A Review on Parallel Parking of the Vehicle

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Abstract - *Parallel parking is the process to park the vehicle parallelly where the space is limited. In earlier method the driver has to do may adjustments which requires more time and more accuracy. To avoid this, the new system can be implemented in the vehicle so that that the vehicle can be parked in shortest distance and time with more accuracy avoiding accidents. The new system consists of implementation of fifth wheel at the rear side of the vehicle or by modifying the steering mechanism or the other alternative option which is more accurate is by using automation in the vehicle using sensors and controllers. This all thing will result in reducing the turning radius, less time requirement, less fuel consumption, more accuracy and reduction in accidents.*

Key Words: Parallel Parking, fifth wheel, steering mechanism, automation, turning radius, Fuel Consumption.

1. INTRODUCTION

As day to day population increases the problem of the space increases as it going to decreases. The increase of the vehicles in the metro Politian city create the big problem of parking as the space going to decreases so to avoid this inconvenience the vehicle should be parked inline which is called as parallel parking. The parking of the vehicle one after another parallelly will decrease the problem of the vehicle. Also, the problem of the unskilled driver is unable to park the vehicle parallelly in less time. This driver may collide the vehicle to the rear side vehicle of the front side vehicle. Without any mechanism the parallel parking required twice its length space, the backward and forward of the vehicle take the double space to park the vehicle. Another problem of the vehicle is the fuel which will be going to waste at the time of parking as it takes more time. So, there are major problems like parking of vehicle by unskilled driver, less space, fuel consumption and time consumption. Several may studies have compared crash experienced or accidental experience which will give the results such that crash rates for parallel parking to be from 19 to 71% lower than the angle parking. To avoid all this problem the different mechanism is used to park the vehicle parallelly without taking any risk and efforts. The parallel parking will be done using adding fifth wheel at the rear side of the vehicle and used different assembly to drive and lift the vehicle at the Rear side of the vehicle. Some studies give the brief idea about the parking mechanism by changing its steering mechanism as well as some study give the brief idea about this parking using a sensor and the controller.

1.1 Literature Survey

Priyadarshini R, et al.[1] done the work on parallel parking of car using fifth wheel. According to his study, Parallel parking is the method of park the vehicle parallel in between the two-vehicle keeping the safe distance. They developed a system by introducing a fifth wheel at the rear side of the vehicle. The pneumatic system is used as a jack to lower the wheel and lift the vehicle from the rear side. The prime mover is used to provide a power to the fifth wheel and for forward and reversed rotation is also done by motor. Firstly, the driver places the vehicle at an angle from the front. As soon as the driver push the button the wheel is goes downwards and vehicle lifted up from rear side. The prime mover gives the rotation to the wheel as per the requirement (Forward or Reversed) and the vehicle park in between the vehicles. For this system they implement a digital display to indicate the status of the fifth wheel.

Mr. Paresh G. Chaudhary et al.[2] introduced a parallel parking mechanism using an auxiliary drive wheel (Stepney wheel). This auxiliary wheel is placed at the rear side of the vehicle. This mechanism consists of rack and pinion, DC motor, triangular hub with the one vertex fixed, chain and sprocket mechanism. The rack and pinion, triangular hub mechanism is used to control the movement of the auxiliary drive wheel to land and lift. In this paper they invented the mechanism such that the rack and pinion transfer the motion to the triangular hub which lift the vehicle as it has one point is pivoted. After lifting the vehicle, the motion will be provided to the auxiliary drive wheel with the help of DC motor or a chain and sprocket mechanism as per the requirement (Forward and reversed). At the time of traveling the fifth wheel is not in contact with the ground and at the time of parking the rear two wheels are not in contact with the ground.

Mandir Harer et al. [3] Develop and design the 90-degree steering mechanism which consist of rack and pinion, bevel gear, internal gear, chain and sprocket. They are modifying steering system in that system front axle wheel rotate left half direction and other wheel rotate right half direction using special type of mechanism. Because of this modified steering system, the car or vehicle rotate 360 degrees. This system having low cost and user friendly. In this mechanism was decrease steering radius. It has great advantages when turn vehicle 90 degree or U turn.

