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Bluetooth Controlled Solar Grass Cutter using IOT Application

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Abstract: *The basic project idea is to develop a grass-cutting robot controlled with help of the android application. Here the Bluetooth module is used to connect raspberry pi with the phone and in which the reading of the ultrasonic sensor is stored on IOT platform i.e think speak. Previously the grass cutter machines are operated by fuel which is costly. Here the solar panel is utilised to charge the battery so that it doesn't have to be charged externally. The sun-based energy source is more straightforward to utilize, more profitable contrasted with other energy and it is not difficult to work. By the use of solar panels, we can use sunlight to generate electricity free of cost. The solar panel is used to charge the battery for grass cutting purposes. The movement of the machine is totally controlled by using the Android app. The controlling device of the system is Raspberry pi. Bluetooth module and DC motors are interfaced to the Raspberry pi. The data received from the android phone application by the Bluetooth module is given as an input to the Raspberry pi and the controller acts accordingly on the DC motor of the solar grass cutter. And also here at the input, we have connected an ultrasonic sensor for obstacle detection whenever the obstacle is detected the raspberry pi sends the command to stop the machine in its place and the reading of the ultrasonic sensor is stored on the cloud.*

Keywords: *Raspberry pi, Solar panel, Bluetooth module, Wi-Fi module, Dc motors.*

I. INTRODUCTION

Robotization is beneficial at many stages of human life. The attractiveness of any hotel, residence, park, meeting hall, etc. is enhanced by the finely shaped trimmed grass. As a result, maintaining the status of any house or hotel requires consistent lawn trimming [1]. Manual grass cutting is feasible with humans, but it generally takes a lot of their time and energy. Furthermore, manual grass mowing is inefficient and frequently results in non-uniform grass structure. To prevent all of these problems, it is preferable to utilise an automatic grass-cutting robot that can be controlled via a smartphone. [4]. And also nowadays the rate of the fuel is increased and using grass cutter which uses fuel will be costly. So to reduce the cost of fuel solar panels are used [2,3].

In this, we have described the latest features and technology used in grass cutters with help of IoT and Bluetooth. The Thing in IoT may be someone with a screen, for instance, protests that are given out an information science address and can aggregate and move information over a relationship without manual assistance [6]. This grass cutter has a unique function in that it can be operated from an Android phone and will automatically stop when an impediment is identified[5]. And the reading of the sensor is stored in the cloud with help of a wifi module. We can even operate it using our mobile phone, which is a very ubiquitous device that everyone has in their pockets [10]. To control the movement of the machine in this device, we utilise a Bluetooth terminal app. A mechanism known as a servo motor is being offered for the up and down motion of grasscutter [9]. An ultrasonic sensor is utilised to identify the obstacle's location and signal the arm to react. Finally, we've come to talk about the energy consumption of this device. We utilised a solar panel and a battery with a 12V capacity [8].

The proposed sun-based grass cutters are harmless to the ecosystem; it keeps the climate perfect and solid. The battery will charge from the sun using a solar panel [3]. The non-skilled person also can handle it easily by using simple switches or by predetermined programming it can be easily handled and controlled with less period of time[5]. It is highly efficient and accurate because it detects the obstacle and changes the directions or stops functioning as per instruction given. Therefore, the equipment can be protected from damage and reduce the risk to humans [11]. This knowledge can be used in the agricultural field in the future.

II. LITERATURE REVIEW

Sultana et al. have represented A Review on Smart IoT based Gesture Controlled Grass Cutting Vehicle this paper focuses on how to control the machine using hand gesture.in this paper, they have used Arduino as well as raspberry pi controller and which increases the cost of the machine. Also, the system is a little complicated to understand. In this, they have used a battery to drive the motor which is connected to the solar panel. The limitations in it are that the project became costly and the system is complicated [1].

