"FABRICATION OF BOTTON OPERATED VERTICAL CAR PARKING – A PROTOTYPE"

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ABSTRACT:

This project deals with manufacture of a Prototype of Button Operated Vertical Car Parking System. This system has been implemented to reduce the excess use of land space which is already very scarce in many 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 rack and pinion mechanism is used for driving the parking platform and wire rope mechanism for lifting mechanism. This total prototype is powered by a D.C motor. When the car comes on the ramp the switch will be activated and the tray for lifting comes down to carry the vehicle. When the switch will be operated by the operator, lifting mechanism and parking mechanism starts to operate and vehicle is parked in available space.

KEYWORDS:

button operated vertical car parking, space scarce, prototype, parking systems, mechanism for parking.

INTRODUCTION:

Given a constrained space, many car drivers today face a problem in parking their cars. Parking a car in a small space requires a series of forward and reverse motions and turns which prove to be a complicated task for most car drivers to handle. We have tried to address this problem in our current project by making an automated parking car which parks itself at the touch of a button. Our project will be a miniature model of a real life car which will sense the availability of parking space and park itself automatically in the available parking area. The surrounding terrain details are continuously sensed by using a rotating distance measurement sensor which will sense the distances of the car from adjacent walls with the help of sensors and the angle of car with respect to the surroundings. Using this continuous feedback we plan to accomplish both parallel as well as perpendicular.

LITRATURE REVIEW:

The concept for the automated parking system was and is driven by two factors: a need for parking spaces and a scarcity of available land.

The earliest use of an APS was in Paris, France in 1905 at the Garage Rue de Ponthieu.[2] The APS consisted of a groundbreaking[2] multi-story concrete structure with an internal elevator to transport cars to upper levels where attendants parked the cars.[3]

In the 1920s, a Ferris wheel-like APS (for cars rather than people) called apaternoster system became popular as it could park eight cars in the ground space normally used for parking two cars.[3] Mechanically simple with a small footprint, the paternoster was easy to use in many places, including inside buildings. At the same time, Kent Automatic Garages was installing APS with capacities exceeding more than a 1,000 cars.

The first driverless parking garage opened in 1951 in Washington, D.C., but was replaced with office space due to increasing land values.[4]

APS saw a spurt of interest in the U.S. in the late 1940s and 1950s with the Bowser, Pigeon Hole and Roto Park systems.[2] In 1957, 74 Bowser, Pigeon Hole systems were installed,[2] and some of these systems remain in operation. However, interest in APS in the U.S. waned due to frequent mechanical problems and long waiting times for patrons to retrieve their cars.[5]Interest in APS in the U.S. was renewed in the 1990s, and there are 25 major current and planned APS projects (representing nearly 6,000 parking spaces) in 2012.[6] The first American robotic parking garage opened in 2002 in Hoboken, New Jersey.[7]

While interest in the APS in the U.S. languished until the 1990s,[2] Europe, Asia and Central America had been installing more technically advanced APS since the 1970s.[3] In the early 1990s, nearly 40,000 parking spaces were being built annually using the paternoster APS in Japan.[3] In 2012, there are an estimated 1.6 million APS parking spaces in Japan.[2]

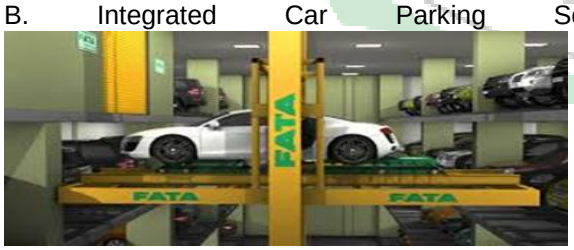
The ever-increasing scarcity of available urban land (urbanization) and increase of the number of cars in use (motorization) have combined with sustainability and other quality-of-life issues[2][8] to renew interest in APS as alternatives to multi story parking garages, on-street parking and parking lots.[2]. Currently the biggest APS in Europa is in Århus (Dänemark) and provides 1000 parking spaces.

