International Journal of Trend in Research and Development, Volume 3(2), ISSN: 2394-9333
www.ijtrd.com

Safety and Security in RFID Based Multilevel Vehicle Parking System

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Abstract - This project has been implemented to reduce the excess use of land space which is already very scarce in metro cities. Different types of vehicle parking are applied worldwide namely Multi-level Automated Car Parking, Automated Car Parking System, and Rotary Parking System. The present project work is aimed to develop a scale down working model of a car parking system for parking cars within a large parking area. The chain and sprocket mechanism is used for driving the parking platform. This total prototype is powered by a D.C motor. The RFID system is used for park the cars automatically in the multilevel parking area. It can identify the vehicle with no tag, invalid tag and then restrict the entry of that vehicle. Dijkstra's shortest path algorithm is used for retrieve the car from the multilevel parking system which ensures time saving.

Keywords: *Multilevel Vehicle Parking, RFID Tag, Dijkstra's Algorithm.*

I. INTRODUCTION

Multilevel vehicle parking system is essential especially in regions facing space shortages, also in areas which cater huge crowds. Multi- level car parks offer greatest possible flexibility for the realization of optimum parking solution. Multi-level car parks offer provide a fast parking process in which the driver does not have to maneuver his car on each level. The advanced automatic parking systems are extraordinarily well designed tested and constructed. They are being used worldwide in totally automated locations, where speed and reliability is critical.

The advantages are clear. The systems are scalable and adapt to virtually any architectural foot print. They hold as many as twice any vehicles as similarly sized conventional garages. Although the Multilevel parking system facilitated parking to a great extent but to increase the security of parked vehicles as well as to reduce the manual work and time consumed during parking, a technique is introduced with this system named RFID. Time and cost are two important factors of human life, whether for an individual or a business. We have to spend much time to retrieve the car from multilevel vehicle parking system it comes in ground position. Dijkstra's shortest path algorithm is used for retrieve the car from the multilevel parking system which ensures time saving. This algorithm works a priority based Executing operation for the given input.

II. PRESENT PARKING SOLUTIONS

A. Integrated Car Parking Solution

Consider the following diagram figure 1, 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.

Figure 1: Integrated Car Parking Solutions

When a vehicle stops in front of the entrance, automatically door opens and trolley transfers the vehicle to parking cell. Misleading of this solution is it should be undergrounded. By this investment increases and lot much space utilization is to be made.

B. Automated Car Parking

Figure 2: Automated Car Parking

Consider the following diagram figure 2, the driver will pull the car onto a computer- controlled pallet, turn it off, and get out. The pallet is then lowered into the abyss of parking spaces, much like a freight elevator for cars, except it can also move sideways, not just up and down. There's an array of laser sensors that let the system know if the car doesn't fit on the pallet (although it's big enough to fit a mid-sized SUV),. The system retrieves the car when the driver returns, although this might take some time and creative manoeuvring. Cars are parked two deep in some spots, so a specially tailored software system has to figure out the logistics of shuffling the various vehicles around as needed to

retrieve a specific car. And for those, like me, who find it difficult to turn their vehicle around after pulling out of a space, there's an underground turntable that turns the car around before it is lifted to the surface, so the car is facing out into the driveway, ready to go. Backing out of garages or parking spaces is one of the most common causes of accidents.

III. RFID TAG IDENTIFICATION

Radio-frequency identification (RFID) is an automatic identification method wherein the data stored on RFID tags or transponders is remotely retrieved. It will be possible to see unmanned, secure, atomized parking-lots functioning with RFID technology. Entry and exit of the car during parking will be handled in a fast manner so that traffic jam problem will be avoided during these processes. The application of RFID technology makes parking effective, convenient and safe.

RFID systems based on UHF and higher frequencies use far-field communication and the physical property of backscattering or "reflected" power. Far-field communication is based on electric radio waves where the reader sends a continuous base signal frequency that is reflected back by the tag's antenna. During the process, the tag encodes the signal to be reflected with the information from the tag using a technique called modulation. An active tag has its own battery and does not rely on the reader for any functions. Passive tags rely on the reader for power to perform all functions. To my project using passive RFID tag because the tags had no batteries; they just collected energy from the reader and sent back their information and limiting in this way the distance between the reader and the tags.