Manimegalai et al. have represented Automatic Solar Powered Grass Cutter Incorporated with Alphabet Printing and Pesticide Sprayer in this paper they have used the alphabetic printing and pestical sprayer and also the solar panel for battery charging purpose with this cutter the alphabet printing is done on grass but its drawback is that we can give only alphabetical shape to grass we are not able to cover the whole lawn[2]. Habib et al. have represented PID controller based automatic solar powerdriven grass cutting machine in this they have used PID controllers for controlling purpose but the drawback of this project is it will not stop the moving of blades when sudden obstacle will detected which can harm the animals or humans[3].

Paala et al. have represented Android controlled lawn mower using bluetooth and WiFi connection. In this they have used the bluetooth and wi fi for controlling the direction of motor but no obstacle detection is done so if the sudden obstacle occurs it will not able to stop at its place[4]. Zhou et al. have represented Research on path planning algorithm of intelligent mowing robot used in large airport lawn in this they have used the p-d algorithm for path planning but the system became to much complicated and the cost is also increased[5]. Adeodu et al. have represented Development of an Embedded Obstacle Avoidance and Path Planning Autonomous Solar Grass Cutting Robot for Semi-Structured Outdoor Environment in this they have developed the lawn mower with application of path planning and also the obstacle detection. But the system is complicated and not easy to handel[6].

Jagdale et al. have represented Android Controlled Solar based Grass Cutter Robot. In this paper they have used Bluetooth for controlling purpose and Arduino AT mega 328P for controlling purpose in this with the help of Bluetooth they have controlled the direction of the motor. But its accuracy is less[7].

Gupta et al. have represented IoT based solar grass cutter. This paper focuses on the IoT application i.e how to use IoT application to control the grass cutter with the help of an android phone in this they have used Bluetooth to connect the android phone to the controller[8]. Kubendran et al. have represented A Fully Automated Lawn Mower Using Solar Pane. In this paper, they have maximum focus on how to use the solar panels to charge the battery when it gets discharged. But the accuracy is less grass cutting[9]. Ismail et al. have represented the Design and Development of Smart Solar Grass Cutter. In this paper writers have introduced the new development of grass cutter and the smart way to cut the grass accurately[10].

Aralwad et al. have represented Solar Grass Cutter Using Bluetooth” In this paper the writer has used Atmega 328,IR sensor for controlling and for detecting the obstacle here they have shown how the Bluetooth is used for controlling the robot[11].

III.PROPOSED METHODOLOGY

We consulted a variety of sources for the fabrication of an IoT-based solar lawn mower. Different ideas were evaluated before designing the grass cutter. From the survey, we got to know different challenges which are faced by normal grass cutters in terms of accessing electricity also the normal solar grass cutter needs a lot of human effort based on these challenges we have developed the solar grass cutter using IoT. The Raspberry Pi controller is used to control the solar grass cutter, which is made up of an induction motor, a battery, blades, and an induction motor. And for charging purposes, we have used a solar panel that charges the battery whenever it gets discharged. the Dc motors are connected to blades for cutting purposes. This is done by the combined effect of the cutting sharp edges' mechanical activity and the robot's forward push. The system is powered by an electrical switch that connects the induction motor to the battery and completes the circuit. The Ultrasonic sensor is determining the course to prevent hitting any obstacles or causing harm to the machine. And with the help of the Bluetooth terminal app, we can control the direction of motors. And the reading of the Ultrasonic sensor is stored on the think speak cloud.

Figure (1), illustrate the operation of IoT based solar grass cutter on the input side of grass cutter the ultrasonic sensor are connected for obstacle sensing. The battery is connected to a solar panel for charging purposes whenever the battery will get discharged with the help of a solar panel it will get charge again.

And the Bluetooth module is used to connect the raspberry pi to the android phone so machine can be controlled with the help of the android phone. And here as we can see at the output we have connected the LCD display so whenever the obstacle is detected how much distance the obstacle is there will be displayed on the LCD display. And the reading of the Ultrasonic sensor is stored on the think speak cloud with help of the wi-fi module. At the output, the DC motors are connected to the motor driver.

