A REVIEW: AUTOMATIC CAR PARKING DESIGN AND VALIDATION

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ABSTRACT

An RC Car that can identify a parking space and parallel park itself is created. This process of Automatic Car Parking is initiated through an application in Cell phone or a wireless transreceiver, making it a part of IoT. On receiving the command RC car drives down the street searching for parking space on its right using ultrasonic distance sensor. When the car has identified parking space, it checks to see whether space is large enough to park in. When it confirms that there is sufficient space, the car will begin parallel parking in same. It uses information from sensors placed on car to direct the car into parking space. Once car is parked it will remain in that position until given signal to move out from parking. S-Curve algorithm shall be used for parking logic.

Keywords: RC Car, S-Curve algorithm, Ultrasonic Sensors, Parking Space, wireless communication, IoT, Autonomous cars.

1. INTRODUCTION

The Automatic parking is an autonomous car-manuevering system that moves a vehicle from a traffic lane into a parking spot to perform parallel perpendicular or angle parking. The automatic parking system aims to enhance the comfort and safety of driving in constrained environments where much attention and experience is required to steer the car. The parking maneuver is achieved by means of coordinated control of the steering angle and speed which takes into account the actual situation in the environment to ensure collision-free motion within the available space.

In the age of Internet of Things (IoT) it is very essential to connect car with surroundings. Wireless control for car parking is part of connected car. Automatic car parking assures connectivity as well as safety to user.

In Additional recent studies (by Boston College, MIT, Transportation Alternatives and others) have also reported that 30% to 50% of traffic congestion in city centers is generated by drivers searching for a parking space and Automatic car parking will reduce this.

The space for parking required using this method will be approximately 1.5 times length of car

2. RELATED WORK

Automatic car parking is available in many vehicles till now, but all are not completely autonomous. Most of them are semi autonomous parking system which assist driver for car parking. Brake and accelerator is to be controlled by driver.

Following are some related work about car parking.

2.1 Parking Systems implemented in industries

In 2003, Toyota began to sell their Japanese Prius hybrid vehicle with an automatic parallel parking capability offered as an option named Intelligent Parking Assist.

In 2006, Lexus added a self-parking system to the redesigned Lexus LS sedan. It parallel parks as well as angle parks.

In 2010, BMW introduced a system called "parking assistant" on the redesigned 5-series. It does parallel parking. Up to 2012, automatic parking systems were being developed by several automobile manufacturers. Ford and Lincoln offered active park assist on Ford Focus, Fusion, Escape, Explorer and Flex and Lincoln MKS and MKT. Toyota and Lexus had advanced parking assistant on Toyota Prius V Five and Lexus LS460 and LS460 L. BMW all-new sixth-generation 3 Series used a system called parking assistant. Audi A6, Mercedes-Benz also offered parktronic on their C-Class, CLS-Class Coupe, M-Class SUV, E-Class, S-Class, GL350, GL450 SUV (standard on GL550) and R-Class in different prices. Jeep introduced automatic parallel and perpendicular parking on its 2014 Cherokee model. Chrysler introduced an all new 2015 200 sedan, offering automatic parking as part of a Safetytec package. The system steers the car into parallel and perpendicular parking spaces.

But all above system are making parking assist feature which take care of steering but brake and accelerator has to be handled by driver. Which make them semi-autonomous parking or parking assist systems. This paper proposes method of fully automatic car parking in which driver can get out of the car and control parking through Smartphone or wireless communication.
2.2 Parking Algorithm
Some of the typically proposed types of path curves are circular arcs with straight lines [4], clothoid curves [5], arc tangent curves, and cubic polynomial curves. The triangular function was also used by some researchers [6]. Research results have proved that the path with straight line segments combined with circular arcs of maximum curvature or minimum radius has the shortest distance between two configurations [7] and it has been commonly applied. Likewise, in Szádeczky-Kardoss and Kiss’s research three different path primitives including straight lines, circular arcs and continuous curvature turns (CC turns) were used for path planning [8],[9].

In these geometrical methods, according to the Ackerman model [1],[2] with front wheels steering, the instantaneous center of rotation is located on the same line than the rear track. This means, that the orientation of the vehicle is tangent in E to the circle arc of the geometric path.

Taking into account demands of driver and considerations of auto manufacturer’s [3], proposed system implements connection of car with android application through Bluetooth.

Parking space detection can be done using both ultrasonic sensors as well as camera [4], but it is recommended to use sensors as it provide more accurate data and cost efficiency.

3. PROPOSED METHODOLOGY

Proposed system can be implemented using ARM controller which is used to process on data coming from ultrasonic sensors and motors used to drive car.

- Ultrasonic sensor:
  
  It is used to detect parking space. When car moves down the street, it continuously scans for available parking space and send signal to controller. Car will stop if it finds sufficient space for parking car. Also these sensors shall be used to detect parking path and obstacles coming in parking path.

- Motor:

  RC car which is miniature model of real car, is made up of two motors. One is used for steering and another for moving car. These motors are controlled using controller for achieving parking position.

- ZigBee:

  Wireless transreceiver are used to send command for parking through PC

- Android App:

  This is an added feature which will control parking maneuver using Bluetooth. It will provide connectivity through single touch and make it feasible in age of IoT.


![Figure 1 Block Diagram](image)

4. CONCLUSION

The proposed method completes parallel parking using S-curve path which achieves most accurate position of parking. This position is achieved in least time taking cost efficiency into consideration. Cost efficiency is achieved using ultrasonic sensors instead of camera for space detection. The proposed system also aims to send command for parking using android application which adds value to project making it feasible in world of IoT.

References


