A SURVEY ON IOT BASED OBSTACLE AVOIDING ROBOT

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***Abstract*— The goal of the project is to create a robotic vehicle that can avoid obstacles by employing ultrasonic sensors to guide it. The requested procedure is carried out by an ATmega328 microprocessor. A robot is a machine that can complete tasks manually or automatically. The concept suggests building a robotic vehicle with built-in intelligence so that it can steer itself around obstacles. This robotic car was constructed utilizing an AT mega 328 series microcontroller. Any obstruction in front of it is detected by an ultrasonic sensor, which then sends an instruction to the microcontroller. The microcontroller leads the robot to move in a different direction based on the input signal it receives by activating the motors connected to it through a motor driver. Some of the project is built with the IR sensors has its own application so in our project those application is not compactable so we are using ultrasonic sensor.**

***Keywords*— Arduino UNO, motor shield L293d, ultrasonic sensor HC-SR04, DC Motor, servo motor, Bluetooth Sensor Etc.…**

I. INTRODUCTION

Obstacle Avoiding Robots are made to avoid collisions while navigating over uncharted territory. Robot that identifies obstacles in its route and avoids them and starts running again. Robot navigation techniques include things like wall-following, edge recognition, line-following, and many others. Edge detection is a more generic and widely used approach for obstacle avoidance. The necessity for the robot to halt in front of an obstruction in order to obtain a more precise measurement is a drawback of obstacle avoidance based on edge detection. All mobile robots feature some kind of collision avoidance, ranging from primitive algorithms that detect an obstacle and stop the robot in order to avoid a collision, using some sophisticated algorithms that enable the robot to detour obstacles. The latter algorithms are more complex, since they involve detection of an obstacle as well as some kind of quantitative measurements concerning the obstacle's dimensions.

Once these are known, the robot must be guided around the obstruction via the obstacle avoidance algorithm before continuing its path toward the original destination. The robot won't have to halt in front of an obstruction while navigating thanks to the steering algorithm. A micro-controller receives an instruction from an ultrasonic sensor when it detects an obstruction in front of it. As a result, the robots may be able to get around some of the issues with navigation that were outlined above and navigate without incident while operating. if the IR sensor were used Infrared radiation is used by infrared sensors to gauge an object's distance. There are restrictions on the sensor that are present when the light beam detects an object and returns to the receiver at an angle after reflection. Due of their low resistance to light, IR sensors have had limited performance.

No object recognition in the dead zone, such as the 0 to 4 cm dead zone of the Sharp GP2D12 IR distance sensor. Transparent or brightly colored materials might also result in false detection results from IR sensors. Results of detection are also influenced by the weather, and IR sensors' detecting accuracy declines with moisture and humidity. Additionally, IR sensors can detect IR radiation from sunshine, which can result in output inaccuracies that are either correctable or uncorrectable. Additionally, signal losses will occur at the amplifier circuit if an analogue IR sensor is employed. PIR motion sensors, on the other hand, require a lengthy calibration process and are thermal radiation sensitive. In addition, the PIR sensor is not sensitive to very slow motions or to items that are in the standing position.

II. Literature Survey

"Line follower and obstacle avoidance bot using arduino" has been designed and developed by **Aamir Attar, Aadilansari, Abhishek Desai, Shahid Khan, Dipashrisonawale** [1]to create an autonomous robot which intelligently detects the obstacle in its path and navigates according to the actions that user set for it. So this system provides an alternate way to the existing system by replacing skilled labor with robotic machinery, which in turn can handle more patients in less time with better accuracy and a lower per capita cost.

"Obstacle-avoiding robot with IR and PIR motion Sensors" has been designed and developed by **Aniket D. Adhvaryu et al** [2] has proposed that developed robot platform was not designed for specific task but as a general wheeled autonomous platform. It can therefore be used for educational, research or industrial implementation. Students can use it to learn the microcontroller programming using C++, Arduino Uno 1.6.5 compiler, IR and PIR sensors characteristics, motor driving circuit and signal condition circuit design. Research on obstacle avoidance robot at the polytechnic level can help students to develop communication, technical skills and teamwork. The design of such robot is very flexible and various methods can be adapted for another implementation. It shows that PIR sensors are more sensitive compared to IR sensors while detecting human being.

