# Mechatronic System Design of Smart Multi-level Car Parking

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***Nowadays our parking need to be more secured with more space for more cars, so our project is a great opportunity to better use our space of land to make spaces for more cars to park, our prototype can be turned into real project either underground or on the ground, both ways have some advantages and disadvantages, but the underground design is better because we can build a building like a mall on the top of the parking and the cars will be parked underground.***

***Our prototype is smart; it doesn't need any humans or workers involved, only for maintenance of the system component. The Parking is divided into 5 floors and each floor has 8 cells. The customer drives the car to the entrance of the parking, and the systems with the actuators takes the car to a specific cell in the parking and provide the user with an ID and a password for his car so he can take back the car with the ID and a password***

***A mobile application is used to give the customer the ability to reserve a cell in the parking in advance, the customer also can see the available cells on the application receives a password for his car which will be used to verify the identity***

## I. INTRODUCTION (HEADING 1)

As the number of automobiles around the world increases exponentially, finding places to park them becomes increasingly difficult. Because the most parking spaces are necessary in urban areas, this poses a challenge to make parking as efficient as possible. Not only location of the parking is important, but also its capacity, the time it costs tenants to use them, and environmental aspects as well. In order to meet the rising demand for parking areas it is necessary to look for innovative and more efficient ways of using space in urban areas.

This report covers two types of parking systems in use today and evaluates them on crucial aspects. The parking systems in question are the conventional parking that we are used to, and the relatively new automated parking. The focus here will be mainly on underground parking facilities, where risks, energy consumption, and costs differ greatly with surface parking facilities. The construction and management of parking is heavily dependent upon:

1. Economic and financial feasibility.
2. Characteristics of the site and the surrounding neighborhood.
3. Parking demand, supply, requirements and attitudes.
4. Market issues.

The development of underground car parking areas is important to achieving a prosperous urban environment, and effective use of underground space is particularly necessary in congested cities. However, maintaining a proper environment in underground parking areas requires more equipment and consumes more energy than typical above ground parking areas. In many districts where urban activity is high, the capacity of the dedicated parking areas is already far below the minimum necessary capacity and parking demands continue to increase.

## II. AIM OF THE PROJECT

Nowadays our parking need to be more secured with more space for more cars, so our project is a great opportunity to better use our space of land to make spaces for more cars to park, our prototype can be turned into real project either underground or on the ground, both ways have some advantages and disadvantages, but the underground design is better because we can build a building like a mall on the top of the parking and the cars will be parked underground. Our prototype is smart; it doesn't need any humans or workers involved, only for maintenance of the system component. The Parking is divided into 5 floors and each floor has 8 cells. The customer drives the car to the entrance of the parking, and the systems with the actuators takes the car to a specific cell in the parking and provide the user with an ID and a password for his car so he can take back the car with the ID and a password A mobile application is used to give the customer the ability to reserve a cell in the parking in advance, the customer also can see the available cells on the application receives a password for his car which will be used to verify the identity

## III. CRITERIA OF PROJECT

- First : connecting power to the project to turn on circuits
- Checking if there is an empty room by looking at application
- Using room card and touch RFID
- Then the door opens
- The mechanism move forward to get the car back to the middle then get down to the room
- After parking mechanism get back to set point then get up to the reset point

## IV. MECHANICAL DESIGN

Mechanical design is done using Solid-Works software, the mechanical design dimensions is 1m length*1m width*1.2m height, mechanical design can be provided later when accepted with all the data including coding, Material used to implement the design on ground is Wood MDF with 5mm thickness

## V. Electrical circuit

Electrical circuit is very simple, the component used is very simple, including different types of motors to give us the required motion of the mechanism with a micro controller (Arduino) and some sensors to sense the motion and the output of the motors and send a signal to the actuators.

Our system is smart and it's working with RFID ID and tag, we used RFID system as an authentication system for more security

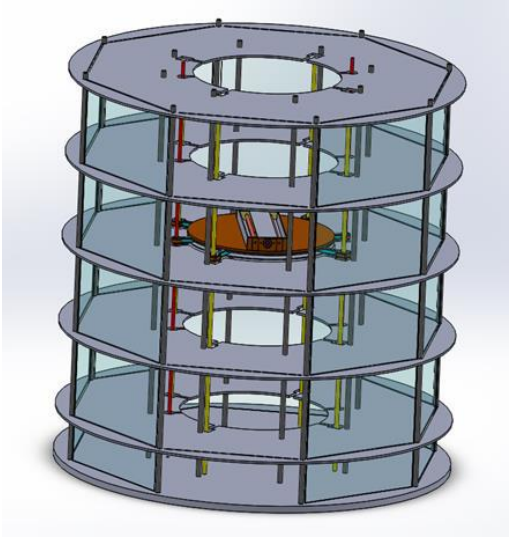

Fig.1 Solid works design of the parking

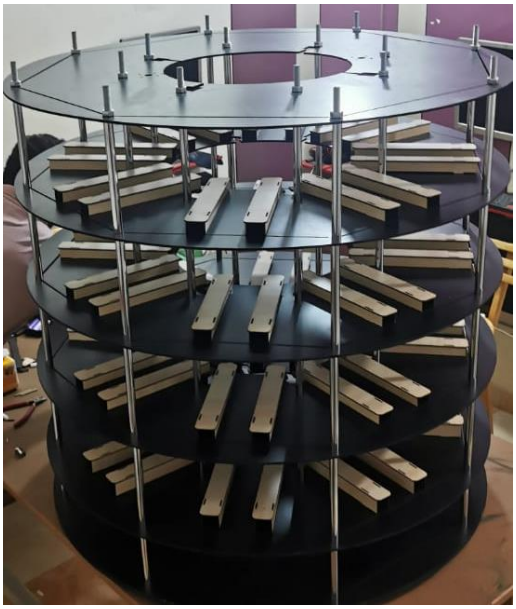

Fig.2 implementation on ground


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