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A SMART PARKING SYSTEM USING RPI

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ABSTRACT

The main motive behind this technology is to reduce and secure the parking issues in metro cities. They technology is designed to solve the daily problems of parking in many places like malls, multiplex, award functions, auditorium etc. The aim and purpose is to scale down an efficient working model of a vehicle parking system for accommodating vehicles within a limited area. The goal is to provide better security and reliability with an advanced vehicle parking system. Architects and designers are finding various possible solutions to reduce this people problem.

Keywords: Automated Parking, Camera, Mechanism Prototype, Pi cam, Raspberry Pi.

I. INTRODUCTION

In recent times, many people have been facing an issue with parking and it is especially painful when in an elite function, mall etcetera and in big metropolitan cities like Delhi, Maharashtra, Ahmedabad the problem is on a day to day basis. To avoid such issues, we use the dexterity of modern technology which can give us fast, efficient and environmentally sound solutions.

II. HISTORY AND BACKGROUND

There have been numerous occasions of crime such as a robber entering a crowded area, vehicle being stolen even from plush areas even if the area was surveilled by a watchman. The first automated parking system was developed by Max Miller in 1925 in New York city which was never practically used. It was Eric Jaulmes who invented a vehicle management system in 1964 which had a valet drive into directly into an elevator. The automated and intelligent systems will always be helpful to secure and manage the parking area even by a single watchman or the owner themselves to manage the and secure the parking more reliably.

III. SYSTEM DESIGN AND REQUIREMENTS

The paper's main objective is to use the parking space effectively and offering better security making the parking system more reliable and easy to use. The WIFI technology of raspberry pi 3 model B along with a Camera and a cam scanner will be used to control and manage the system. A database will be used to record every person's vehicle by their face and an RF-ID will be used to recognize the parking space for vehicle and the details would be shown to the administrator for complete transparency. The admin would also be able to access the whole parking system manually in case of any emergency.

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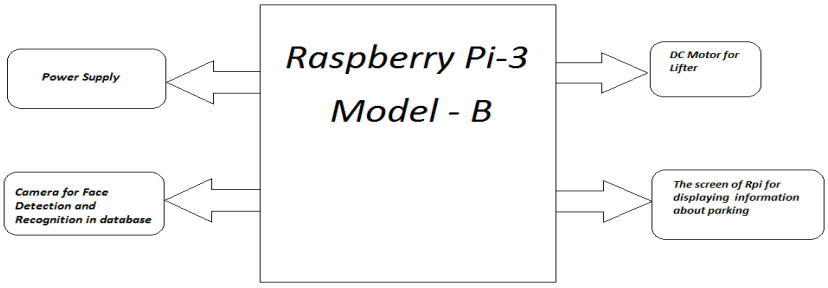

Fig. Block Diagram of Parking Unit

3.1. Specification of Requirements

The Raspberry pi 3 model B is a debit card sized microcomputer having a 64/32-bit ARM Cortex A-53 and quad core with a clock frequency of 1.2 GHz. It has an on board 802.11n WIFI with Bluetooth 4.0 and has 40 GPIO pins. It also has CSI camera port for connecting a Raspberry Pi Camera and a DSI display port for connecting a raspberry pi touchscreen display. The RF-ID will be connected to a Raspberry Pi to detect if there is already a vehicle in the parking place. The GPIO ports of the Raspberry Pi will be connected to the RF-ID which will detect whether the space is available to park or not.

