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Annexure I

Project title: ROTARY AUTOMATED CAR PARKING SYSTEM

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1.1 Abstract:

This work proposes to develop and implement a prototype model of an efficient unmanned car parking system using microcontroller. Model developed for car parking with slots, prevents the usage of the parking space at ground level. Entire process was automated so that it reduces the time wasted by a person. This model uses four parking slots in a ferries wheel model. Various sensors, motors and software were used to detect and transport the car to its allocated parking slot. Hence, this system provides a closed loop control, making it an efficient, accurate, secure and a convenient method proposed for parking cars in both commercial and residential areas. Here we use a RFID card reader for entry of parking and exit of parking. an IR sensor is used to detect a car and assign a tag. this makes the parking to be secure. To park the car in free slots, we provide rotation if necessary. A stepper motor is used here for rotation either in clockwise or anticlockwise direction.

1.2 Motivation:

In the present busy life, car parking has become a crucial factor. It leads to the wastage of time and fuel. It is impossible to know the status of car parking whether it is empty or not. However the parking in residential and commercial area is too difficult and it is not secure too. We know that the traditional parking is a time taking and however it occupies more space to park. Hence a ferries wheel model parking is introduced to overcome these problems and providing security and making convenient and comfort to the people.

1.3 Objective:

This project deals about a model composing a micro controller based system. With user friendly interfaces this system allows its user to be aware of parking. The system also provides the user his/her usage statistics so that he/she can be aware of the usages. And, it provides security for parking with an RFID card reader.

2.1 Block diagram & Working:

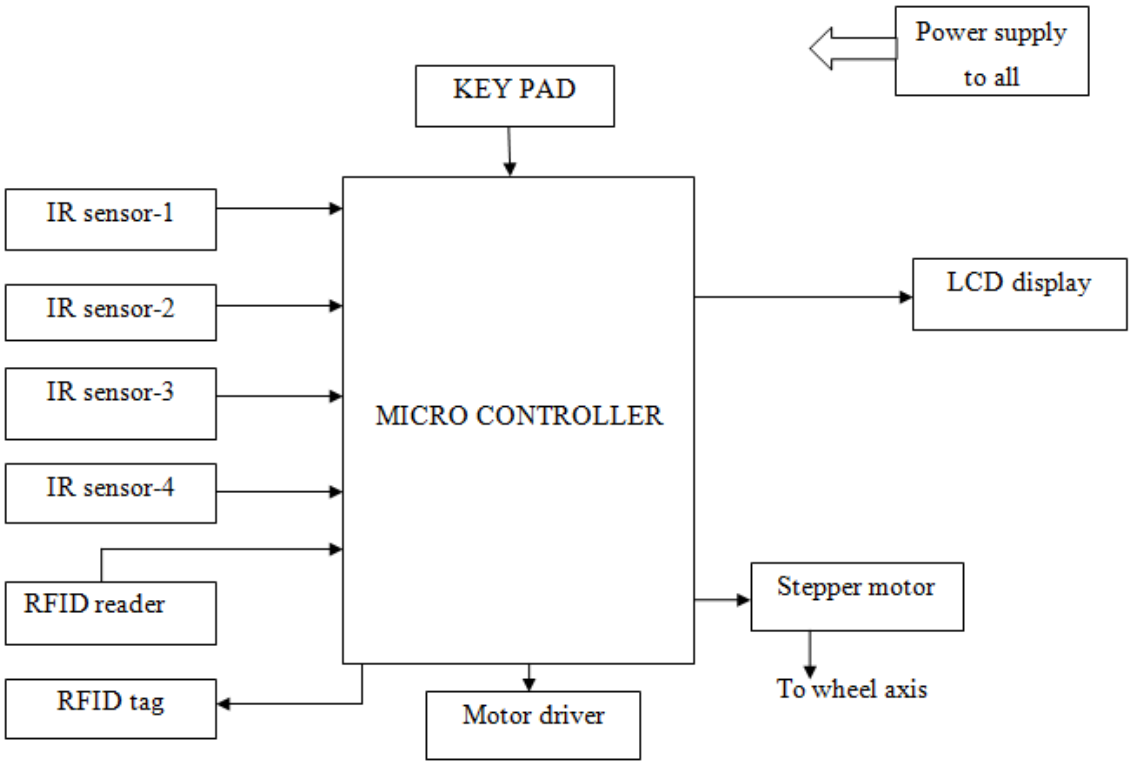

Figure 1: Block Diagram of Rotary Automated Car Parking System

The fig:1 show the block diagram of Rotary automated car parking system

The block diagram consists of microcontroller, infrared sensor, RFID tag generator, RFIDreader, stepper motor and its driver, LCDdisplay, keypad. The microcontroller here used is arm7 LPC2148.When the car enters the IRsensor detects the car and sends the information to the microcontroller. Every slot contains an IRsensor which is used to give the information about whether the slots are available or not. If slots are available then RFID Tag will be issued to the owner. If the ground slot is empty then the car enters the slot, if the ground slot is not empty then the ferries wheel should take a step rotation by using the stepper motor and the car should be parked.