"Obstacle Avoidance Robotic Vehicle Using Ultrasonic Sensor, Android and Bluetooth for Obstacle Detection" has been designed and developed by **Vaghela et.al** [3] has mentioned that enormous amount of work has been done on wireless gesture controlling of robots. Various methodologies have been analyzed and reviewed with their merits and demerits under various operational and functional strategies. Thus, it can be concluded that features like user friendly interface, International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org NCESC - 2018 Conference Proceedings Volume 6, Issue 13 Special Issue - 2018 1 light weight and portability of android OS based smart phone has overtaken the sophistication of technologies like programmable glove, static cameras etc., making them obsolete. Although recent researches in this field have made wireless gesture controlling a ubiquitous phenomenon, it needs to acquire more focus in relevant areas of applications like home appliances, wheelchairs, artificial nurses, table top screens etc. in a collaborative manner.

"Obstacle Avoidance Robot" has been designed and developed by **Paul Kinsky, Quan Zhou** [4] mentioned that robot with a few mechanical components to add two more functions to the main body, namely the laptop holder and the camera holder. AT89S52 development board is designed, developed and tested in a large scale, which was used to control the motors smoothly. the cameras with relatively low cost are fixed and adjusted on the camera holder for good calibration of the computer vision. Users establish the serial communication method between the upper laptop and the lower development board with USB port. The laptop will send out a signal of the motor condition to the development board.

"Obstacle avoidance car" has been designed and developed by **FaizaTabassum, et.al** [5] has mentioned that Obstacle Avoidance Car successfully detects and avoids obstacles. Simple algorithms used to steer and reducing the turning radius, successfully navigated the vehicle. In conclusion, the group successfully interfaced every component that was originally planned. Timer interrupts for IR pulse generation. Obstacle detection using IR transceiver. Servo mechanism using PWM. Steering system using Lego and Servo.

Lalit Goyal el at.[6] proposed the concept of obstacle avoidance can be taken from the line following robot. This line following robot can move in vertical, horizontal and diagonal way to complete its journey. This paper discusses the pseudo code of the proposed C-approach for reaching the target. According to given algorithm, the robot moves first diagonally then vertically and then horizontally to reach the target. Robot repeats this sequence until it reaches the target. For given obstacles and robot, there are eight possible placements of target: Bottom Right, Top Right, Top Left, Bottom Left, Horizontal Left, Horizontal Right, Vertical Top and Vertical Bottom. The path which robot takes also determines a huge role for its efficient way. The work presented here shows that C-approach based algorithm for solving problem of robot navigation has less path length and requires less time taken to reach the target than the Fuzzy logic-based algorithm. C-approach based algorithms are better than Fuzzy logic-based algorithms. The problem in this approach is that sometimes robot might get trapped in a cycle and does not reach the target. The c-based algorithm has limited scope of only movement as the line robot.

Vignesh R el at.[7] proposed the use of best first search algorithm can be used to find the optimal path. This paper presents the design and implementation of an autonomous mobile robot for indoor purposes using an approach that minimizes the travel time. The robot uses a grid-based map representation and the wave front algorithm to build representations of the indoor environment. The A* search algorithm has been used to carve out optimal paths. An obstacle detection strategy determines the presence of an obstacle and its location. The use of best first search algorithm to find the short path is exceptional method but the use of VFH and HIMM method is quite difficult.

Kyomin Jung el at.[8] has proposed that a single robot can be of limited help. Thus, the use of decentralized control mobile robot for maximum coverage can also be beneficial. Map making involves generating a map of unknown environment for the purpose of navigating efficiently using sensor data.This paper utilizes movement information of the obstacle. The robot predicts a furore trace of a sensed moving obstacle using past few histories. The decentralization control increases the number of robots used and the area of coverage is increased. The use of complex algorithm and environment is used up to minimum level.

Emelia Cpumin el at.[9] proposed that the complex environment can be difficult to trace. This paper refers to the model of a parallel robot, with three-point guidance. This robot belongs to the family of mechanisms endowed with closed kinematic chains which have three points of guidance, called parallel mechanisms. It has six degrees of freedom which are given by the position and orientation of the end effector. Avoiding an obstacle by the method presented in this paper involves a deliberately erroneous training, as part of the training examples. The use of the fuzzy based methodology for WMR obstacle avoidance is used for.

III. METHODLOGY

The basic block diagram for the implementation of the project is as shown in figure1.