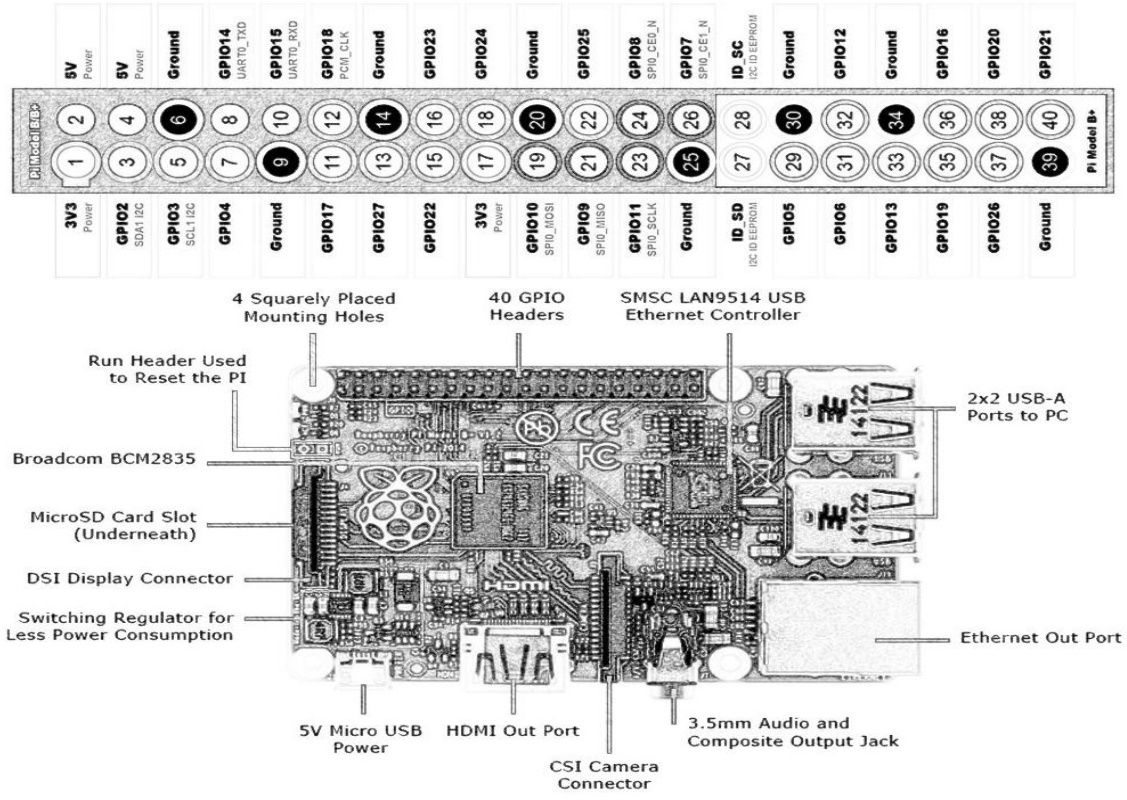

Fig. GPIO Ports along with Hardware Description in Raspberry Pi

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3.2. THE PARKING SYSTEM WITH IMAGE PROCESSING

The image processing will be done with the help of camera as soon as the person driving the vehicle steps out of the vehicle and steps in the specified area for face recognition the face recognition will be done and the face scanned if found in database then it will return the vehicle associated with that scanned face to the ground or else an entry will be made for that person's face in our database while based on the weight of the vehicle the parking ticket will be generated in parallel while the scanning of face is being done. After the driver pays the ticket and steps away from the vehicle the extended metal ramp will slide inside and lift the vehicle to the floor wherever the parking is available based on an efficient algorithm and then the ramp will put the vehicle in that empty slot and change its value in the database to 'parked' from 'empty' along with the id of the image processed as its key. Whenever the person again returns and again steps in the face recognition area the face will be searched in the database and if match is found in the database then the vehicle will be shifted to the slider and it will be brought to the ground and slider will go again to its original position. There would be multiple Raspberry Pi for multiple entries from different places and all of them will be connected to same database for convenient parking management.

