A Smart Parallel Parking by Rotating Wheels of Vehicles

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Abstract – A sensible Parallel parking system is that the Method to park vehicle parallel to other parked vehicles. The Parallel Parking system consists of both software and specialized hardware, which helps to create the motive force task easy and also, it helps to attenuate the damage to other parked car. This technique is principally supported Nuvoton microcontroller, mechatronics concepts and with the assistance of DC motor, chain system and also the wheels of the vehicle rotating in 90 degree. The DC motor helps to rotate the wheels of the vehicle. This technique is additionally implemented by Bluetooth technology and ultrasonic sensor. Bluetooth Technology for giving instructions to the vehicle like forward, backward, left, right. Ultrasonic Sensor are used which can sense the objects between to avoid accident. If the item is simply too near the vehicle, then the alarm will gets activated. This technique result helps in making the motive force task easy and easier, less time requirement, more accuracy and reduction in accidents.

Key Words: Parallel Parking, Nuvoton Microcontroller, Mechatronics, Rotating wheel, Ultrasonic sensor.

I.   INTRODUCTION

Parallel Parking can be an enormous problem in developed and developing countries. A Smart Parallel Parking can be a way of parking a vehicle in sequence with the other parked vehicles. Parking vehicle in congested area is incredibly difficult task for the drive. So on in the reduction of these problem we are making all wheels of our vehicle to rotate in 90 degree by the chain system and DC motors in our project. Each wheel of the vehicle is connected to DC motor and each one DC motor of auto are connected to chain system. Chain system is controlled by Bluetooth technology by giving some instructions like forward, backward, left, and right. Bluetooth technology and DC motor was implemented by the synthetic language called Kiel µVision5 Software.

To reduce this problem our project was implemented with Nuvoton Microcontroller and Kiel µVision5 Software. This project mainly for parallel parking, to make driver task easy and softer, avoid accident and to chop back damage to other parked vehicles. We implemented the ultrasonic sensor in our project to detect an object found before of the vehicle. Using Kiel µVision5 software we written c programming code for DC Ultrasonic sensor.

II.   LITERATURE SURVEY

1. Mr. Adimurthy M-2017 International Journal of Engineering Research & Technology

Title: "Parallel Parking"
In Metropolitan area the most important problem is parking the vehicle. The Vehicle has to park in between the already Parked vehicle. Today's car wheels can rotate up to 60 degree for this driver has to suffer lot to park the vehicle in Small Street and parallel parking. During this paper the author explained about the parallel parking of auto by 90 degree of rotating wheels. This was implemented by the switch activation, which is ready to be simpler for the drive to rotate all the four wheels of the vehicle to tilt 90 degree to park the vehicle.

2. Suraj Bawankude-2018 International Journal of Advance Research and Innovative Ideas in Education.
Title: "Fabrication of Parallel Parking System in vehicle"
In this paper the author had explained about the gear system mechanism for the vehicle. The block diagram consists of 12v battery, Lead screw and Gear System. The instructions to the gear system is given by the Zigbee Module such as forward, backward, left, right. During 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 like hydraulic or pneumatic at the underside 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 maneuver in transverse direction. The movement of car is controlled by remote controller and also the speed of the auxiliary wheel at the time of movement is 30 rpm. The lead screw is used to provide the soundness to the auxiliary wheels. This mechanism is used as a built-in jack also. This mechanism required less effort and also the fuel consumption may be a smaller amount because the facility taken from the DC geared motor which is connected to the auxiliary wheels.

III.   PROBLEM STATEMENT

In Metropolitan area the biggest problem is parking the vehicle. The Vehicle has to park in between the already Parked vehicle. Today's car wheels can rotate up to 60 degree for this driver has to suffer lot to park the vehicle in Small Street and parallel parking. It is also take time to park the vehicle but in our project we implemented the chain system to the wheels and DC motor. This is mainly based on Nuvoton microcontroller and Bluetooth technology. This makes the driver task easy and more comfortable.

IV.   OBJECTIVES

1. To Reduce the complexity of parking vehicles.
2. To Park the vehicle parallel to the other vehicles.
3. To make the driving task safer and more comfortable.
4. Driver can easily stop the car at any time using Gear system.
5. Helps to minimize the damage to other parked vehicle.

