JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

ROTARY CAR PARKING SYSTEM USING ARDUINO MEGA 2560

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Abstract : This project aims to design, build, and implement a Radio Frequency Identification (RFID) Based Smart Rotary Car Parking which will automatically park and retrieve the vehicles without the driver. Present parking systems have several problems, such as high operation costs, inefficient vehicle management, and, most importantly, the time-consuming process of issuing tokens and collecting money. Therefore, we are trying to resolve the above-stated problems by RFID Based Smart Rotary Car Parking. This project uses several sensors, trays and microcontrollers, and sensing circuits monitored by LCD displaying the entry and exit of vehicles. The vehicles are allowed access only when there is an empty tray, and the valid RFID card on the sensing circuit at the gate is punched. Similarly, the RFID card corresponding to the tray needs to be punched when the vehicle wants to exit. A sensor will determine whether a tray is occupied, and the resulting data will be fed to the display. The number of trays that are either empty or loaded will be prominently displayed on the monitor to aid drivers in making a decision. This automated system process allows the parking system to work efficiently and requires fewer personnel to manage the parking. Through the implementation of the RFID Based Smart Rotary Car Parking system, more cars can be accommodated in the same area and can be applied effectively in almost any city in the world. This resulting efficiency is the driving force in the global adoption of smart, automated car park systems in place of conventional car parking systems. This project focuses on the teamwork and engineering design principles process required for solving this problem. Although this approach works theoretically, the reality is that there are many unforeseen variables relating to technical mishaps, availability of desired components, efficient management and myriad other factors that may hamper this undertaking.

IndexTerms **: Arduino Mega , RFID, Motor, Mechanical Body, IR Sensor, LCD, Keypad, Etc.**

I. INTRODUCTION:

This project aims to develop RFID based smart rotary car parking and thereby increase the efficiency of existing manual parking systems and, in turn, reduce their operational costs by reducing personnel requirement cost of operation processing speeds at check etc. Completing this project would help tackle the increasing demand for parking facilities by decreasing the capital requirement per car slot. It will also provide a platform for monitoring parking demand at different times of the day by which enough data could be gathered to inform future plans or projects. Dhaka is a densely-populated city that hosts a population of 16 million. It is the capital and busiest city of Bangladesh and is the hub of education, administration, trade, commerce, etc. Dhaka is constantly attracting people and, therefore, traffic from all corners of the country looking for work or education. The current state of parking spaces is woefully inadequate to cope with worsening traffic and the increasing number of private cars entering the streets of Dhaka, according to the Bangladesh Roads Transport Authority (BRTA). Although relatively wealthy individuals and their families mainly use these private cars, they constitute almost 25% of all motorized vehicles registered within Dhaka city. Private cars disproportionately affect traffic compared to other vehicles, such as busses and trucks. It has been found that private cars spend almost 95% of their time on the road, creating persistent and regular times traffic jams on busy roads. 1 RFID based smart rotary car parking is an important way of solving the traffic jam problems and improving the utilization of present parking spaces. For a long while, planners, politicians, engineers and environmentalists have wrestled with the challenge of stowing away cars from busy roads. Ranging from the earliest parking garages— little more than sheds— to fully automated car parks, the demand for a better parking system has been there. However, a promising but feasible concept is the Smart card car parking — a suite of advanced technologies working in unison to drastically improve the speed and efficiency of locating, reserving, and paying for parking. The need for such a system is critical in chaotic transportation management scenarios like the one in Dhaka city, where most people prefer to use private cars in busy commercial centers. A study conducted by Rahman K. N. (2007) revealed that 60% of the vehicles parked in Motijheel, the city's busiest commercial area, are private cars. Thus, the viability of these commercial areas depends on the availability of convenient parking facilities adjacent to or readily accessible to desired destinations, especially off-street parking facilities. (2012). The problem is worsened by the absence of an effective parking policy for Dhaka, where there is rampant illegal on-street parking on every busy street.

II. HISTORY OF SMART PARKING SYSTEM:

With the increase in the number of vehicles in high-density urban housing, the problem with a limited amount of parking space became apparent. One of the proposed solutions to this problem is the automatic parking system, with the first such system being created in the United States. Between 1940-1950, the automatic systems used were by Bowser, Pigeon Hole and Roto Park. In the years between 1957 to 1974, Bowser and Pigon Hole systems were used, but due to frequent mechanical problems and prolonged waiting time for the vehicle, the interest in such a solution waned drastically. The concept, however, saw a resurgence in popularity since 1990, and in 2012 there were 25 projects planned or in progress, which yielded about 6,000 parking spaces. While until 1990, the interest in the systems was mediocre in Europe and Central America, Asia has been using automatic parking systems since 1970. In Japan, since early 1990, about 40,000 parking spaces based on the automatic parking system paternoster type were created.

