IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AUTO-ROADSIDE ECONOMIC PARKING SYSTEM WITH OPTIMAL SPACE UTILIZATION SOLUTION

[1]Ajay Kumar Yadav, [2]Sarthak Sharma, [3]Vishesh Yadav, [4]Sumit Kumar, [5]Amarjeet Vishvakarma

[1]Student, [2]Student, [3]Student, [4]Student, [5]Student

[1]Electrical and Electronics,

[1]Lovely Professional University, Phagwara, India

Abstract: **This paper "Auto-roadside economic parking system with optimal space utilization solution technology" discusses the solution to parking problems that are being frequently encountered by urban planners and vehicle drivers. This research paper deals in technology that measures the accurate length of the vehicle through ultrasonic sensor installed in parking lot. In addition to this the same signal is now sent to the micro-controller Arduino Uno which is connected to the peripherals like LCD, Servo motor and circuit breaker. Arduino calculates the distance of the vehicle through programming and sends the signal to LCD. If the space is available in parking then the servo motor connected to barrier gets the corresponding signal from micro-controller and directs barrier to adjusts itself and thereby making an efficient spacing for parking the vehicle.**

Index Terms **- Smart parking system, Urban parking, Arduino Uno, Ultrasonic sensor.**

I. INTRODUCTION

The drastic increase in human population is leading to high density of vehicles on the roads. The demand of parking in urban areas has amplified with the enormous increase in vehicular traffic in last few decades. Furthermore, this trend is disturbing the available parking space. Disorganized parking in urban cities leads to increase in driving distance and sometimes collisions between the vehicles and minor accidents [1]. Presently automobile giants are working in the enhancement of the smart parking systems in their vehicles whereas on the other hand urban planners are welcoming the technologies that favors them to use the parking space judiciously in order to avoid congestion in parking.

The solution to this problem can be overcome by using the ultrasonic sensor which is capable of measuring the time of flight between the rear end and the front end of the vehicle by sending an ultrasonic pulse through its transmitter and receiving the same pulse back to its receiver's end [2]. The proteus based virtual model of the technology involves the use of micro-controller Arduino Uno, LCD and the servo motor employed with the barrier. The ultrasonic sensor sends the signal to the Arduino and the LCD attached to the Arduino displays the vehicle length. As soon as the vehicle length gets measured, Arduino sends the signal to the servo motor and instructs the corresponding barrier to shift according to the length of the vehicle thereby making the efficient space for the car parking. This technology helps in using the parking space judiciously, avoids the minor accidents, collisions and reduces the driving distance. It has been found that human errors are the most accepted source for accidents on roads and in parking lot [3]. Hence, after the introduction of such technologies it will be easier for the vehicle drivers to park their vehicles easily. In addition to this it will also reduce burden of manual works in the parking lot.

II. THEORY OF OPERATION

Auto-roadside economic parking system with optimal space utilization solution technology comprises of Proteus software, an Ultrasonic sensor, Arduino Uno as microcontroller, stepper motor, LCD, LED and a circuit breaker. The working operation is discussed below :

A. Proteus

The software is majorly involved in electronic design automation and is used for schematic capture, simulation, and PCB layout design. Depending on the need of project and requirements for microcontroller simulation it can be available in many configurations.

B. Arduino Uno

It is an open-source microcontroller which can be easily programmed, reprogrammed and erased as per the requirement of the user [4]. It can receive and send information to most devices, and even through the internet to command the specific electronic device. The languages used for programming include C, C++, Python etc[5].

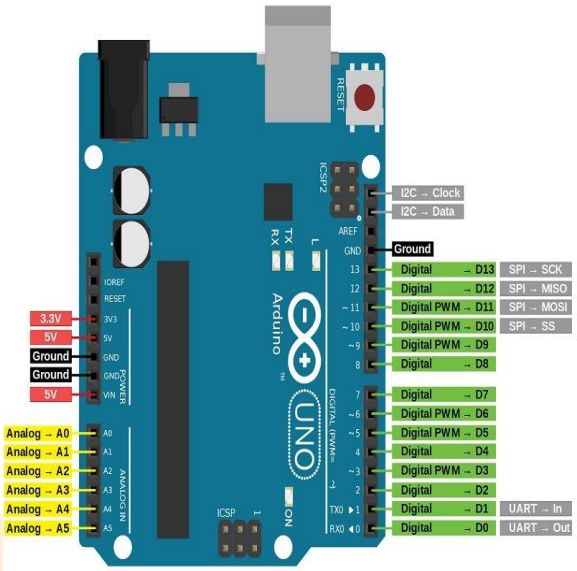

Fig. 1. Image depicts the pin configuration of micro-controller Arduino [6]

C. Ultrasonic Sensor

An electronic device that is used for measuring the distance between the target object and the sensor [7]. It emits the ultrasonic sound waves, and converts the reflected sound into the corresponding electrical signal.