V.   MATERIALS AND METHODS

1. NUVOTON MICROCONTROLLER

The Nuvoton microcontroller [W78E052D] has some important features and it is low-cost chip and it is useful to embedded system developers Main feature of this microcontroller is that it has a inbuilt UART boot-loader. So, using serial port it can be programmed. It uses less power and processes 8 bits micro controller. Also it allows wide range of frequencies.. IT has I/O ports to communicate with other components. It has got vectored interrupt management, where the tasks need to be performed during interrupts are predefined. It provides safety to the user's code. It has many modes of operation like idle, power down, etc. These modes will make the system to work as low power Microcontroller.
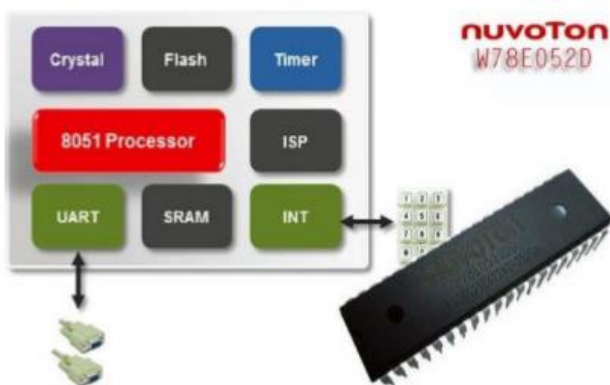

Fig1: Nuvoton Microcontroller

It has built in methods to protect itself from low and high powers, and always maintains minimum power to ensure the required basic functions are running. Fig1 shows the Nuvoton microcontroller.

VI.   KIEL VISION5 SOFTWARE

The Micro Vision may be a window based programming advancement stage that joins a solid and in rage proof-reader with a venture administrator and construct office instrument. It coordinates all the apparatus expected to make installed applications along with a C or the C++ compiler, the complete scale constructing agent, linker or the loader, and also the hex file generator. The µVision5 IDE offers more features and advantages that helps you to quickly and successfully develop the applications. Those are very easy to use and that they are absolute to facilitate your to realize your goals designs.

VII.   BLOCK DIAGRAM

The Block diagram of our project consist of Nuvoton Microcontroller, Ultrasonic Sensor, Bluetooth, Gear System, Dc motor, Dc motor Drive, Buzzer and Power Supply System.
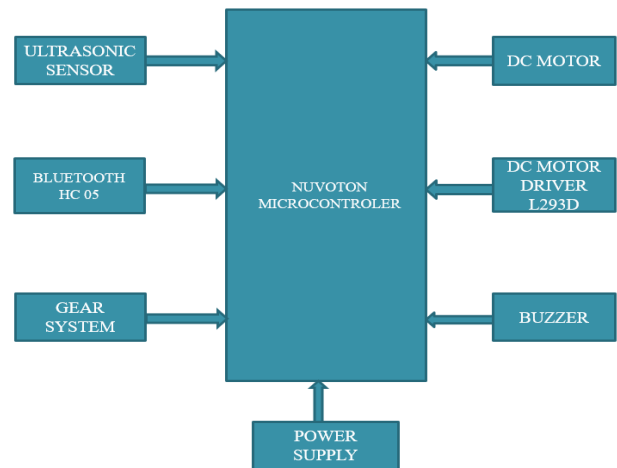

Fig2: Block Diagram of System

Ultrasonic Sensor: Ultrasonic sensors are mainly accustomed measure sound waves with the frequency between 30 kHz to 300 kHz.

There are 3 differing types of Ultrasonic sensor:
1. Time of flight for sensing distance
2. Doppler shift for sensing velocity
3. Amplitude attenuation (or sensing distance, directivity, or attenuation co-efficient.

Bluetooth (HC 05): Bluetooth is mainly used for wireless technology with limited distance. In our project we written code for Bluetooth to give instruction to DC motor such as right, left, forward, backward. Bluetooth can configure in both slave and master.

DC Motor: The Direct Current Motor is a machine. It is mainly used for transmission of electric energy into mechanical energy in form of rotation. The DC Motor is used to rotate the wheels of the vehicle. In our project we connected 4 DC motor to 4 wheels of our project.