A car parking system is a mechanical device that multiplies parking capacity inside a parking lot. Parking systems are generally powered by electric motors or hydraulic pumps that move vehicles into a storage position.

There are two types of car parking systems: traditional and automated. In the long term, automated car parking systems are likely to be more cost-effective when compared to traditional parking garages. Automatic multistorey automated car park systems are less expensive per parking slot since they tend to require less building volume and less ground area than a conventional facility with the same capacity. Both automated car parking systems and automated parking garage systems reduce pollution cars are not running or circling around while drivers look for parking space.

III. LITURATURE REVIEW

Everycar park owners have their different parking system. Some systems have successfully attracted and meet the requirement of customers. Three parking systems are list as followed.

1. Integrated Car Parking System:

Figure 1. Integrated Car Parking

Customize application suitable for various types of landscapes and buildings Structures available below the ground. Ease control by soft touch on the operation panel screen. When a vehicle stops in front of the entrance, automatically door opens and trolley transfers the vehicle to parking cell as shown in Figure 1.

2. Robot Car Parking System:

Figure 2. Robot Car Parking

It is the first of several large-scale robotic car parks being built to address parking problems in the UAE. All the customer sees are a parking garage with space for one car, though the floor is platform which rides on the top of a robotic trolley. When the customer leaves the vehicle and collects a ticket, the wall of the garage drops away and the car is whisked to an elevator, which in turn takes the car to another trolley. From there, the machine parks the car in the dark depths of the structure. In total, the process takes around three minutes.

With this technology, you do not need to drive through the garage to find a parking space. You simply drive your car to an entry station and leave your car to be picked up by the computerized lifts that will safely place it inside the building on a shelving system as shown in Figure . When you leave, you return to a central point and your car is swiftly retrieved for you.

This robotic car park will be especially convenient for the office tenants, parking or retrieval can be completed in less than 160 seconds. It is safe and secure and obviously doesn't expose expensive paint work to the absarsive elements during lengthy office hours.

3. Multilevel Car Parking System:

Figure 3. Multilevel Car Parking

A multi-level car parking is essentially a building with number of floors or layers for the cars to be parked. The different levels are accessed through interior or exteriorramps. An automated car parking has mechanized lifts which transport the car to the different levels. Therefore, these car parks need less building volume and less ground space as shown in Figure 3. and thus save on the cost of the building. It also does away the need for employing too many personal to monitor the place. In an automated car parking, the cars are left at the entrance and are further transported inside the building by robot trolley. Similarly, they are retrieved by the trolley and placed at the exit for the owner to drive away.

4. Rotary car parking system:

Figure 4. Rotary car parking

The rotary parking system shown in Figure consists of one automated mechanical system, which rotates at an angle of being perpendicular to the ground. By this way, cars parking and retrieving is reliable. It runs in a rotating way that driven by the reducer, transmission device drives the parking pallets rotating for cars parking and retrieving.

IV. PROPOSED SYSTEM

Figure 5. below shows the overall project's block diagram of the system.

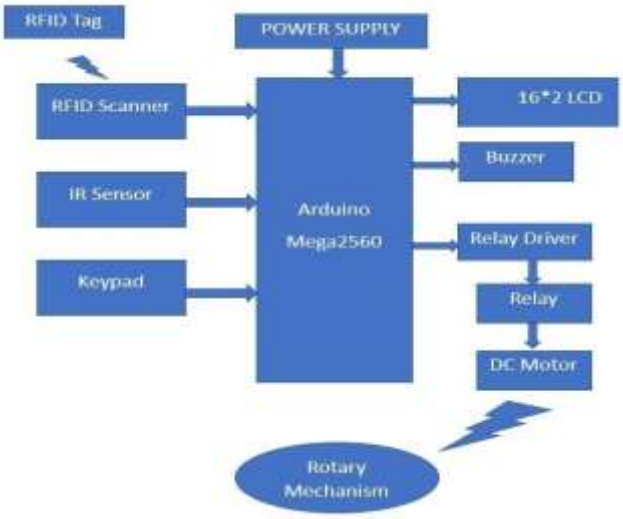

Figure 5. Block Diagram

RFID based car parking system is modern and built with safety in mind. Initially, the trays are empty since no cars are loaded. If one car enters the parking, the first tray it enters registers as occupied and the system rotates one at a time, and an empty tray replaces the occupied one's place, ready to receive a new car. The owner of a parked vehicle provides an RFID card in order to release and receive their car. How much rotation occurs is always counted and kept track of by the Master Controller. Here are two limit switches for calculating the cycle and determining the mid-position of the tray. If the two limit switch registers as zero, the tray stays in mid position. When the tray stays mid-point master controller checks car status, RFID etc.

