Intelligent, Driverless Automated Valet Parking System

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Abstract*: This project report has shown the concept of automatic car parking system, which can automatically sense the empty space available for parking and according to it displays the number of empty platform available on the LCD. This automated car parking system reduces the time taken to check the space for the vehicles. In this proto we used the infrared sensor s to follow path & ultrasonic Sensor which detectparking slot is empty or not to sense the cars. The perception system corresponds to a fusion between an ultrasonic system and aIR sensor. It provides the localization of the vehicle, the navigable area around the car and a map of already visited areas. This information is used afterwards as input for the car control system in order to ensure it's integrity during navigation. The Autonomous Valet Parking system is able to take control of the car and to drive it from the drop-off zone to the parking and from the parking to the pick-up zone. In the following it will be described the hardware and the software system architecture and the main principles of algorithms.*

Keywords: Valet Parking, Automation, Line Follower, Obstacle Detection, Microcontroller

I. INTRODUCTION

Nowadays there are more and more multi-storey building is springing up every day, this giving rise to vehicle parking problems. Thus giving rise to vehicle parking problems. Thus there is a limitations of land which leads to cutting down of trees. This has harsh and adverse effects on the environment. This project aims of saving the ground space required for parking using the parking system any number of cars can be parked according to the requirement; This microcontroller Based Car Parking System enables enables the parking of vehicles, by displaying the available slots thus reducing the parking space that is used by users. Here in this parking system any number of cars can be parked according to the requirement, making the system very modern and saving the space. The correct incentive for applying automation is to increase productivity, that possible with current human labour levels so as to realize economics of scale. The incorrect application of automation, which occurs most often, is an exercise to replace human labour. Simply put, whereas correct appliance of automation can net as much as 3 to 4 times original output with no increase in current human labour, incorrect application of automation can only save a fraction of current labour level cost. An Automatic car parking system is a smart parking system which will play an important role to reduce traffic in the city. Cars parked callously on the streets limits, the space so with a smart parking system these problems can be solved. Moreover, this kind of system will reduce the manual work and save time. Such a system can be used in a large multilevel building. There has been some problems related car parking issues which are: How to control the number of the car inside it, monitoring the movement of car in/out side of the parking lot , to check whether there is a place inside for more cars or not and safety to park. The microcontroller serves as a programming tool to run the whole operation, to reduce the cost in terms of requirement such as job opportunity and to increase security. Moreover, this system is faster, flexible and can meet the market requirement. The aim of this paper is to solve these problems by designing a system to control the parking area using microcontroller. Whenever a car is placed on the pick platform the LCD screen displays the empty space available with the help of infrared sensors and microcontrollers. These operate the motor to the specific platform to the vehicle and place the vehicle .the pick platform will return to its initial position. Now the PIC microcontroller decrements the value of the count that will display on LCD and displays it on LCD. If the count reaches 0, i.e. if the parking space completely filled, this LCD will display NO SPACE FOR PARKING on LCD. If any vehicle leaves the

parking area, the microcontroller will increment the number of count and allows the other vehicles for parking. This project useregulated voltage 5V, 500mA power supply. Unregulated voltage 12 V DC is used for relay circuit. 7805, which is three terminal voltage regulators is used for voltage regulation. The bride type full wave rectifier the ac output of secondary of 230/12V step down transformer. They are needed to have parking area in the existing situation where no space for parking the car is available .the purpose of the Microcontroller based car parking system is to specify the usefulness of the hardware and software and software simulated product motivation is car parking system shows usefulness to parking the car.

Parking has been a major problem in our cities due to the following reasons: 1. Lack of space and 2. Unauthorized parking. Regulated growth in the number of vehicles, compounded with unplanned parking areas in small localities such as residential complexes and office plazas make it a daunting exercise to find a parking spot for an automobile. This leads to people parking in any empty spot they can find. This issue is critical when a spot assigned to a particular person or resident of a building gets occupied by a visitor's vehicle. This kind of situation often causes disputes in residential areas and can cause a nuisance such as a traffic jam in public spaces. Given that the problem of parking arises due to inappropriate parking of vehicles at the parking area, a well-managed parking lot with proper allocation of parking slots for both resident and visitor vehicles coming to the locality can prevent disputes and help traffic flow well. So to overcome the aforementioned problem, we are planning to design an automated parking system.