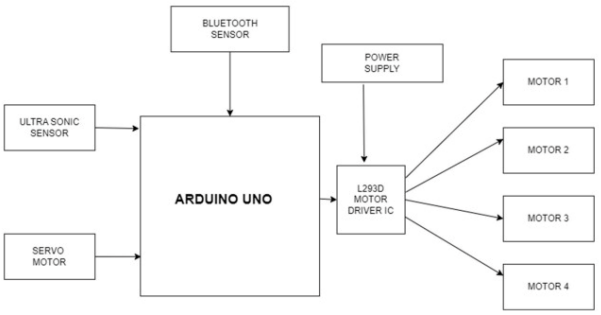

Fig 1. Block Diagram of the system

The HC-SR04 ultrasonic sensor uses a sonar system to measure distance to an object, similar to how bats do it. From around 2 cm to 400 cm, or 1 foot to 13 feet, it provides outstanding non-contact range detection. Neither sunshine nor dark objects have an impact on its operation. The signal is brief and high frequency and is sent by the ultrasonic sensor. If they identify an item, they return the echo signal that is input to the sensor through the Echo pin by reflecting it. First, the operator sets the Trigger and Echo pins to a low beginning position before moving the robot forward. The microcontroller will receive information as high from the echo pin when an obstruction is identified. The distance from the obstacle is calculated using the pulse-in function. Every time the function starts timing as it waits for the pin to go high, timing is terminated when the pin goes low. If a complete pulse was not received within the

timeout, it returns the pulse length in microseconds. The timing has been established, which means it provides the pulse's length and will reveal timing issues in shorter pulses. Pulses of a duration of 10 microseconds to 3 minutes are considered.

It translates into a distance once the time has been established. When an object is moderately distant, the robot slows down and makes a left turn. If an obstacle is on the left side, it does a right turn.

If the distance of object is short then speed of robot gets reduced and will turn in backward direction and then can go in left or right direction. This robot was built with an Arduino development board on which microcontroller is placed.

Arduino board is connected with DC Motor through Motor driver board which provides power to the actuators. Actuators are used to move robot in Forward, Backward, Left and Right directions. The brief description of inputs pins for movement of robot is given in below in table. The movement of robot will be stop whenever there is an obstacle is present on its path which can be detected by ultrasonic sensors. Ultrasonic sensors give time in length to the microcontroller as an input for further actions.

A. Obstacle Avoidance Sensors

There are several different sensors that may be used to detect barriers. Among the most well-liked sensors are: Sonar, cameras that can be used for computer vision, infrared (IR), and ultrasonic sensors. It can measure the distance between about thousands and hundreds of points in its area of view. Ultrasonic sensors are being used in the robot's design for obstacle recognition and avoidance. When an obstruction is recognized, the ultrasonic sensors constantly transmit frequency signals, which are then reflected back and used as input by the sensor.

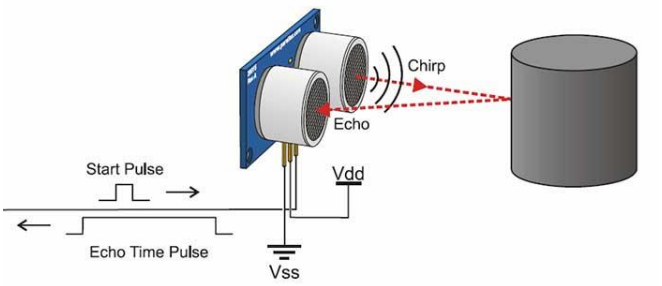

Fig 2. Working of Ultrasonic Sensor

The ultrasonic sensor consists of a multi vibrator, which fixed at its base. The multi vibrator is combination of a resonator and vibrator the ultrasonic waves generated by the vibration are delivers to the resonator. Ultrasonic sensor actually consists of two parts: the emitter which produces a 40 kHz sound wave and detector which detects 40 kHz sound wave and sends electrical signal back to the microcontroller. HC-SR04 ultrasonic sensors are used which consist of 4 pins VCC, Trigger, Echo and GND

Features of Ultrasonic Sensor:

1. Compact and light weight
2. High sensitivity and high pressure
3. High reliability
4. Power consumption of 20mA
5. Pulse in/out communication
6. Narrow acceptance angle
7. Provides exact, non-contact separation estimations within 2cm to 3m
8. The explosion point LED shows estimations in advancement
9. 3-pin header makes it simple to connect utilizing a servo development link

IV. APPLICATIONS

1. Applied to portable robot navigation systems
2. Applied to domestic tasks like automatic vacuum cleaning
3. Used in hazardous conditions where human encroachment would be fatal.
4. Automatic traffic signal switching
5. An alert for intruders
6. parking meters and access controls for counting devices
7. Automobile back-sonar

V. FLOW CHART

The flow chart for how the obstacle-avoidance robot operates is shown in Figure 3. It starts by looking for obstacles within 50 cm. If there is an obstruction, the vehicle stops, rotates to the left, and looks for anything that is closer than 50 cm. The answer to the check is either yes or no. Yes, indicating that there is an object that is 50 cm or closer. No, which indicates that no objects have been found within 50 cm. The robot may simply move forward if there is nothing within 50 cm of it because the way is clear. The robot must engage in obstacle avoidance if something is more than 50 cm away. Stopping the robot is the first step in the obstacle avoidance process! The robot will crash if you don't quickly stop it! The robot must determine its best course of action after coming to a standstill. In a manner similar to how you should when crossing the road, it accomplishes this by looking in both ways. The robot takes a reading while turning left, right, and left again. Another check is made to determine the appropriate course of action. If going left is the best course of action, you must first turn around and head back. The robot just travels forward because it is already oriented in the appropriate direction if moving right is the best course of action.

