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Driverless Parking System for Automobiles

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ABSTRACT

In this paper we have proposed a new and novel automatic parking system for 4 wheelers (Auto mobiles) where we are hoping for less area consumption and human interface. This can be achieved by the use of Artificial Intelligence and Programmed Logic Controllers (PLC's), Sensors and Surveillance systems.

The Vehicle is provided with the Proximity sensors around it, they will sense the distance around it and for obstacles every time. If any obstacle is in the range then it will goes in to wait state for minimum time until the obstacle clears or If not the engine goes into off state. After Pushing Automatic Parking Button (APB), it will checks for clearance and then the vehicle is parked automatically and autonomously

Index Terms: AI, PLC, APB, Sensors

I. INTRODUCTION

Automatic parking system is an independent auto move that moves a vehicle from an activity path in a parking space to perform in parallel, opposite or calculated stopping. The Automatic parking system expects to enhance the solace and security of driving in confined situations where a great deal of consideration and experience required directing the vehicles. The stopping move is accomplished by method for an organized control guiding point and speed that considers the genuine circumstance in the earth to guarantee free development inside of the accessible space impacts.

Nowadays parking a car in parking lot without dents is a major issue .To avoids this we can try automatic car parking system with the help of PLC. We have developed PLC ladder logic with the help of logic gates to park the car automatically. With the help of proximity sensors arranged to the car it is easy to measure the distance to the other objects and easy to identify the obstacles around the vehicle.

II. BACKGROUND WORK

M. M. Rashid *et al.*, worked to identify the vehicle with its number plate, in out scanning in parking area and toll plaza system with the help of image processing algorithems[1]. Hitendra.g.wasnik *et al*, Worked on Optimal Automatic car pa4rking system for Indian Environment, in this paper they explained different parking methods suitable for Indian environment where within the less space more number of vehicles can be parked autonomously[2]. S. Poornalakshmi *et al.*, worked on Automatic Park and retrieve assisted systems for automobiles using smart phone explained how to park a car with help of smart phones, ultrasonic sensors[3]. Mala Aggarwal *et al.*, worked on Comparative Implementation of Automatic Car Parking System with least distance parking space in Wireless Sensor Networks to find a vacant parking lot with the help of cctv footage wireless network to and sensor and the status of parking area to central computer to display it[4]. R. Mohanpriya *et al.*, worked on Driverless intelligent vehicle for feature public transport based on GPS worked on intelligent parking and retrieve system by an sms[5]. J.K.Radhika *et al.* worked on Independent

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smart parking & retrieve of vehicle using mobile application based on GSM modem technology. By allowing parking more cars than the usual[6]. Joanna Marie *et al.*, Worked on Automation of Packaging and Material Handling Using Programmable Logic Controller to handle material using plc[7]. Prof. Burali Y. N worked on PLC Based Industrial Crane Automation & Monitoring to automate industrial crane[8].

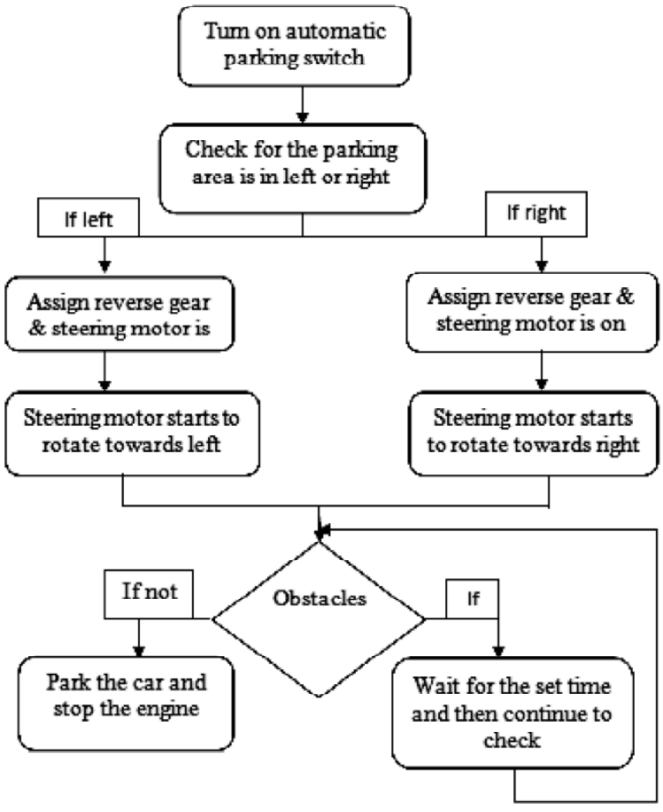
III. METHODOLOGY

Whenever car or any vehicle enters into parking area, after searching for an empty parking lot we initiate the automatic car parking by enabling the "Auto-Park (AP)" switch. Then the sensors are activated, the clutch motor is activated, then the gear motor is activated and assigns reverse gear. After the above process the steering motor is then activated, the sensors mounted around the car starts to check for the obstacles.