II. LITERATURE SURVEY

Noor N.M. Z Razak and Mohd Yamani, --car parking system. The smart parking system implemented mainly in the Europe, United State and Japanis developed with the incorporation of advanced technologies and researches from various academic discipline. Now-a-days there is a rapid growth in parking system. manpower is needed for each car parking slot to select a parking slot manually and give direction to drive properly into slot. So, there is a need to develop an automatic parking system which will reduce manual work as well as will be useful for careful parking of cars and other vehicles. Parking system routinely experience parking related challenges, especially in the urban and metropolitian areas. While doing a survey we have found that this automatic car parking system has been proposed by various researchers using different technology .in some paper some researchers have proposed this system using Around View Monitor(AVM). In their paper they have discusses fusion of AVM and ultrasonic sensor, used to detect the vacant parking slot in the automatic car parking system. The AVM provides a virtually 360 degree scene of the car in birds eye view.

C. Patel, M. Swami,P.Saikia, S.Shah,--Rotary Automated car parking system. Another paper discusses a system using some digital key along with some robotics technique. When a car enters the entry of the automated car parking system. An IR detection subsystem detects the presence. Then the driver is promoted to enter a valid key and to choose the option either parking or retrieving a car. Each key is checked for accuracy and assigned a designated parking slot. Upon entering the correct key, car is picked up along with the pallet from the stack system and placed in the designated spot when drivers return to pick up the carhe enters the valid key for which the system will check in its database and car is return back to the drive way. The stack system will be pull down the pallets to make room for incoming pallets. The system includes robotic lift with motors for picking car and placing in it in the designating spots.

Microcontroller based car parking system shitaln B. Dhote, Mamta B. Tayade, SagardilipBharambe, India. In the previous parking system driver manually selects the parking slot and drive into it. This method is useful as a backup tool for failure cases of automatic parking system methods. Manpower is needed for each car parking slot to select a parking slot manually and give direction to drive properly into the slot. There is need of manpower .so this system is replaced by the ultrasonic based sensor are mounted on both side of the front bumper. Adjacent vehicle are detected by using ultrasonic data. This ultrasonic sensor find the adjacent vehicles and driver properly drive into the free space between that adjacent vehicles. Using the multiple echo function, parking space detected more accurtely in real parking environment. These method fail when there is no adjacent vehicles and in slanted parking situations where adjacent surface vehicle are not perpendicular to the heading direction of ultrasonic sensors. Another method is parking slot Marking-based methods.

III. METHOD OF DISEASE DETECTION

In this, we present the theory on solar powered automatic valet parking system. In this proposed block diagram consist of several sensors (ultrasonic sensor, IR sensor,) are connected to our controller. The controller is accessing the sensor values processing them and find out path as well as empty slot to park vehicle. The robot parks itself in the available visitor slot closest to the out position of the arena. The robot enters the arena as a visitor vehicle and parks in the available visitor slot; it doesn't parks in the resident slot.
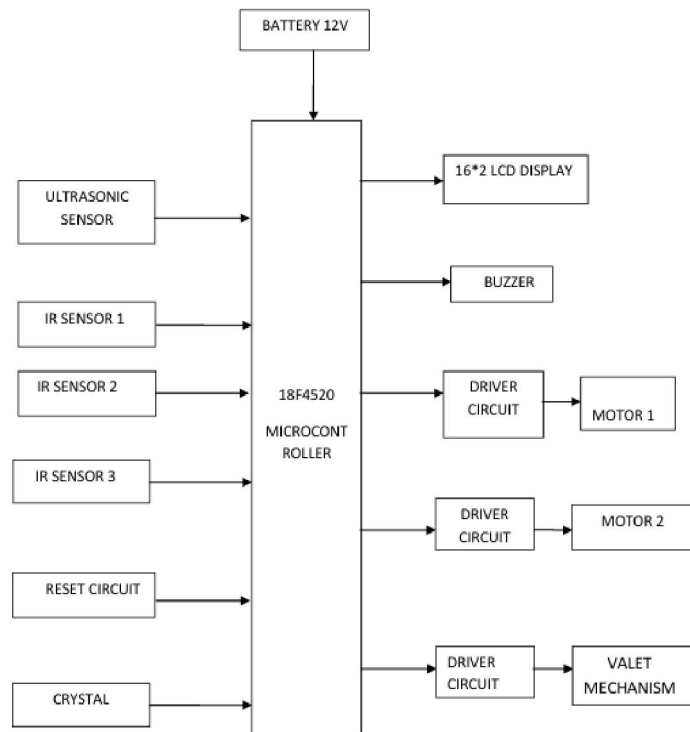
Fig. 1. Block Diagram