Ultrasonic sensors have two main components:

I. Transmitter- Emits the sound using piezoelectric crystals.
II. Receiver- It encounters the reflected signal.

The sensor measures the time taken by the sound wave between the emission by the transmitter to its contact with the receiver.

$$D=1/2T \; X \; C$$

(where D is the distance, T is the time and C is the speed of sound i.e., 343 meters/second)

In comparison to IR (infrared) sensors in sensing the nearby objects, ultrasonic sensors are not as suspectable to interference of smoke, gas and other airborne particles [8].

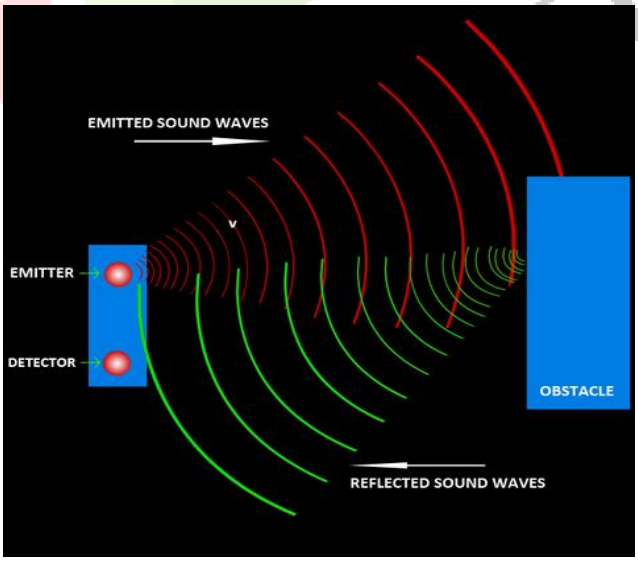

Fig. 2. Waves being transmitted and received by ultrasonic sensor[9]

D. Liquid Crystal Display (LCD) 16X2

LCD is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments [10]. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.

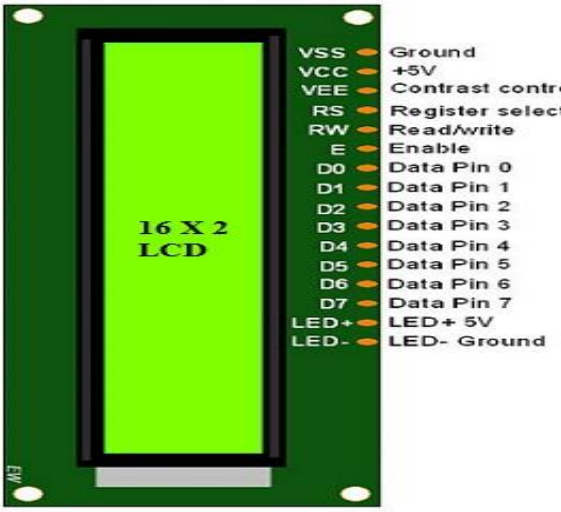

Fig. 3. Pin configuration of LCD 16X2.

III. METHODOLOGY

Initial vehicle arrival check **-:**
As the object or vehicle is arrived at the parking space it is first aligned at the marking position so that we can measure the exact distance of the object.

End marking of vehicle **-:**
As the vehicle is aligned in a particular space provided the initial and final end of the objects are marked for the proper calculation of the distance.

Data processing for pms **-:**
As the object is aligned in a particular position the program is started for the parking management system.

Display of greeting message **-:**
As the program has been started then after a particular delay set in a program a greeting message is displayed on a screen welcoming the customer.

Vehicle size measurement **-:**
As the vehicle is aligned in a particular position the light beam of an ultrasonic sensor is dropped on one end of the vehicle and it is returned back. This light will calculate the particular length of the object or vehicle. The length is then displayed on the screen.