A. Arduino Mega 2560:

The Arduino MEGA 2560 is designed for projects that require more I/O lines, more sketch memory and more RAM. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities maintaining the simplicity and effectiveness of the Arduino platform. This document explains how to connect your Mega2560 board to the computer and upload your first sketch.

B. RFID:

Figure 6. RFID

An RFID reader is placed at the entry and exit points of the car park, and each user is given a credential or tag that allows him access to the facility. RFID tags are usually in the form of stickers / decals that are directly attached to the vehicle's windshield, or portable hang tags, cards or fobs that offer more flexibility when the individual needs to drive another vehicle for the day.

C. LCD Display:

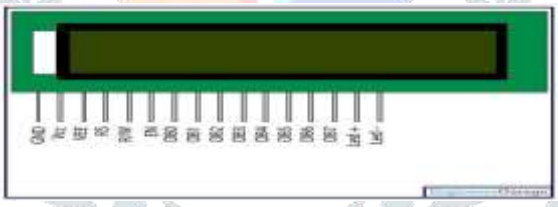

Figure 7. LCD Display

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.

D. Keypad:

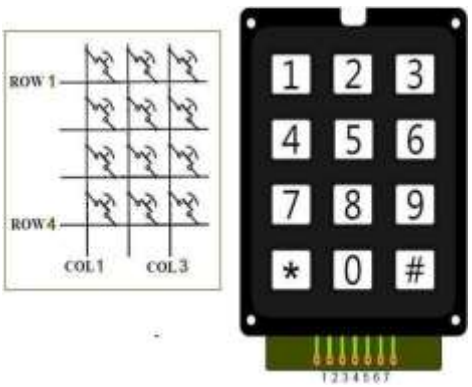

Figure 8. Keypad

Keypads allow users to input data while a program is running. This tutorial shows you how to connect a twelve-button keypad to an Arduino and how to use the library. A keypad is often needed to provide input to an Arduino system, and membrane-type keypads are an economical solution for many applications. They are quite thin and can easily be mounted wherever they are needed.
In this project, demonstrate how to use a 16-button numeric keypad, similar to what you might find on a telephone. A 16- button keypad has four columns and four rows as show in Figure

E. IR Sensor:

Figure 9. IR Sensor

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation.

F. Electric Motor:

An electric motor is used in small machines that need Precies control of their motors, such as printers, laser cutters, etc. One of the most important features of this type of motor is that it is possible to control the number and speed of its cycles and the stopping angle accurately. This motor is also used in robotic applications, since it can be controlled to stop at a specific angle.