The table 1 shows the components which we have used for hardware and in figure 2 the working of model can be understand as in the flow chart we can see that first we will start the relay button to start the motor and then the initialization will be done to move the robot after that if the obstacle will detected then the motor will stop moving at its place.

As shown in figure 1 the motor is connected to the power supply so that it can get 12v. Here we have used 2 motor drivers and 3 motors in which 1 is for cutter and another is for wheels. Here the Bluetooth model is used to connect to the phone so that we can control the robot by sending the command from the phone using the Bluetooth terminal app

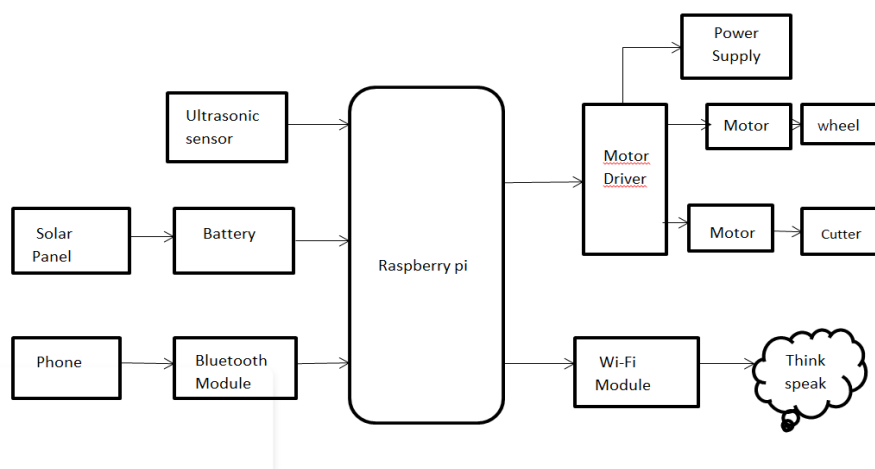


Fig. 1 Block diagram of purposed methodology

Table 1: Hardware Component Specification

COMPONENTS	SPECIFICATION
Ultrasonic Sensor	<ul style="list-style-type: none"> Operating voltage:+5V Theoretical Measuring Distance: 2cm to 450cm Practical Measuring Distance: 2cm to 80cm Accuracy: 3mm Operating Current: <15mA Operating Frequency: 40Hz
Motors	<ul style="list-style-type: none"> 60 RPM motors for wheels 150 RPM motor is used for rotation of the blade
Raspberry pi	<ul style="list-style-type: none"> It runs at 1.2 GHz USB Port : 4 Network:10/100Mbps Ethernet and 802.11n Wireless LAN
Motor Driver	<ul style="list-style-type: none"> Motor channels:2 Maximum Power:25W
Bluetooth Module	<ul style="list-style-type: none"> Operating Power Supply:3.3V to 6V DC Range:15meter
Solar Panel	<ul style="list-style-type: none"> System uses 3Watt solar panel.
Power Supply	<ul style="list-style-type: none"> 12V

A. Software Explanation

For controlling the machine from the android phone we have used the Bluetooth terminal app and to store the reading of the ultrasonic sensors we have used the IoT platform called Thinkspeak. The Bluetooth terminal app is a line-oriented terminal/console for microcontrollers, Arduino, and other devices having a serial / UART interface that are linked to your Android device using a Bluetooth to serial converter. Bluetooth Terminal can be used both as a server to connect to client devices and receive data from them and as a client to connect to other devices. Here we have used the Bluetooth terminal app to connect our phone to our device and send commands from the phone. This application can send and get orders by means of Bluetooth, you can utilize it to investigate your gadgets and projects. ThingSpeak is a cloud-based IoT examination stage management that allows you to total, envision, and break down live data streams. You can use your devices to communicate information to ThingSpeak, make real-time perceptions of live data, and trigger alarms. Here on the Thingspeak application, we have stored the reading of ultrasonic sensors.