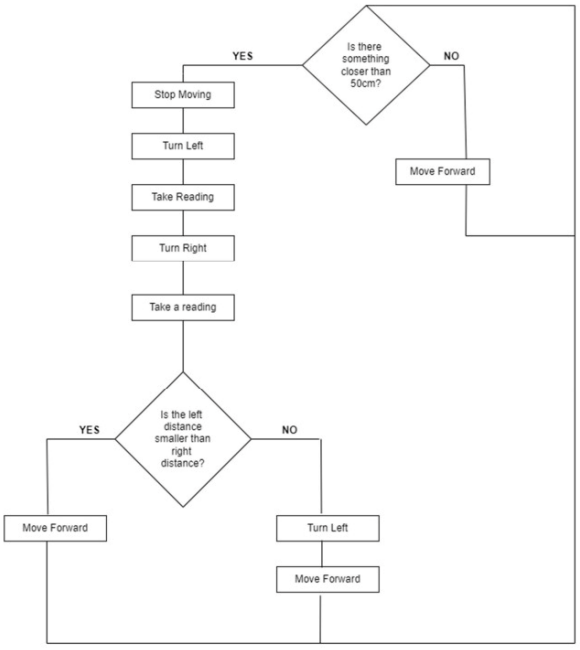

Fig. 3. Flow chart of obstacle avoidance robot

VI. RESULT

The obstacle avoidance robot's results are achieved using Arduino. If the robot is moving ahead and encounters an obstruction, it checks other directions before moving forward in those cases. Ultrasonic sensors are used to detect impediments. The ultrasonic sensor was rotated by a servo motor.

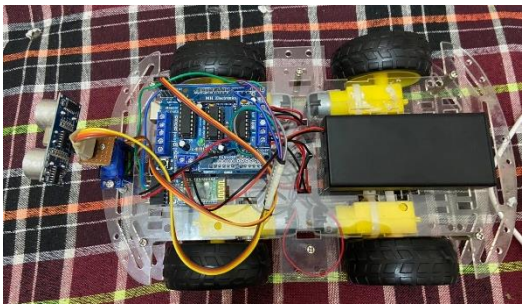

Fig 4. Top view of the model

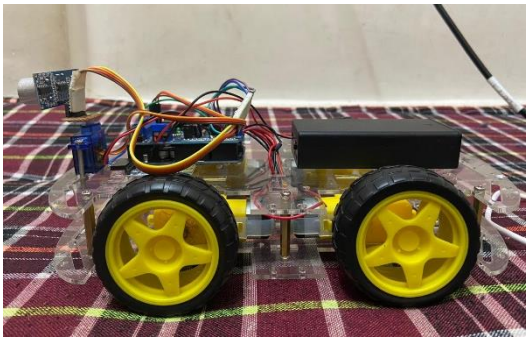

Fig 5. Side view of the model

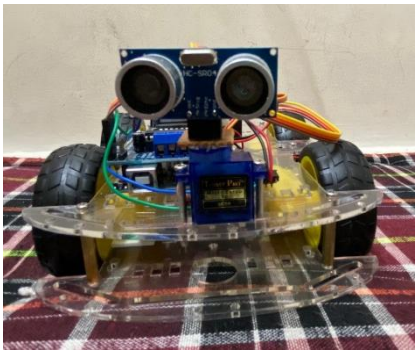

Fig 6. Front view of the model

VII. CONCLUSION AND FUTURE SCOPE

This project developed an obstacle avoiding robot to detect and avoid obstacles in its path. The robot is built on the Arduino platform for data processing and its software counterpart helped to communicate with the robot to send parameters for guiding movement. For obstacle detection,
three ultrasonic distance sensors were used that provided a wider field of detection. The robot is fully autonomous and after the initial loading of the code, it requires no user intervention during its operation. When placed in unknown environment with obstacles, it moved while avoiding all obstacles with considerable accuracy. In order to optimize the movement of the robot, we have many considerations for improvement. However, most of these ideas will cost more money and time as well. In future cameras can be used to detect the obstacle however, it is better to get CCD or industrial use ones to get clear and fast pictures. Even the ones we mentioned in the camera holder part will be better because of the special software.

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