PRESENT PARKING SOLUTIONS:

A. Automated Car Parking

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.

B. Integrated Car Parking Solution



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. Misleading of this solution is it should be undergrounded. By this investment increases and lot much space utilization is to be made.

C. Multi-Level 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 exterior ramps. 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 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.

D. Puzzle Type Parking System

This system features combination carrying cars. Individually load and unload of the cars is possible thus system is independent system. This system is electromechanically operated. Fast in and out of the cars is possible. Combination of vertical and horizontal with multiple levels is possible. Suitable for indoor and outdoor installations

WORKING:

Button operated vertical car parking systems use a similar type of technology to that used for another mechanical devices such as mechanical presses and steering mechanism and wire rope mechanism for lifting. The driver leaves the car inside an entrance area and technology parks the vehicle at a designated area.Mechanical car lifters raise the vehicle to another level for proper storing by the use of gear train, rack and pinion mechanism and wire rope mechanism which is operated by the 12 V electric supply D.C. motor by the DPDT switch. The rack and pinion mechanism is used to carry the vehicle. The vehicle can be transported vertically (up or down) and horizontally (left and right) to a vacant parking space until the car is needed again. When the vehicle is needed, the process is reversed and the car lifts

transport the vehicle back to the same area where the driver left it. In some cases, a turntable may be used to position the car so that the driver can conveniently drive away without the need to back up.

BUTTON OPERATED VERTICAL CAR PARKING – A PROTOTYPE:

Unique Characteristics

- The space for parking 9 cars can hold more than 50 cars.
- It adopts rotating and lifting for mechanism so as to minimize the vibration and noise.
- Flexible operation.
- No caretaker is needed, key pressing operation only.
- High safety, can be easily inspected.
- Stable and reliable

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. Rack and pinion operates to carry the car on tray which is attached to rack and pinion mechanism. After carrying the car the rack and pinion mechanism is lifted by wire rope mechanism, the space to park a car is found and and car is parked safely by rack and pinion mechanism. The parked car is easily retrieved by pushing the button for the car which is parked in a specified position number. This causes the required car to come 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. Although the construction of this system seems to be easy, it will be par from understanding the knowledge of materials, wire ropes, rack and pinion, motors, bearings, and machining operations, kinematic and dynamic mechanisms

Imagine the time that automatic smart parking systems would save your time. Every time you enter your office building you have to find a parking space and spend time walking in and out of the lot as well. Imagine how much time it is costing you. Even if you just spend 5 minutes a day to park that translates to you spending more than a whole day just parking every year. If you calculate the time you spend walking in and out of the parking lot, searching for space and such it will be easily more than the above amount. A fully automated system mimics a futuristic assembly line structure where the cars are moved to an empty platform. The rack and pinion carries a car to an empty space automatically so that no cars are stuck.

You know the number where you parked the car by looking at screen. You simply drop off the car at the entrance and pick up on your way out. Aside from the comfort that the automation brings you can also save space through incorporating the park lift system as well. Through this we are able to utilize the vertical space in a parking lot that is usually wasted. You are also able to customize each stack parker so that you can fit different sized cars in each of the different slots. It would be meaningless to have all stack parkers adjusted to the height of a SUV when you can have different sets. Where you can park any type of vehicle like SUV or sedan.

