

New Trends in Automatic Parking System

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Abstract— It has been decades since the first invention of cars or automobile. Then came the boom in the sector of automobile and people started buying more and more cars. This gave birth to the inevitable problem of car parking. This started a chain reaction and then the parking lots came into existence. Thus the conventional parking system began and then few parking methods were made viz. perpendicular parking, parallel parking and angle parking. When all these methods were not able to solve the more dominating problem of ever increasing number of cars. Then came the solution in the way of new technological advancements like parking assists in the cars, self-parking capability in vehicles, and more advancement in the parking systems such as inclusion of RFID in parking for improvement in security. This paper lists down various new methods included in the parking system which has made it an epitome in the field of technological advancement. This paper also tries to list the future advancement in the field of automatic car parking.

Keywords: Automatic Parking; Parking Assist Systems; Smart Parking.

1. INTRODUCTION

Stopping is the demonstration of halting and unfastening a vehicle and abandoning it vacant at a specific place regularly known as parking area. Stopping on one or both sides of a street is regularly allowed, however here and there with limitations. A few structures have the confinement that just structures' clients will be permitted to stop in the specific stopping. Diverse governments and at times private contractual workers assigned through various powers have rules for configuration and utilization of parking spots. As the social and monetary foundation of individuals is developing which is straightforwardly influencing their way of life in which transportation has a noteworthy part to play. To have a superior vehicle and more number of vehicles is an imperative mark of individual's financial level. Lately enormous urban areas are putting loads of cash in activity administration building savvy stopping frameworks and shrewd parking garages. There are three sorts of stopping frameworks the first being parallel parking which is thought to be extremely intense for amateurs, in this the vehicle is stopped parallel to the street and along the sideway, the second one is angle parking in this the vehicle is stopped along the control or before a divider in the parking area however it is not straight neither one of the it is opposite it is at an edge under ninety

degrees and the last one is perpendicular parking in which the auto is stopped against a divider or hindrance at an edge of 90 degrees.

Then came the era of automatic parking system, this paper covers various new technologies and smarter ways adopted in cars and in parking areas for smarter parking. Some of those ways which are discussed in this paper are:

- 1) Parking assist systems in vehicles.
- 2) Smart parking areas which are fully automatic.
- 3) RFID based parking systems for security.
- 4) Various technologies used to give self-parking capabilities to vehicles.

These are the various topics discussed in this paper. In the end we would also shed some light on the future of the parking systems which will be even smarter and more capable of handling more cars much more efficiently.

2. EVOLUTIONS IN TECHNOLOGIES

2.1 Parking assist systems

Intelligent Parking Assist System (IPAS), also known as the Advanced Parking Guidance System (APGS) for Lexus models in the United States, is the first production automatic parking system developed by Toyota Motor Corporation in 1999 initially for the Japanese market hybrid Prius models and Lexus models [1]. Parking assist systems are used to help the driver to park the vehicle safely within the given space and thus the parking a vehicle is not a two man job anymore for the novice drivers. The parking assist system includes a camera, few proximity sensors and a display.

Parallel parking is a very tough task for some drivers, yet with parking spot restricted in huge urban communities, pressing your car into a modest space is task that requires high skill. It's from time to time a simple errand, and it can prompt activity tie-ups, fatigued nerves and bowed bumpers. Luckily, innovation has an answer - cars that stop themselves. Envision finding the ideal parking space, however as opposed to attempting to move your car forward and backward, you essentially press a catch, sit back, and unwind. The same innovation utilized as a part of self-stopping cars can be

utilized for crash evasion frameworks and eventually, self-driving cars.

2.2 Automatic parking systems

Automated car parking systems use a similar technology to that used for mechanical robot hand that keeps things from one place to another for performing a particular task. The driver leaves the car just inside the entrance and the complete mechanism parks the vehicle at the best place available in the parking lot. Hydraulic or mechanical car lifters lift the car to another level for proper storing. The vehicle may be transported vertically (up or down) and horizontally (left and right) to a vacant parking space if the car is needed again or if a new car is to be parked. When the vehicle is needed, the process is reversed i.e. the car is picked from the area where it has been parked in some cases, a turntable may be used to position the car which gives the driver convenience for driving away the car without backing up.

The idea of the automated parking system is driven by two factors:

1. A need for parking spaces
2. Scarcity of available land.

The earliest use of an Automated Parking System was in Paris, France in 1905 at the Garage Rue de Ponthieu. The Automated Parking System consisted of a multi-story concrete structure with an elevator to take cars to upper levels where people parked the cars. In the 1920s, a rotating wheel-like Automated Parking System called a paternoster system became popular as it could park eight cars in the ground space normally used for parking two cars. 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 Automated Parking System with capacities exceeding more than a 1,000 cars.