Signal sent to motor -:
The calculated distance is then sent to the Arduino for further calculations and further process to be done. Arduino plays a major role in whole of the system. All the process done is calculated in it and the next steps are initiated with the help of Arduino.
As the distance is measured and calculated with the help of ultrasonic sensor, the Arduino starts the motor and sets it to high and the motor begins to rotate as per the distance provided by the ultrasonic sensor making the particular space required for the vehicle to park.

Setting marker according to size of vehicle **-:**
As the barrier/marker is connected to the motor so as the motor rotates the barrier/marker starts moving automatically. The movement of the barrier makes the space accordingly so that the vehicle could be parked in a particular space provided by the markers.

Cross verification of marker movement with measured size of vehicle **-:**
As the input is given by the Arduino the distance covered will be the same as given by the ultrasonic sensor. The barrier will move the exact distance provided. This will utilize the space efficiently and will only provide the distance as required by object.

Signal to stop marker movement **-:**
As the distance is covered by the motor and barrier is moved according to the particular length the break led starts glowing which tells that the circuit must be switched off as the space required by the vehicle is created.

Stopping of motor movement **-:**
As the led starts blinking it indicates the space has been created by the barrier, and we need to break the circuit so that the rotation of the motor can be stopped and the barrier movement is controlled.

As now the space is created according to the length of the vehicle so the vehicle can be parked in a particular space created. This type of the system will utilize the space efficiently and a greater number of vehicles can be parked in a particular space.