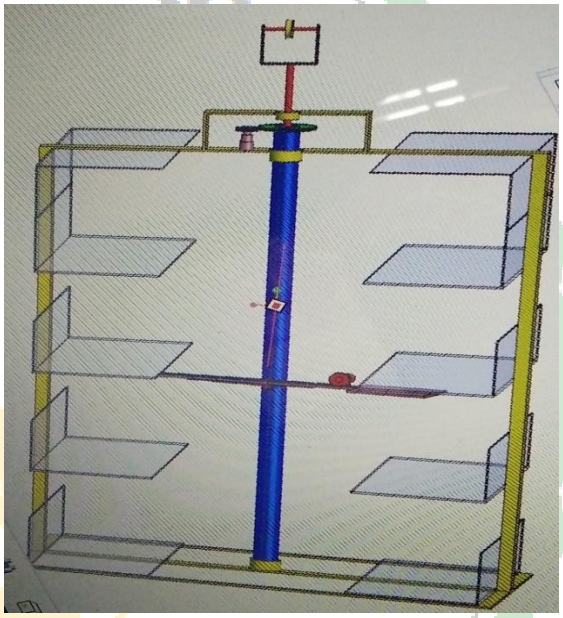


Fig : CAD model for prototype

STEPS TO COMPLETE THE PROJECT:

PHASE 1

a. Market survey

During this period detail market survey has been done to learn available parking systems and their utility also their literatures of different types of parking systems and its difference between have been observed.

b. Problems in existing systems

The problems regarding the existing system have been found such as, Complicated programming, High budgets, Unfeasible design, high end robots, etc.

c. Conceptual Design.

Taking problem statement from above and studying the fundamental engineering concepts various

concepts regarding modern parking system are prepared and amongst those best concepts design has been selected for further phases.

PHASE 2

a. Modelling in CAD

Putting the ideas on the modelling software for visualisation of the prototype and making it more and more compatible so that there will be less complexity in designing

b. Material Selection and Procurement

In this phase material selection is done and also its procurement as per need the dimensions are taken from CAD model. c. Fabrication

This phase includes fabrication of prototype in the workshop from the procured material and preparing the Prototype model from the software model. d. Assembly & Testing

This phase include Assembly, finishing like grinding, painting, wiring, installing motors.

Testing phase includes testing of the Prototype model under real environment.

OBSERVATIONS:

After completion of manufacturing all the parts were gathered to assemble the whole prototype. Accordingly it has assembled but after assembling it was observed that there were pulley, wire stucks on it during lowering lifting mechanism.

So it was checked thoroughly and the output came was a bit loosening of one of the rope. The corrective actions were taken and the prototype ran without problem.

After eliminating above it was found that the D.C. motor used for rack and pinion is not working

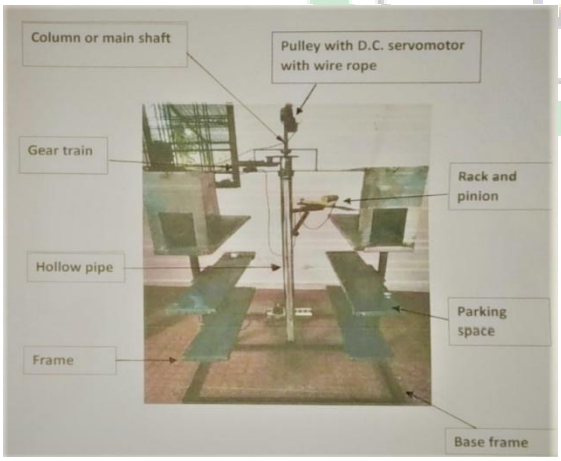


Fig : Prototype of button operated vertical car parking system

properly so we changed this motor with another D.C. motor and fixed it properly.

Even though corrective actions were taken there were little bit vibrations in lifting and founded that it was vibrating only when the lifting operations In this way the prototype ran successfully.

CONCLUSIONS:

- Vertical Car Parking model has been designed; all the parts in it were manufactured and assembled and tested successfully.
- When it is manufactured inreal for vehicles it can park all types of SUV's and sedans.
- As the life cycle model involves proper design and advanced methods are to be used to meet the requirements of the customers.

FUTURE SCOPE:

1. The platforms can also be equipped with safety sensors guiding the movement of vehicles in the platforms.

2. Also various sensors can be used for detecting empty space and used space.

3. It can be fully automated by integrating it with a panel board, such that whenever a particular number is called on the panel board, the respective platform should appear at the ground level.

4. This system can also be made more secured by providing each platform a specific password, so that only whenever a particular password is typed the platform is retrieved.

5. There is also a RFID system which is used in foreign countries in parking buldings.

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