to user.

C. Relay

Relay, a switch operated electrically, generates a low power signal to control a circuit or many circuits together with necessary isolation between relay and the system to be controlled. It either uses electromagnet to operate the relay/switch mechanically or other mechanisms such as solid-state relays. 12 Relay (HE JQC3FC) with a nominal operating current of 160 mA, coil resistance of 75 ohm and operating power of 1.92W is used.

D. DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.

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DC motors have some internal mechanisms, either electromechanical or electronic, to change the direction of current flow in the part of the motor. The speed of DC motor can be controlled in a wide range. In this model, 2 DC (12 V) motors with 200rpm and 100rpm and 1 DC motor (5V) with 50 rpm are used.

E. LCD

A liquid crystal display (LCD) module is used to display the status of free and occupied parking lot spaces. It is an optical device that uses reflectors to provide the information on screen in either monochrome or color.

LCDs are economical and easy to use device. These are most commonly used display devices in embedded system. Commonly available display is set up as 16 to 20 characters by 1 to 4 lines.

III.   BLOCK DIAGRAM

The following represents the block diagram of Circular parking lot.
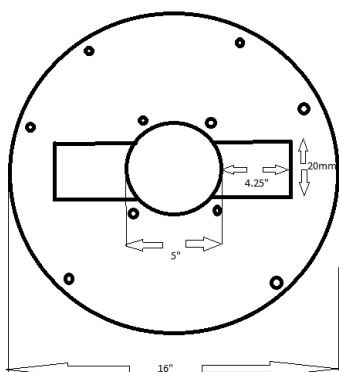
B. Parking Lot Storey Dimensions

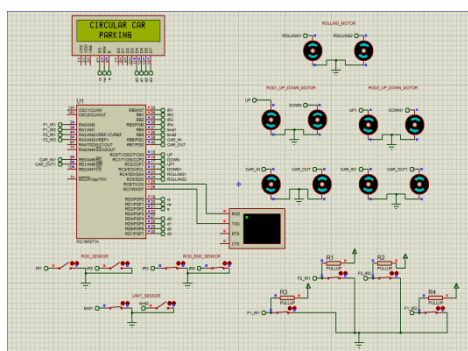**Figure 2: Parking Slot Dimension**

C. Simulation Result

Figure 3 : Simulation Result

D. Implementation of Hardware

Figure 4: Hardware Assembly

The Software program is embedded into the controller. The exterior of the prototype is made up of acrylic sheets supported by fiber pultruded rods. It is a three storey parking lot that comprises of two slots in each storey. The assembled mechanical structure are kept in the centre in the 5inch hole of the 16inch diameter sheet. The groove is 4.25 inch length and 20mm in width. The gap between each storey is 15cm. The acrylic sheet is 3mm thick.

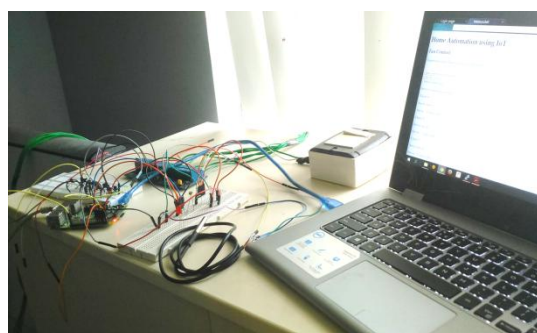**Figure 5: Circular parking lot Exterior hardware assembly.**

Figure 6: Software Interface with Hardware assembly.

IV.   CONCLUSION & FUTURE SCOPE

This paper focusses on automated circular car parking for multi storeyed buildings in order to provide space efficient solutions for parking problems in highly traffic urban areas

A prototype model is developed and the proposed mechanism is implemented. In future, this parking lot which is implemented only for cars can also be made applicable to any kind of transportation with suitable space optimization techniques.

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