K. Lohith et al. [4] Create a four-wheel steering system instead of two-wheel steering system. In regular vehicles two-wheel steering system is used but this system has large turning radius. This system creates a problem when turn a vehicle or park a vehicle. This problem is solve using four-wheel steering system. They consider the parameters of Maruti Suzuki 800 for calculations purpose. They used Catia software for design and motion simulation was done using ADAMS. The turning radius was calculating using CRS (constant radius test).

Suraj Bawankude et al. [5] developed a mechanism which will attach at the bottom of the vehicle. This mechanism consists of 12V battery, pedestrian bearing, Lead screw, geared motors. In this mechanism the four auxiliary wheels are connected to the vehicle at a 90 degree to the longitudinal axis of the vehicle. This auxiliary wheel mechanism is connected to the actuators such as hydraulic or pneumatic at the bottom of the vehicle. When the actuator pushes the mechanism of the four wheels downwards which lift the vehicle upward and whole car is ready to move in transverse direction. The movement of car is controlled by remote controller and the speed of the auxiliary wheel at the time of movement is 30 rpm. The lead screw is used to provide the stability to the auxiliary wheels. This mechanism is used as a built-in jack also. This mechanism required less effort and the fuel consumption is less as the power taken from the DC geared motor which is connected to the auxiliary wheels.

Muhammad Faiz Bin Wahab et al. [6] develop a model of automatic parallel parking system for a small mobile vehicle. It consists of a DC geared motor, Servo motor, Arduino MEGA 2560 microcontroller, ultrasonic sensor and a relay. The working of this mechanism in conceptually is also proposed in this paper. In model, the sensors are placed at such placed from which the total parking space will be detected. The ultrasonic sensor senses the space, if available space is sufficient for the parking the vehicle then the next mechanism take place. After sensing the space, the vehicle moves reversely and moves into the parking space without any collision this phase is called as positioning phase. Lastly vehicle moves the correct parking position in the parking space by adjusting the distance from rear and front side of the vehicles. From this paper the parking space required will be 1.33 of vehicle's length. The small vehicle successfully parks without hitting or touching front and rear vehicles or obstacles.

S-J Huang et al. [7] developed a model which is auto park parallelly using self-organizing fuzzy logic. It consists of a multiple ultrasonic sensor to sense the coordinate of the vehicle, the self-organized fuzzy controller in which the parameters that are designed by trail-and-error work to obtained appropriate results and fuzzy rules are need to be set by an expert. The properties and the fussy rules modified at the time of process to improve the system. In this system the multiple ultrasonic sensor sense and construct the two-dimensional environmental map using coordinates. The total trajectory planned properly which based on two-dimensional environmental map. The surrounding area of the vehicle is also constructed. The X-Y components of the vehicle and the front wheel steering angle are derived. The fussy logic controller tracks the path. It regulates the front side steering angle as per the path track by controller. It estimates the vehicle current position or location and orientation and finally goes to the parking space which will be the target position of the vehicle. If the parking position is not the same then again execute the trajectory path and again adjust the vehicle in that place. After correct parking the system is stopped.

Dr. Gene Yeau -Jian Liao et al. [8] has discussed about the project of automated parking he is also discussing about making the prototype or toy and implementing the system on it. The project is focused on achieving a single task (automatic parking) by integration of sensors and actuators controlled by microcontroller and strategy planning/coding, therefore the vehicle platform is not built from the parts but from modifying a RC toy car instead for saving the time. There are generally three kinds of parking patterns: parallel, front/back-in perpendicular, and with an angle (usually 45 degrees), and this project is just focused on the parallel parking. The modified toy car is expected to do the following tasks in a complete automatic parking process: 1. Drive along a limited road-side environment and detect the distance from the car to the road-side obstacles such as parked cars or just curb on the right-hand side. 2. Once the length of a parking space larger than the length of the car plus a buffering distance is detected, the car will stop automatically. 3. Perform a smooth and efficient parking behaviour according to the relative positions of the car and the parking space. For this particular project we need microcontroller, fussy controller system, ultrasonic sensors, dc motor and servo motor etc. This will make the car fully automated and about 94% of accidents caused by human error will be reduced. The author also discussed about the Google and Toyota systems of automation in cars.