If the owner of the car wants to take the car away, then he wants to show the RFID Tag which was issued at the time of parking. RFID Reader is used to read the RFID tag. Then the micro controller validates whether it is correct or not. If it was validated one it checks the car for

an ensured tag. The rotation of a system depends on the position of a car. In this way RFID reader functions.

Here, in this project we are using a microcontroller named arm7 LPC2148.This microcontroller is a heart of the system. All the other components used in this system are interfaced with the microcontroller. An IR sensor which is used to detect the car is interfaced with the microcontroller. Whenever the car was detected it sends information to the controller. Then microcontroller checks for the slot whether it was empty or not. As this car parking system is in a ferries model, rotation is provided by the stepper motor. Firstly stepper motor is interfaced with microcontroller. If the car wants to be parked in a grounded slot, then rotation is not necessary. If the car wanted to be parked in other slots, microcontroller makes the stepper motor to rotate. After the parking, an RFID tag is issued.

During the exit of car parking the issued RFID tag is to be validated with RFID reader. If it is a validated one the process continues for exit of parking. This is mainly installed on this system for the security purpose. At the time of exit it checks for the slot whether it is present at ground or not, if it is present at the ground slot no need of rotation. If it needs rotation for exit of car parking the stepper motor rotates in clock wise or anti clockwise for the exit of car. Then the car will be exit. In this way the entry and exit of car parking will takes place.

2.2 Technical Specifications:

2.2.1 ARM7:

Introduction

ARM7 LPC2148 Microcontroller Socket is used with LPC2148 Pro Development Board. It is a standalone board for LPC2148 microcontroller. It has 12MHz crystal for system clock and 32KHz crystal for RTC. It has power on reset circuit with MCP130T brownout monitoring chip and power decoupling capacitors. This board can be used for LPC2148 based generic development.

Technical Specifications:

- Microcontroller : LPC2148 with 512K on chip memory
- Crystal for LPC2148 : 12Mhz

- Crystal for RTC : 32.768KHz
- Operating Supply : 3.3V
- Power on reset circuit with MCP 130T brownout detection

LPC2148 Features:

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 40 kB of on-chip static RAM and 512 kB of on-chip flash memory.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.
- USB 2.0 Full-speed compliant device controller with 2 kB of endpoint RAM.
- Two 10-bit ADCs provide a total of 14 analog inputs
- Single 10-bit DAC provides variable analog output
- Two 32-bit timers/external event counters (with four captures and four compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.
- Multiple serial interfaces including two UARTs, two Fast I²C-bus (400 kbit/s), SPI and SSP with buffering and variable data length capabilities.

2.2.2 IR sensor:

Dominant Wavelength	625 nm
Forward Current	30 mA
Forward Voltage	2 V
Illumination Color	Red
Luminous Intensity	90 mcd
Max Operating Temperature	100 °C
Min Operating Temperature	-55 °C
Number of Elements	1
Number of LEDs	1
Power Dissipation	100 mW

2.2.3 RFID tag:

SNo.	Parameter	Particular
1	Power	Tags are Passive
2	Frequency	UHF 860 MHZ to 960 MHZ as per EPC Gen 2 standards
3	Data Transfer Rate	At least 512 kbps under ideal conditions & 64 to 512 kbps under field conditions
4	Protocol	EPC Gen 2, ISO 18000-6C
5	Dimensions (including the substrate/ backing)	Maximum area occupied on the windshield shall be 50 Sq. cm.
6	Material	Plastic substrate with printed antenna
7	Physical printing of Tag ID on the Tag	The Tag ID shall be physically printed on the Tag using the Hexadecimal numbering system and shall be adequately clear for easy visual recognition

2.2.4 Stepper motor:

- Size: 42.3 mm square × 38 mm, not including the shaft (NEMA 17)
- Weight: 285 g (10 oz)
- Shaft diameter: 5 mm “D”
- Steps per revolution: 200
- Current rating: 1.68 A per coil
- Voltage rating: 2.8 V
- Resistance: 1.65 Ω per coil
- Holding torque: 3.7 kg-cm (51 oz-in)
- Inductance: 3.2 mH per coil
- Lead length: 30 cm (12″)
- Output shaft supported by two ball bearings

2.2.5 LCD display:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

Pin No	**Function**	**Name**
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

2.3 Budget:

S.No.	Name of the equipment	Specification	Quantity	Unit Cost	Total Cost
1	ARM7	LPC2148	1	2500	2500
2	Stepper Motor with Driver	ULN2003	1	270	270
3	Sensor		6	200	1200
4	Keypad		1	500	500
5	LCD	HD44780	1	200	200
6	Miscellaneous				1500
Grand Total					6170

3.1 CONCLUSION AND FUTURESCOPE

The Rotary Automated Car Parking System is designed to reduce the availability of parking space and reduce the man power. It is a very convenient parking system to park cars. User can easily understand the status of car parking. All will be alerted with a buzzer when the RFID tag is not validated. Owner will save time and assuring that parking is secure.

The setup can be configured with the electrical components being chosen according to the scale of the project. It can be a low-cost installation process and can provide security to the cars which are parked. Due to this parking system in upcoming days the availability of the parking space is reduced. Due to this the car which is parked can be delivered within a short time. This is an automatic system so there is no use of man power.