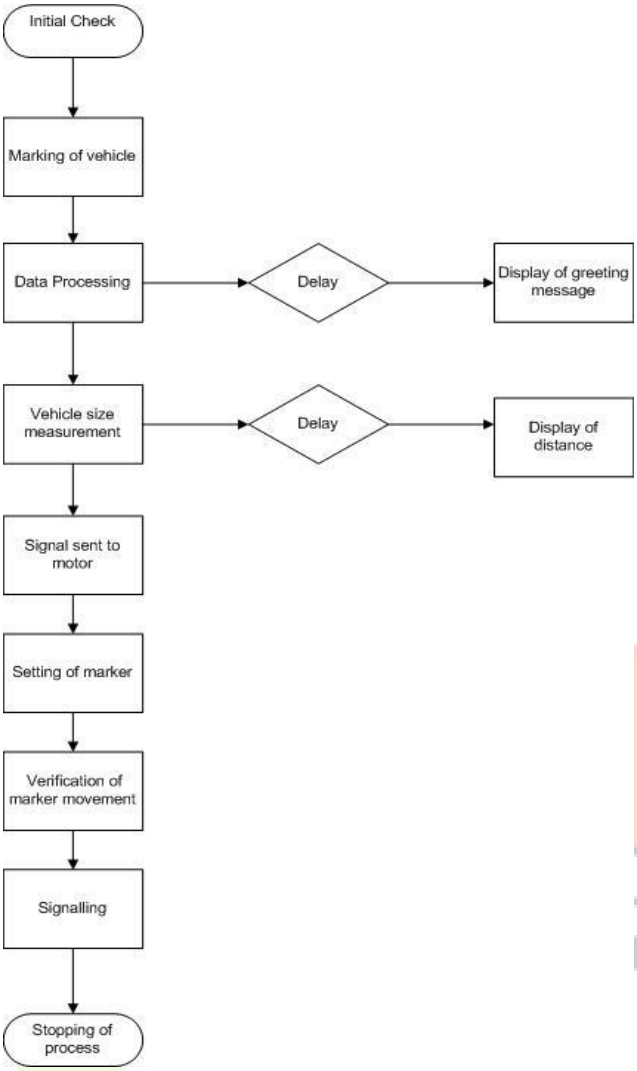

Fig. 4. Flowchart depicts methodology

IV. CIRCUIT DIAGRAM

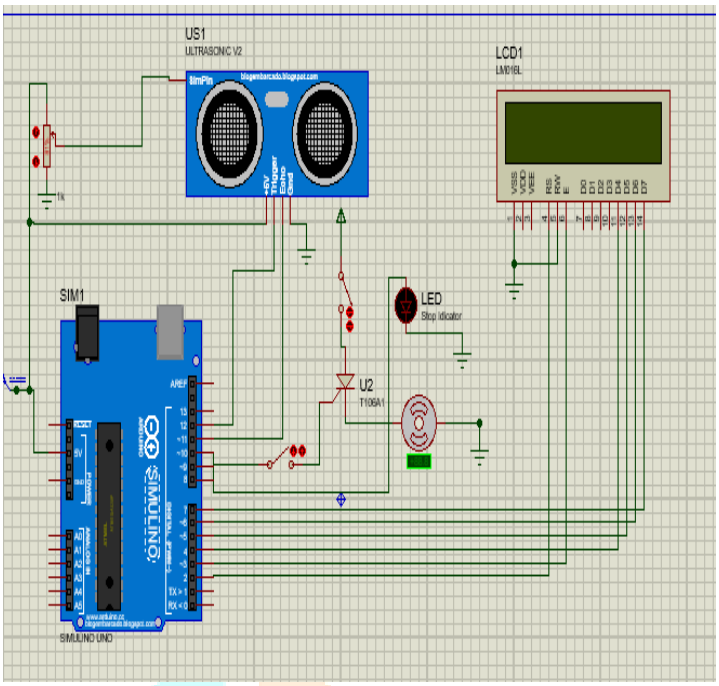

Fig. 5. Proteus based simulation of the technology.

V. CONCLUSION

In today's world with the increase in population, there is also an increase in the number of vehicles being manufactured and hence used.
Anything in access can cause trouble excess of population diminishes our natural resources quickly similarly excess of vehicles consumes a lot of space. There is already a fight going between nations for land and if this goes then it will be not long when there will be internal clashes between nations.
To prevent such a situation, we have created a project which aims to improve space utilization while parking vehicles
Although many modern technologies might have already addressed this issue, they are not economical. We not only focused on space utilization but also on the economical factor by using simple and cheap equipment/devices in our project.
The components used works most on DC (5v or 12v) supply only. The methodology used is also very simple so that the operator can operate on it easily and also debug it in case of any fault. The project also puts minimal effort on the operator to observe the functioning as LCD is provided for guided info.

VI. REFERENCES

[1]. Zhang Bin; Jiang Dalin; Wang Fang; Wan Tingting; , "A design of parking space detector based on video image," Electronic Measurement & Instruments, 2009.

[2]. Boda, V.K.; Nasipuri, A.; Howitt, I.; , "Design considerations for a wireless sensor network for locating parking spaces," SoutheastCon, 2007.

[3]. Yusnita, R.; Fariza N. ; Norazwinawati B.; “Intelligent Parking Space Detection System Based on Image Processing,” International Journal of Innovation, Management and Technology, Vol. 3, No. 3, June 2012.

[4]. Singh, Himal Pratap, Om Prakash Uniyal, and Kireet Joshi. "An Approach to Implement Cost Efficient Space Detection Technology with Lower Complexity for Smart Parking System." Indonesian Journal of Electrical Engineering and Computer Science 15.3 (2015): 415-419.

[5]. Z. Zhang, X. Li, H. Yuan, and F. Yu, “A street parking system using wireless sensor networks,” Int. J. Distrib.Sens. Networks, vol. 9, no. 6, p. 107975, 2013.

[6]. T. Lin, H. Rivano, and F. Le Mouël, “A Survey of Smart Parking Solutions,” IEEE Trans. Intell. Transp. Syst., vol.18, no. 12, pp. 3229–3253, Dec. 2017.

[7]. S. Lee, D. Yoon, and A. Ghosh, “Intelligent parking lot application using wireless sensor networks.,” in CTS,2008, pp. 48–57.

[8]. Najmi Hafizi Bin Zabawi, Sunardi, Kamarul Hawari Ghazali, "Parking lot detection using image processing method", October 2013.

[9]. Banerjee, Sayanti, Pallavi Choudekar, and M. K. Muju."Real time car parking system using image processing."Electronics Computer Technology (ICECT), 2011 3rdInternational Conference on. Vol. 2. IEEE, 2011.

[10]. W.-J. Park, B.-S. Kim, D.-E. Seo, D.-S. Kim, and K.-H.Lee, "Parking space detection using ultrasonic sensor in parking assistance system," in 2008 IEEE intelligent vehicles symposium, 2008, pp. 1039–1044.