If the parking lot is in the left, the steering motor then starts to rotate towards left or else to rotate towards right. If an obstacle or an object comes in the way then the car break is the activated and the car goes to idle mode for a specified time represented in PLC program. If the obstacle does not move or it is in the range it after the time it means that the car has reached the end of parking lot or n space for parking (It is the Sensor arranged for back Bumper).

While Parking, In the middle of taking a turn if the car goes near to another car then the output from the sensors is checked and the car goes to idle condition, the loop continues to execute and in a closed loop until it searches for accurate counter measure. Like the car goes forward to some distance and the stars in reverse direction to overcome the problem.

After the car reaches the parking lot all the sensors checks the distance from the edges of paring lot and checks whether the car is parked properly or not. if it parked properly then the car engine is turned off, if not the car is moved forward and the again reversed to overcome the issue and it is clearly shown in **flow chart 1** given below.



Flow chart 1: Process representation

IV. PROPOSED WORK

In this proposed work we have assigned the main inputs and outputs for the PLC program. The details of the input and output are shown in the tables bellow.

The assignment to the sensors and its ports in PLC are explained in detail in below table 1

Table 1
Sensors and its ports

Sensor name	*Port number*
BS-L – Back side Left sensor	I:0/1
BS-R-Back side Right Sensor	I:0/2
BL-S – Back Left Sensor	I:0/3
BR-S – Back Right Sensor	I:0/4

The below table shows the main four outputs their names and port numbers in the PLC Program

Table 2
Output Port name and its ports

Output name	*Port number*
Clutch PLC Main Relay	O:0/1
Brake PLC Main Relay	O:0/2
Gear Motor	O:0/3
Alarming System	O:0/4

When the car is going to park in a specified parking lot, the initial condition to be considered is that the Car Parking Straight Assuming where there will be no obstacles, the condition is given below.BS-L,BS-R,BL-S,BR-Swill be in OFF Conduction (PLC ladder logic)

As there are no obstacles, the PLC receives null data from the sensors (all the sensors are in OFF condition) and hence the car moves in reverse direction until it reaches the end of parking lot.

The following diagrams show how the system works the figure 1 shows empty parking lots and the figure 2 shows the parking lot after the vehicle enters the parking lot and the figure 3 shows after the vehicle is parked