2.3 RFID Based Smart Parking System

RFID is a very advanced automated detection technology which can transfer data in a full-duplex mode without making any contact. Du Shaobo and Sun Shibao (2012) has made a model of parking system. This is done by making a radio contact between the tag and the reader the distance and the line of sight is not important for the detection of the tag by the reader because they are coupled using an electromagnetic induction. The tag is made of antenna and a chip which is embedded in the chip this unique code is what gives the tag one-to-one correspondence to the detection.

When the RFID system is switched on the reader sends out an electromagnetic wave at a certain frequency which when strikes the tag in range produces an inductive current which starts flowing in the tag and it thus sends out the unique code embedded in the chip of the tag.

Then the reader reads the data and then sends to data exchange and management system i.e. a personal computer for

processing. The chip in the tag does not need battery power to operate it is done by the induced current. This whole process thus is very energy efficient and thus takes a step towards the greener earth by making less use of energy.

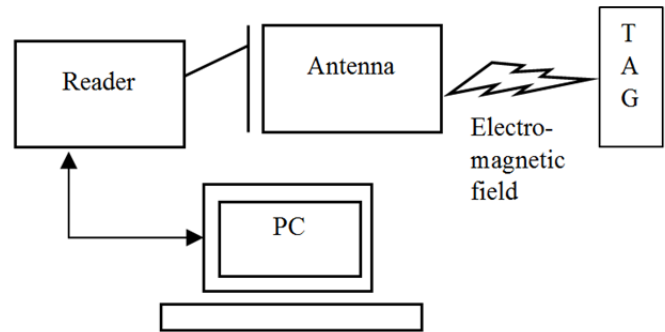


Fig. 1: Block Diagram of the system [2]

2.4 Technologies used for self-parking capable vehicles

2.4.1 FPGA Based car parking system:

In this setup the car like model used, the programming of this model is done on a Field Programmable Gate Array (FPGA) using VHDL code. The flow diagram in Fig. 2 shows the flow of the logic used in the setup. In this the car automatically searches for the parking space, when the parking space has been detected by the car, it stops there and then the back parking algorithm is executed in this the car reverses and parks itself with the help of the proximity sensors installed on the side of the car. All of the above steps are done without any human intervention. The complete setup is based on a fuzzy logic controller which continuously monitors the distances from close by object and sends the instructions to the motors driving the wheels to slow down or to accelerate as per the condition given by the sensors.

Fuzzy logic controller takes in the crisp values and converts them into fuzzy values which are processed by the FPGA.

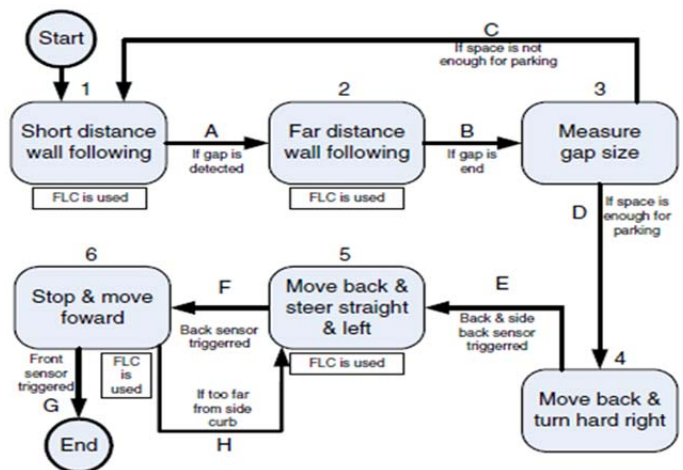


Fig. 2: Simplified Flow diagram of the System [3]

2.4.2 CPLD based Self-Parking Systems

CPLD stands for Complex Programmable logic device. It works same as the FPGA but it is more complex and less logically capable than FPGA. In the case of CPLD the car finds the parking space using the IR sensors and when it finds the space available for parking. It parks itself into the newly found spot. This technology also advances the parking lot system and helps in organising the parking space more efficiently.

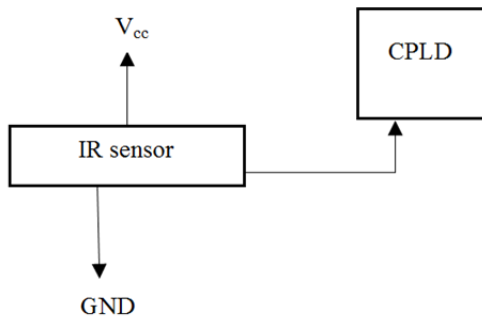


Fig. 3: Explains the link between the CPLD and the IR sensor through which the car finds the free slot in the parking lot.

3. CONCLUSION AND FUTURE SCOPE

This paper points out the advances in the parking system and its evolution through time. Firstly came the parking Assist Systems, then came the advances in the parking area and the management of the cars. Finally came the stage where and which is still in progress, in which the cars have the capability to park itself in the parking space without any human intervention.

The future is even more brighter if today the vehicles can drive themselves and park, that future is not far enough where the computer driven or self-driven vehicles will exist and while going from one place to another we can take a nap and watch our favourite movie throughout the journey and let the car drive itself.

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