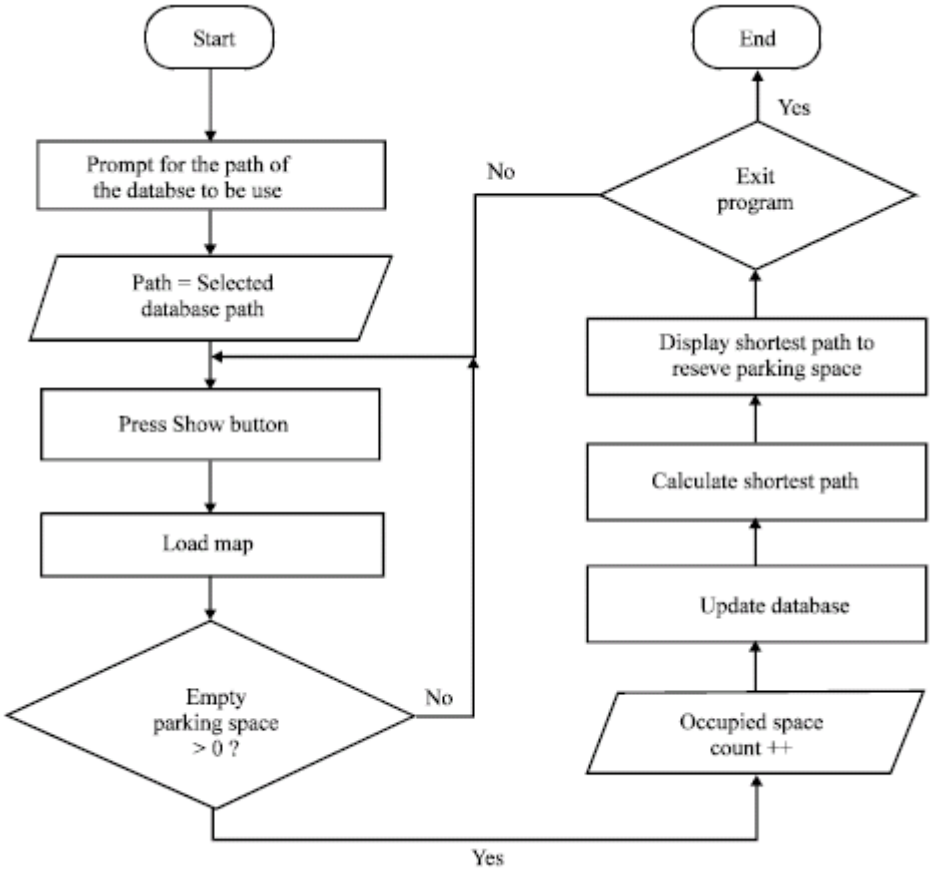

Fig. Flowchart for Parking space selection

3.3 . PRESENT SOLUTIONS AND SYSTEMS

a) Multilevel Parking

There are many malls and auditoriums which use this solution which is basically providing large space of parking in underground levels so that there is ample space even for a national holiday crowd so that there is no

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issue in parking. The disadvantage of this solution is that the cars are parked anywhere in the floor which wastes a lot of space and many times people just forget where they parked their vehicle and there is also a chance of robbery from your car or your car being damaged and sometimes even if the first floor has empty space people park in the second floor which wastes a huge amount of resources. The floors are of significant height which again adds to waste of space. Now a day the officials have employed staff people for guiding the people to park their vehicles in the right slot to save space but since the floors are very large it needs large staff to manage a single floor which is again not an efficient use of staff. There are chances of crimes being committed on normal days since there are not much people on a floor and there is rarely any network signal on your phone when in underground parking.