V. FLOW CHART:

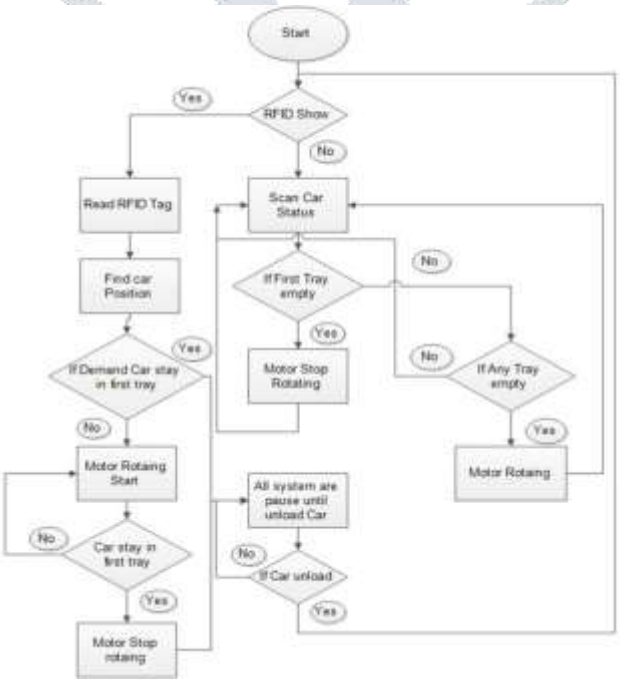

Figure 10. Flow Chart

VI. ADVANTAGES:

1. Efficiency: RFID based smart rotary car parking provides car parking solutions to accommodate the maximum number of cars in a given space.
2. Cost-Effective: RFID based smart rotary car parking significantly improves the financial viability of commercial and residential developments.
3. Saves Time: RFID based smart rotary car parking reduces parking and retrieval time. It saves time spent searching for empty parking slots and the subsequent time spent searching for the parked car.
4. Easy and Cost-Effective Maintenance: RFID based smart rotary car parking is cost-effective in terms of maintenance and upkeep over conventional parking systems.
5. Car Safety: RFID based smart rotary car parking provides improved security and safety for the cars. Parked cars are free from theft and damage.
6. Safer for Drivers: Drivers collect their cars from secure waiting areas and, thus, they do not have to walk through a car park alone and are less vulnerable.
7. Environment Friendly: RFID based smart rotary car parking uses electricity only when engaged. As drivers don't have to drive around looking for empty slots, cars don't have to be active when parked, thereby reducing fossil fuel consumption.

VII. APPLICATIONS:

1. Excellent utilization in dense multi-store buildings.
2. Commercial places like shopping malls, hospitals, and corporate offices that see heavy traffic can benefit greatly.
3. This system can be used in educational institutions like schools, colleges and universities.

VIII. CONCLUSION:

The RFID based rotary smart car parking system has been successfully designed and developed. The RFID based rotary smart car parking system is realistic and can control the parking automatically by using the RFID module with RFID smart cards. The total cost of RFID based rotary smart car parking System infrastructure can be reduced. This parking system enables users to operate an unattended parking barrier with controlled parking access privileges. This system is ideal for apartments and condos, gated communities, business parking lots and garages, and university parking areas. The RFID based rotary smart Parking System offers the utmost efficiency, convenience, safety & reliability. It is ideal for today's car parking and traffic problem in cities. The RFID Rotary Smart Car Parking is one of the important factors in traffic areas, multiplexes and apartments etc.

IX. ACKNOWLEDGEMENT:

It gives us great pleasure in presenting the paper on "Rotary Car Parking System Using Arduino Mega 2560" We would like to take this opportunity to thank our guide, Prof. S.B.Mandlik, Professor, Department of Electronics and Telecommunication Engineering Department, Pravara Rural Engg. Collage, Loni for giving us all the help and guidance we needed. We are grateful to him for his kind support, and valuable suggestions were very helpful.

X. REFERENCES:

[1] Rico, J., Sancho, J., Cendon, B. and Camus, M., 2013, March. Parking easier by using context information of a smart city: Enabling fast search and management of parking resources. In 2013 27th international conference on advanced information networking and applications workshops (pp. 1380-1385). IEEE.
[2] Zhou, F. and Li, Q., 2014, November. Parking guidance system based on ZigBee and geomagnetic sensor technology. In 2014 13th International Symposium on Distributed Computing and Applications to Business, Engineering and Science (pp. 268-271). IEEE
[3] Zheng, Y., Rajasegarar, S. and Leckie, C., 2015, April. Parking availability prediction for sensor-enabled car parks in smart cities. In 2015 IEEE Tenth International Conference on Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP) (pp. 1-6). IEEE.
[4] Ji, Z., Ganchev, I., O'Droma, M. and Zhang, X., 2014, August. A cloudbased intelligent car parking services for smart cities. In 2014 XXXIth URSI General Assembly and Scientific Symposium (URSI GASS) (pp. 1- 4). IEEE.
[5] Alessio, B., De Donato, W., Persico, V. and Pescapé, A., 2014. On the integration of cloud computing and internet of things. Proc. Future Internet of Things and Cloud (FiCloud), pp.23-30. [9] Ballon, P., Glidden, J., Kranas, P., Menychtas, A., Ruston, S. and Van Der Graaf, S., 2011, October. Is there a need for a cloud platform for european smart cities?. In eChallenges e-2011 Conference Proceedings, IIMC International Information Management Corporation (pp. 1-7).
[6] http://pubs.sciepub.com/automation/8/1/1/
[7] Mott MacDonald Ltd, "Working Paper Vol-IV Road Side Management", Dhaka Urban Transom Project - Phase l, Bangladesh Road Transport Athodyd, Gob.