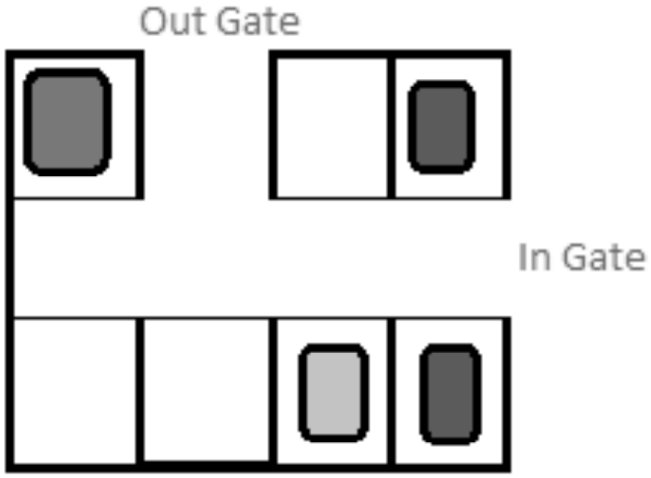


Figure 1: Empty parking lots

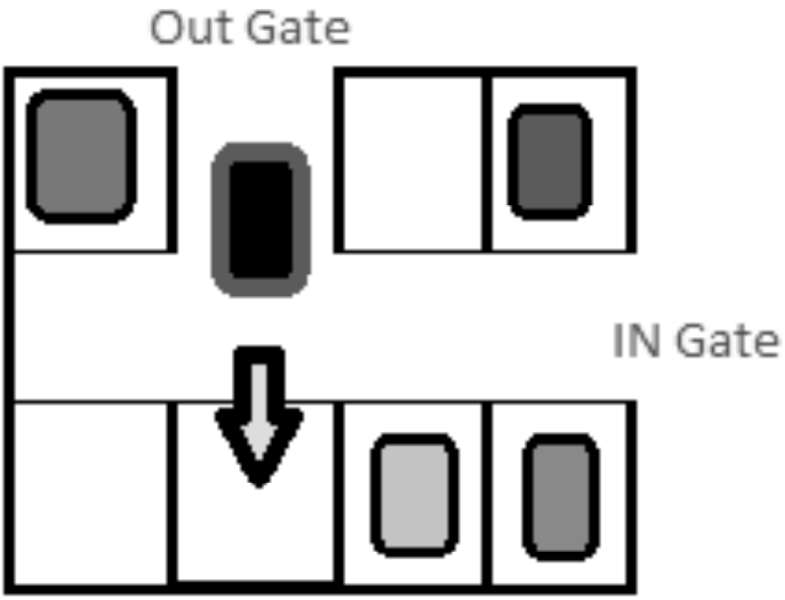


Figure 2: The parking lot after the vehicle enters the parking lot

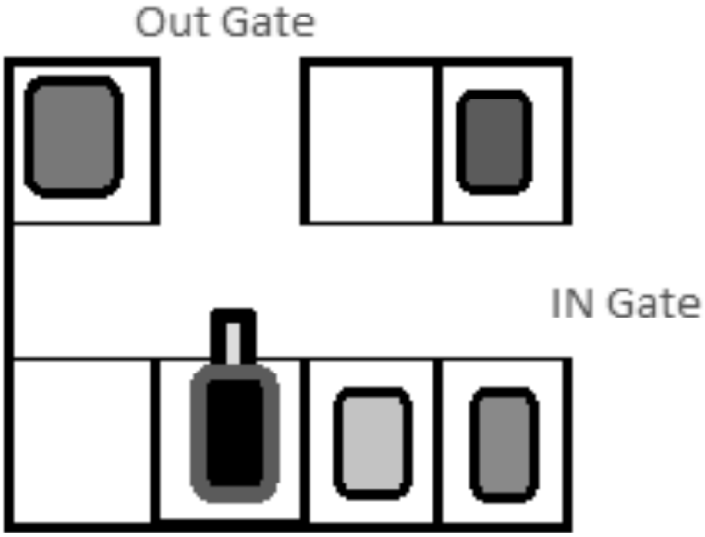


Figure 3: After the vehicle is parked

As the BS-R-Back side Right Sensor - I:0/2 and BR-S – Back Right Sensor -I:0/4 are ON and the PLC gets the data from these two sensors the car starts to turn to right side Initial where the parking is in the right ride of car Conditions are taken as bellow

I:0/2 & I:0/4 =1 ;;; I:0/1 & I:0/3 = 0

The inputs are takes as shown and the process is the BS-L – Back side Left sensor - I:0/1 is enabled than B3:0/0 & B3:0/1 = 1 the code is done as follows

I:0/0=1 than B3:0/0 & B3:0/1 = 1

B3:0/2 & B3:0/4 =1 than B3:0/3 =0

Then Based on sensor values the scale with parameters instruction will give instructions in time format for a timer T4:2Than C.unhold B3:1/3 =1 If directly the wall comes than back sensors BS-L will be On by holding Brake & Clutch B3:1/5 & B3:1/6. Then the car stats and parks by taking reverse gear and parks in the parking lot