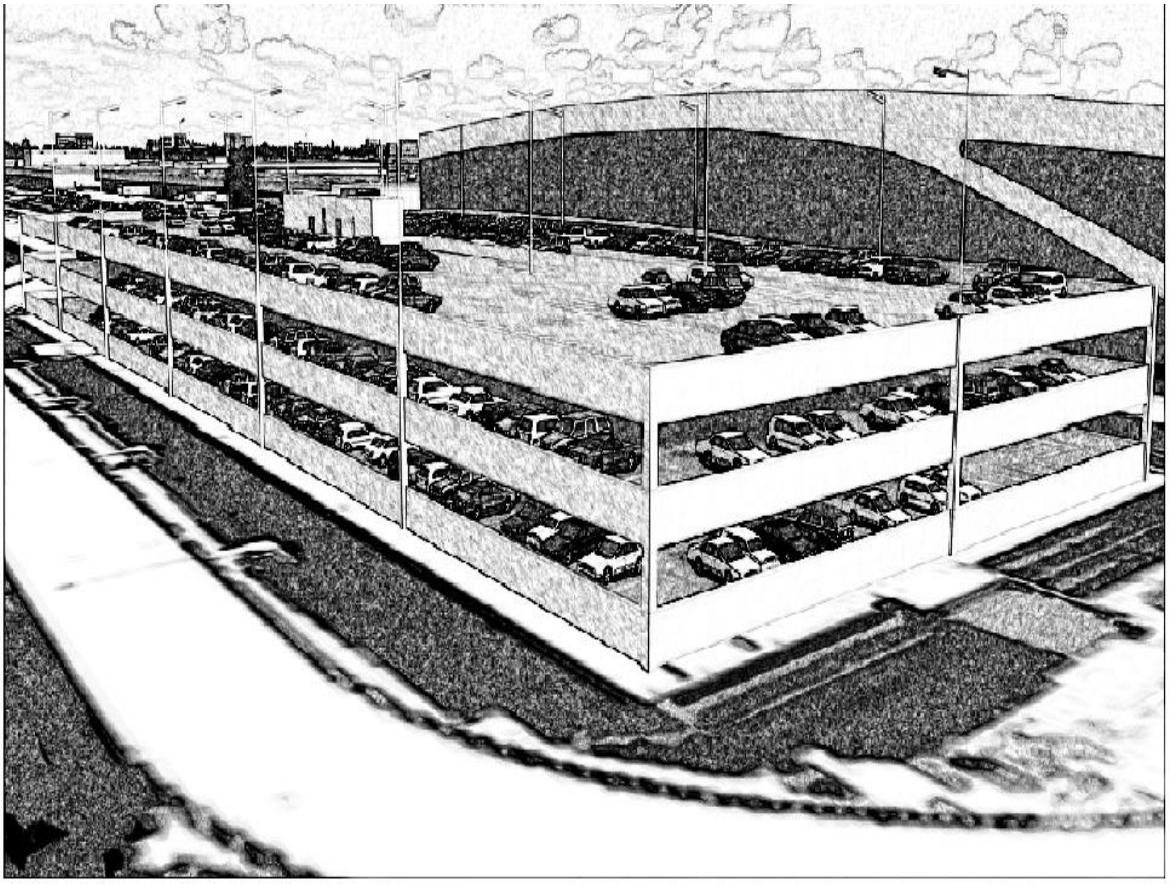

Fig. Multilevel Parking

b) Ground Parking

Instead of parking on floors this method utilizes the simple concept of parking in an open area instead of underground parking or high floor parking. Some malls or multiplexes use an empty area or ground nearby for providing parking space to people. The vehicle is parked in open by the normal people and so it wastes a lot of space which can be utilized for parking. Again, the parking is done in an open ground so there is a high chance of your vehicle getting a dent or being damaged and in some cases the cars are also stolen which is a big problem. The security and reliability of this system is very less though there are some guards and watchman's

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who take care of your car and people to direct you while you park your car to utilize the space of ground efficiently. This system is not very effective.

Fig. Ground Parking

3.4. COMPARISON OF SYSTEMS

The sole reason of comparison is to give you an idea about relative efficiency and effectiveness of systems. The first advantage in our system is that a lot of space is saved on every floor as we are sure that no drivers will be there on any floor in our system the height of each floor will be slightly higher than height of the average car (although it will be able to accommodate a mid sized sports utility vehicle) which would be significantly less than the currently used systems which will ultimately save a lot of space as we advance on every floor. The second advantage is that as we are using an automated system with an efficient algorithm to utilize parking space there are no chances of human error. Since the system is automated the user has an advantage that they themselves do not need to go to parking space in any floor which saves a lot of their time. As the face recognition system stores the driver's face in database they also need not remember where their car was parked because our Raspberry Pi's database runs the searching function and does it for them. As the parking ticket is also automatically generated based on the weight of the vehicle they is practically no human involvement required making the system automated in true sense. The Raspberry Pi can also calculate the total revenue generated from the parking tickets which is a bonus to the owner.