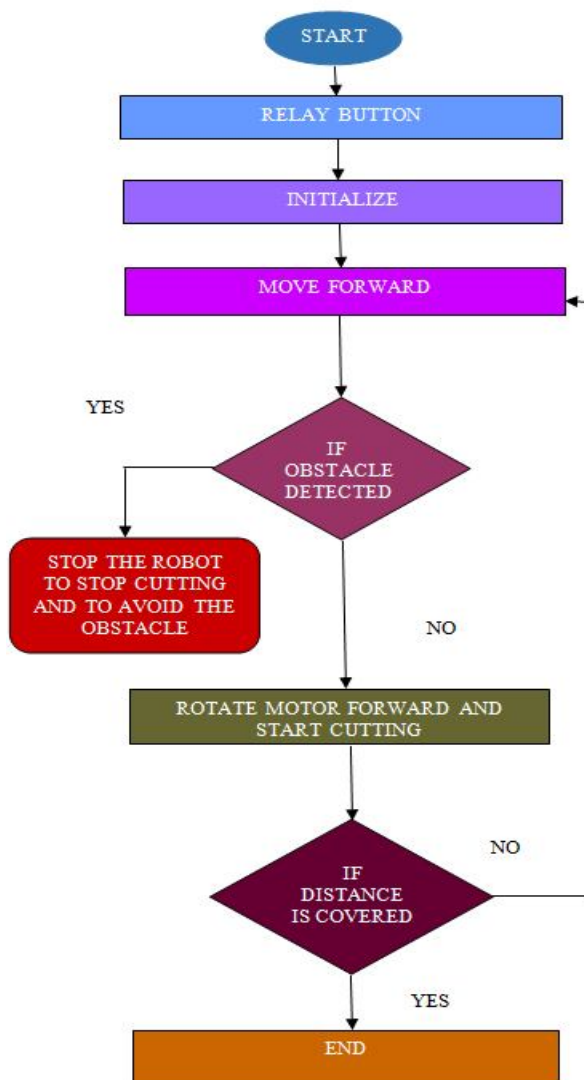


Fig. 2 Flow chart for methodology

IV. RESULT

Now a days energy plays an very important role in lot of peoples life. Here the solar panel is used for charging the battery when it gets discharged. Here we can control the grass cutter with the help of Android phone so that we can cut the grass in any shape we want and even we can cut the grass without much human efforts. For the simulation we have used the proteus software in it we have did the simulation in which we have shown when obstacle gets near to Ultrasonic sensors the distance between the obstacle and robot will be displayed on the LCD.

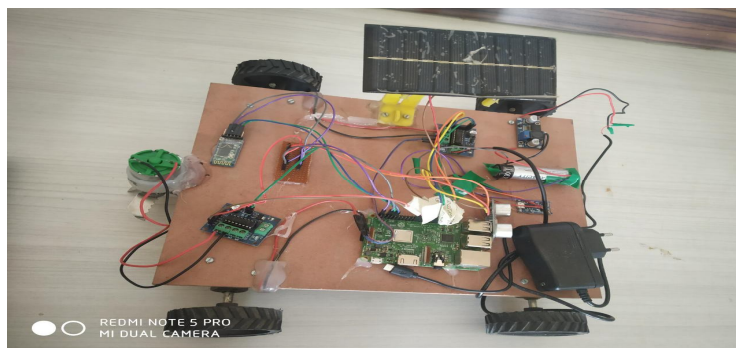


Fig.3 Result

V. CONCLUSION AND FUTURE SCOPE

With the help of Bluetooth module the man power will required less and the cost of the robot will also decrease. The unskilled person can also easily use this robot for grass cutting purpose. And we can also check the reading of Ultrasonic sensor on Thinkspak. In the future, AV mechanisation and image processing might be added to fully automate the system. In future we can cut the grass in different size by adjusting the blades.

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