The following diagrams show how the system works

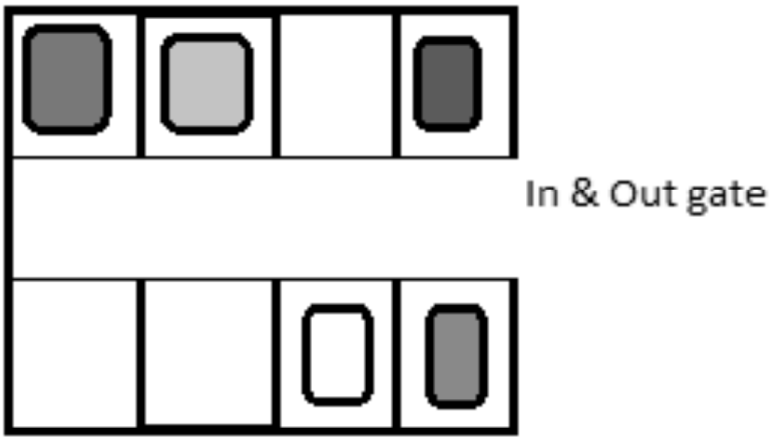


Figure 4: Empty parking lots

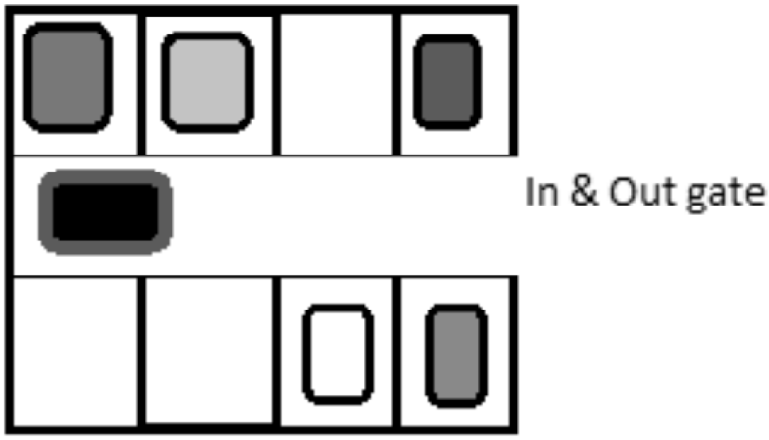


Figure 5: The parking lot after the vehicle enters the parking lot

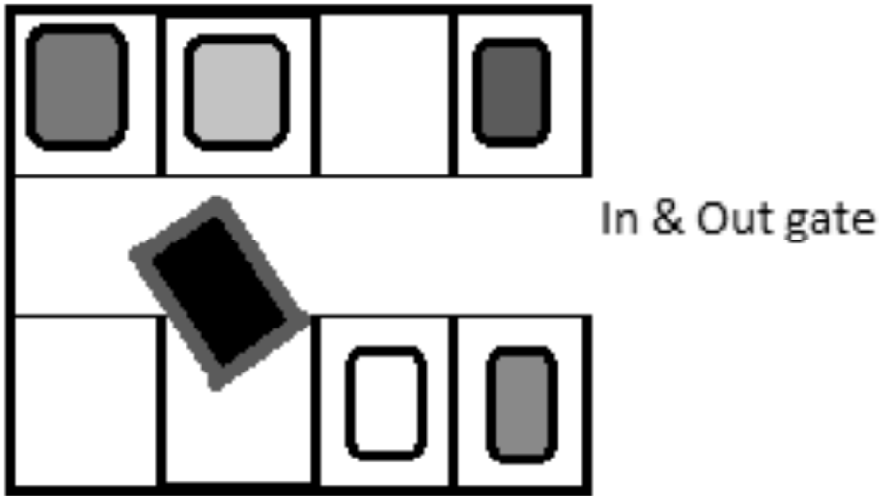


Figure 6: after the vehicle is parked

As the BS-L-Back side Left Sensor - I:0/1 and BL-S – Back Left Sensor -I:0/3 are ON and the PLC gets the data from these two sensors the car starts to turn to left side Initial where the parking is in the left ride of car Conditions are taken as bellow

I:0/1& I:0/3 =1 ;;; I:0/2& I:0/4 = 0

The inputs are takes as shown and the process is the BS-R– Back side Right sensor - I:0/1 is enabled than B2:0/0 & B2:0/1 = 1 the code is done as follows

I:1/0=1 than B20/0 & B2:0/1 = 1

B2:0/2 & B2:0/4 =1 than B2:0/3 =0

Then Based on sensor values the scale with parameters instruction will give instructions in time format for a timer T4:2Than C.unhold B3:1/3 =1 If directly the wall comes than back sensors BS-L will be On by holding Brake & Clutch B3:1/5 & B3:1/6. Then the car stats and parks by taking reverse gear and parks in the parking lot

V. RESULTS AND DISCUSSIONS

Whenever the input sensor conditions are varied, there will be appropriate variation in corresponding output variables in a perfect manner. The Logic is very clear and it show a specific parking area for a vehicle, parks in a perfect and safe position.

After the vehicle is safely placed, the gear shifts to neutral position and the engine automatically switches OFF

The Total Program is simulated in Delta PLC and the results are shown below.