Buzzer: A Buzzer is an audio signaling device. There are 3 different types of Buzzer.
1. Mechanical
2. Electromechanical
3. Piezoelectric

In our project Buzzer will turn on while travelling any obstacle found in front of the vehicle.
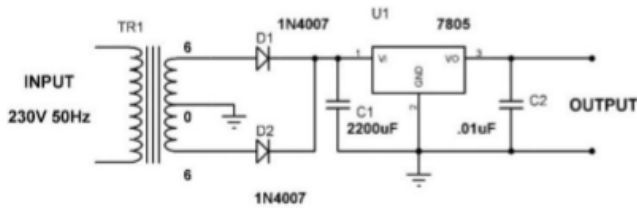
VIII.   POWER SUPPLY SYSTEM

Fig3: Block Diagram of Power Supply System

Transformer: It is used either step up or step down the ac signal. It uses the coils mounted on Ferro magnetic materials. Based on the number of terns on input and output sides, the signal will be stepped up or stepped down.

Rectifier: A rectifier is an electrical device that converts an Alternating Current (AC) into a Direct Current (DC) by using one or more P-n junction diodes.

When the voltage is applied to the P-N junction diode in such a way that the positive terminal of the battery is connected to the p-type semiconductor and the negative terminal of the battery is connected to the n-type semiconductor, the diode is said to be Forward Biased.

When the voltage is applied to the P-N junction diode in such a way that the positive terminal of the battery is connected to the n-type semiconductor and the negative terminal of the battery is connected to the p-type semiconductor, the diode is said to be Reverse Biased.

Filter: An electrical filter is a circuit which can be designed to modify, reshape or reject all the undesired frequencies of an electrical signal and pass only the desired signals. In other words we can say that an electrical filter is usually a frequency selective network that passes a specified band of frequencies and blocks signals of frequencies outside this band.

Voltage Regulation: It is the supporting system used to keep the voltage level within the range of operation. If the voltage varies, voltage regulator will do some action to keep the voltage in the range of operation.

IX.   METHODOLOGY

1. We are designing a parallel parking system with help of Nuvoton Micro controller and mechatronics concepts.
2. We are making a four wheeler module with help of 4 DC motor and chains.
3. All four DC motors are connected to the upper gear system.
4. DC motors are used for Vehicle movement (forward, backward, left and right)
5. All wheels are connected to upper gear terminal, by which we can control all four wheels in 360 degree. It will help driver to park the vehicle in congested parking place.
6. Driver can park the vehicle using android application.
7. All motors and gear is controlled by android application.
8. Ultrasonic sensor are used, which will sense the distance between the objects.
9. If the object is too near then alarm will be on.
10. Battery is used as power source for our applications.
11. This system makes parking ease and convenient.

X.   RESULTS

Fig4: The Car Parallel Parking in Cities

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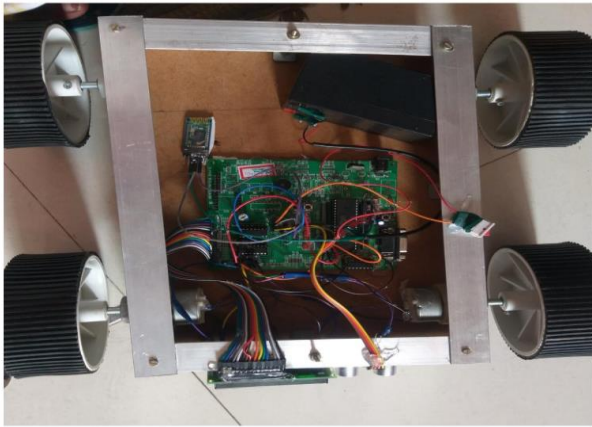**IETE – 2020 Conference Proceedings**

Fig5: The Hardware Picture of Parallel Parking Model.

XI. CONCLUSIONS

In this paper we studied about smart parallel parking in congested area with the help of rotating wheels, chain system and Bluetooth technology for giving instruction to the chain system such as forward, backward, left, right. The project makes driver task easy and more comfortable and also while parking it reduce damage to other parked vehicles. It also saves our time while parking.

In the digital world, where parking space has become a very big problem and in the era of miniaturization, since everybody wants to have a car and the space required to park is getting shorter. This problem can be minimized by adding some more feature to the vehicle such as identification of key, camera in back side, identification of space to park the vehicle.

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