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IV. FIGURES AND TABLES

Variety of OS's supported by Raspberry Pi

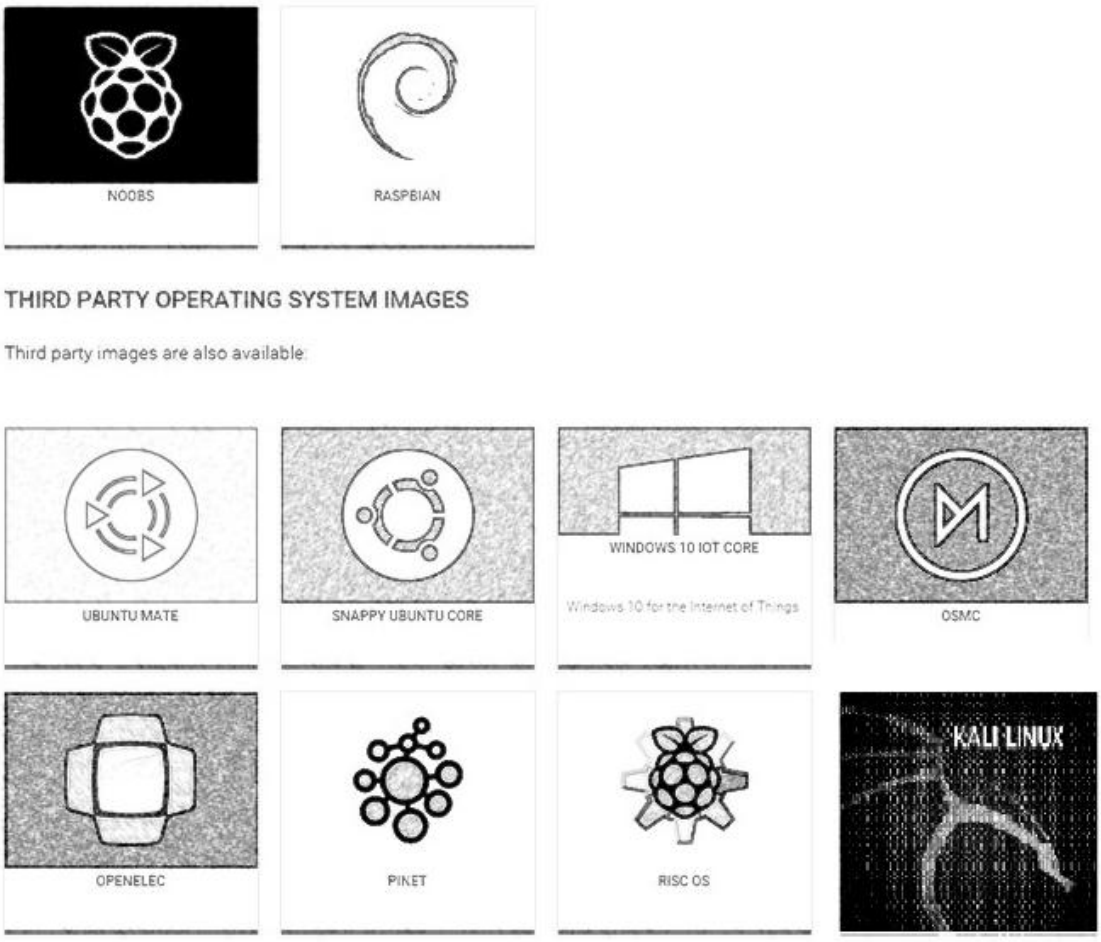

Fig. Various Operating Systems supported by Raspberry Pi

V. CONCLUSION

As is clearly visible by the paper the conclusion is as, the issue of parking in malls, auditoriums, big buildings etc is solved by this technique. This solution is quite advantageous than most of the current solutions and provides security and facility along with reliability while providing a better approach.

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