1.2 Materials and Methods:

This paper gives the various solutions for solving the parking problems faced in the metropolitan cities and parking in compact spaces the various methods discussed in this study are:

1. The implementation of fifth wheel at the rear side of the vehicle in which there are also two different mechanisms used in this system in first mechanism the vehicle is lifted directly using hydraulic and pneumatic systems for turning it in second mechanism is of a set of triangular hub, rack and pinion which is used to make the wheel in contact with road and the vehicle is lifted up.

Fig -1: Implementation of fifth wheel

2. Modifying steering mechanism of the vehicle in which there are two methods to reduce the turning radius of the vehicle due to less turning radius the vehicle will parked parallel, in first mechanism only front two wheels are rotated at 900 and vehicle is parked and in second mechanism all the four wheels are rotated at 900 and the vehicle is rotated at the place (zero drift concept).

Fig -1: Two-wheel steer

Fig -1: Four-wheel Steer

3. Also, this problem can be solved by using auxiliary four wheels which are perpendicular to the longitudinal axis of the vehicle. The auxiliary wheels lift by an actuator the vehicle and park the vehicle.

4. The other way is by using ultrasonic sensors, controllers, self-organizing fuzzy logic controller and GPS system. Using all this system the coordinates of

the vehicle and free parking space is recognized and the vehicle is automatically parked.

Firstly, ultrasonic sensor to sense the coordinate of the vehicle and construct the two-dimensional environmental map using coordinates. The total trajectory planned properly. After that the fussy logic controller tracks the path. It regulates the front side steering angle as per the path track by controller. It estimates the vehicle current position or location and orientation and finally goes to the parking space.
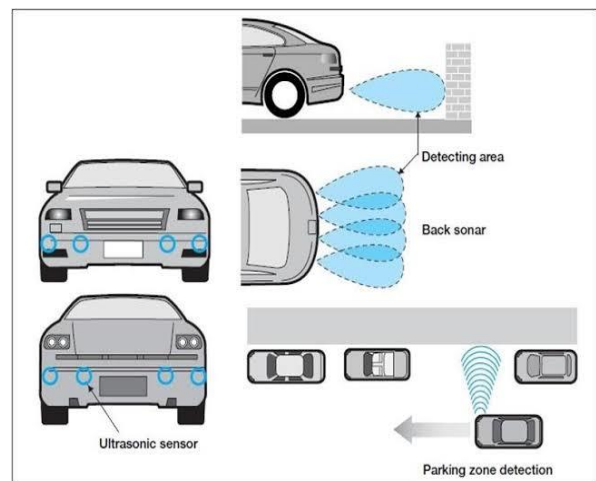

Fig -1: Automatic Parking System

2. DISCUSSION

The solutions of parking mechanisms are discussed but the fifth wheels currently discussed, steering mechanism, automation in vehicles requires the separate power source to run the system this reduces the efficiency or increases the weight of the system so such a system has to be implemented in the vehicle such that the power source will be taken from the existing system and with a slight change we can solve the problem. This will be economically fit for the system and there will be no drastic change in the existing system will take place.

3. CONCLUSION

By using the various system like fifth wheel mechanism, modified steering mechanism, and automation in the vehicle will result in solving the parking problem in the compact spaces which require more space and more time, this both the things will be reduced to 1.33 times its length from double its length. This will reduce the number of accidents and the traffic jam problems caused due to the parking problems will be solved. This system will also reduce the fuel consumption.

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