PIC18f4520Microcontroller

PIC18f4520 is a 40 PIN Micro-controller from Microchip with 13 channel 10 bit Analog to Digital Converter. Special PIC18f4520 Micro controller Features

- Up to 10 MIPS Performance at 3V
- C compiler optimized RISC architecture
- 10-bit ADC, 13 channels, 100K samples per second
- Programmable Low Voltage Detection Module
- Master Synchronous Serial Port supports SPI™ and I2C™ master and slave mode
- EUSART module including LIN bus support
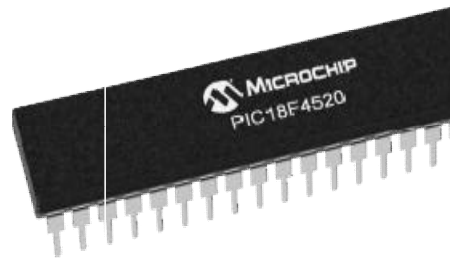- Four Timer modules
- Up to 5 PWM outputs

Fig. 2. PIC 18f4520

Ultrasonic Sensor

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

Using IO trigger for at least 10us high level signal,

The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time×velocity of sound (340M/S) / 2,

Fig. 3.Ultrasonic Sensor

IR Sensor

Proximity Sensor are used to detect objects and obstacles in front of sensor. Sensor keeps transmitting infrared light and when any object comes near, it is detected by the sensor by monitoring the reflected light from the object. It can be used in robots for obstacle avoidance, for automatic doors, for parking aid devices or for security alarm systems, or contact less tachometer by measuring RPM of rotation objects like fan blades.
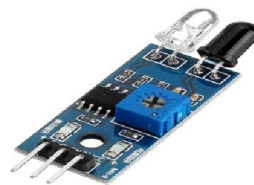
Fig. 4.IR Sensor

L293D Motor Driver IC

A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between controller and the motors. The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of

two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor. We will be referring the motor driver IC as L293D only. L293D has 16 pins.

The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor.
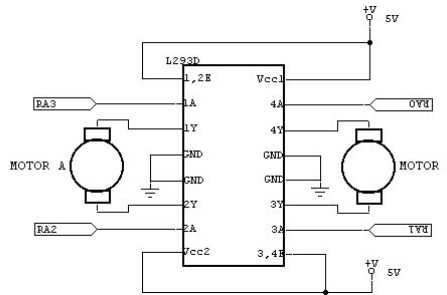

Fig -5:L293D Motor Driver IC

LCD Display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.
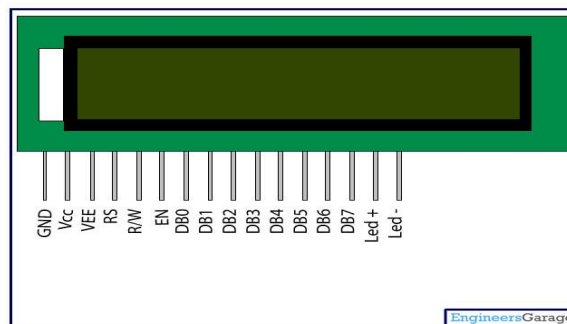

Fig. 7.LCD Display

IV. CONCLUSION

In this article it was described the system architecture for Autonomous Valet Parking developed on a solar power prototype vehicle. The concepts rely on cheap sensors that are already used in conventional cars. Another main goal was to avoid the use of data provided by external infrastructure. The robot parks itself in the available visitor slot closest to the out position of the arena. The robot enters the arena as a visitor vehicle and parks in the available visitor slot; it doesn't parks in the resident slot. The proposed model has presented a novel automated car parking system using line follower and artificial intelligence technology. when car enter in parking slot parking robot pick car and start to find out empty slot using ultrasonic sensor. The line follower robot which is operated by microcontroller identifies the free slots and parks the car in the destined slot. Our proposed work can be well suited for real time efficient parking implementation.

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