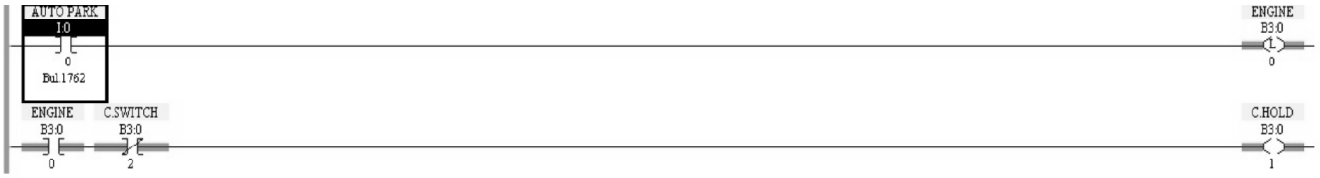


Figure 7: Engine On

The Black box shows auto park switch is enabled and ready to park

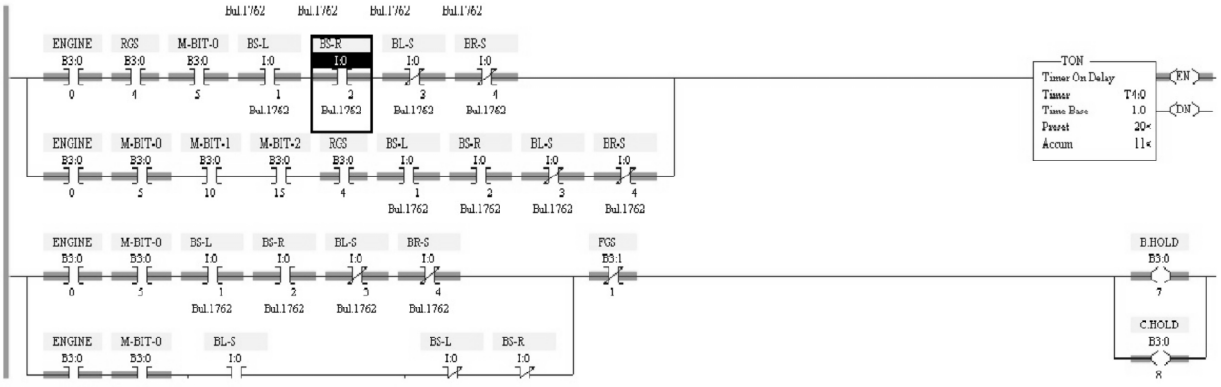


Figure 8: Back side left and right sensors are on

The Black box shows that Back side left and right sensors are activated and at this condition the car checks for parking area clearance

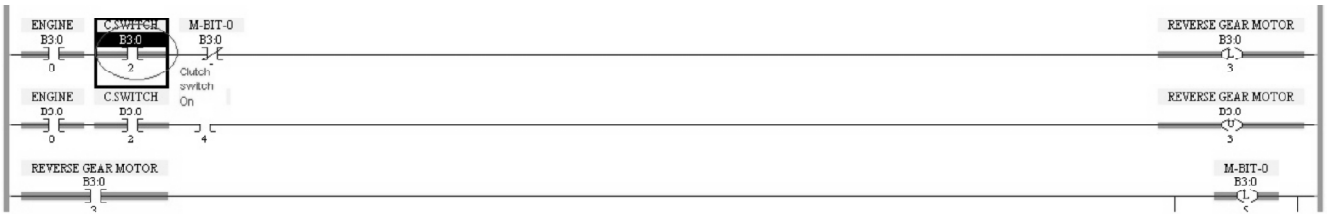


Figure 9: Clutch switch on

The Black box shows that Clutch switch on, and the vehicle is ready to shift the gear

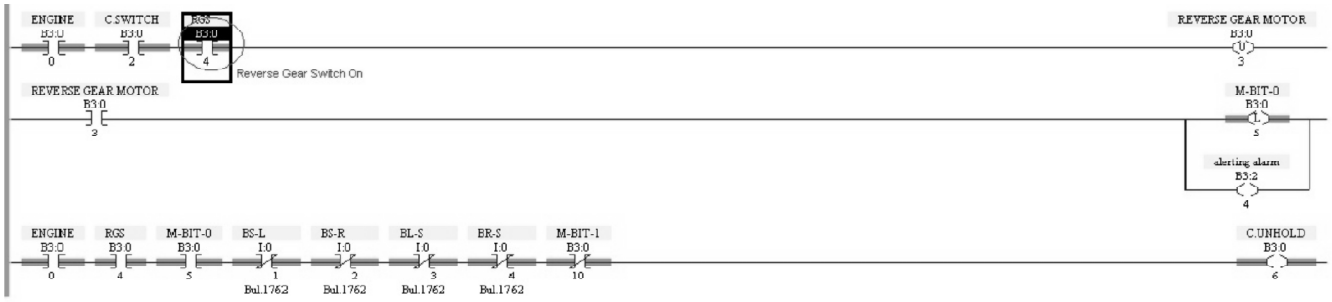


Figure 10: Reverse gear switch on

VI. FUTURE SCOPE

Up to now this project is implemented to park a vehicle in a safe position autonomously and automatically. In feature we want to extend the same to driverless cars.

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