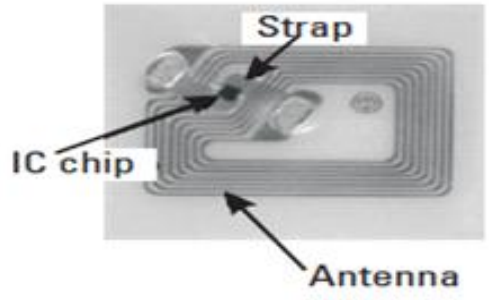

Figure 3:13.56-Mhz RFID passive Tags

Consider the following diagram figure 3, The RFID reader is interface with the PIC microcontroller connect between multilevel vehicles parking system. Here used passive RFID tags, it's convenient for our project. To design the RFID tag above mentioned operation is followed. The tag can be a show from the reader it detects the data and converts from PIC microcontroller the operation is performed.

IV.DIJKSTRA'S SHORTEST PATH ALGORITHM

Dijkstra's algorithm is called the single-source shortest path. It computes length of the shortest path from the source to each of the remaining vertices in the graph. Dijkstra's algorithm uses the greedy approach to solve the single source shortest problem. It repeatedly selects from the unselected vertices, vertex v nearest to source s and declares the distance to be the actual shortest distance from s to v.Dijkstra's algorithm works on priority based search between edges and vertices. Priority queues dictate a different order based on priority of their elements. The element with the smallest distance is the one that has the highest priority. It gives best output of my project in multilevel vehicle parking system and which provides time saving.

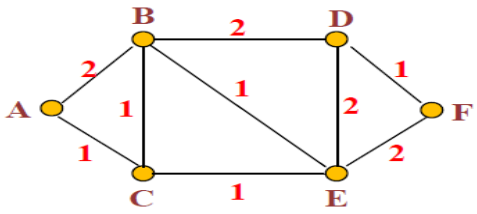

Figure 4: Path finding Graph

Consider the following diagram figure 4, the edges of v is then checked to see if their destination can be reached by v followed by the relevant outgoing edges. The algorithm works by keeping the shortest distance of vertex v from the source in an array, sDist. The shortest distance of the source to itself is zero. sDist for all other vertices is set to infinity to indicate that those vertices are not yet processed. After the algorithm finishes the processing of the vertices Dist will have the shortest distance of vertex w to s. These two sets are maintained Frontier and New Frontier which helps in the processing of the algorithm.

V. MULTILEVEL VEHICLE PARKING

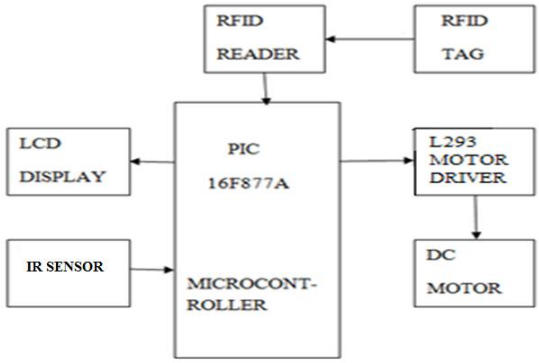

Figure 5: Block Diagram of Vehicle Parking

The diagram consists of RFID tag, RFID reader which is placed in front of the vehicle parking system.PIC microcontroller controls the vehicle parking system using Dijkstra's shortest path algorithm. It is simple to operate with the driver parking and leaving the vehicle in the system at the ground level. Once the driver leaves the incorporated safety zone the vehicle is automatically parked by the system rotating to lift the parked car away from the bottom central position. This leaves an empty parking space available at the ground level for the next car to be parked on. The parked car is easily retrieved by Down to ground level ready for the driver to enter the safety zone and reverse the car out of the

system. Except vertical car parking system all other systems use a large ground area, vertical car parking system is developed to utilize maximum vertical area in the available minimum ground area. It is quite successful when installed in busy areas which are well established and are suffering with shortage of area for parking.

CONCLUSION

The multi-level car parking system had successfully designed and developed. The number of entering and existing car from all the floors was controlled as per the signals from the sensors on each floor at the entry and exit point. The car exist from various floors will depend on time based Dijkstra's shortest path algorithm. The process of accessing the RFID will take time in microseconds. Hence it's less time consuming technique. It can be fully automated by integrating with tag and reader, such that whenever a particular tag is showed from reader, the PIC microcontroller called on the respective platform should appear at the ground level.

Future Scope

This system can further be made space efficient by designing slots of different size. Whenever the human movement is present in the system, the rotation of that system should be immediately stopped for avoiding accidents. The platforms can also be equipped with safety sensors guiding the movement of vehicles in the platforms.

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