EFFECTIVE TECHNIQUE FOR SOLAR GRASS CUTTER ROBOT

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Abstract - In this paper, the main purpose is to design a programmable robot that can be worked wirelessly using an android via Bluetooth for a specific distance which is capable of cutting the grass in certain required shapes, the equipment work with assistant of the motor power supply using battery, the robot is dual powered with a solar panel and rechargeable battery. Two ultrasonic obstacle detectors are used to detect obstacles, if any obstacle is found in front of the robot while travelling, it avoids the obstacle by taking a right or left turns automatically appropriately thereby avoiding collision. In this work we use simplified version of C^{++} language as the programming language for the process of the Arduino Uno micro controller board.

Keywords - Ultrasonic Sensor, Solar Panel, Bluetooth, DC Motor.,

I. INTRODUCTION

In paper [1], the author enhanced a new lawn cuuting equipment. The system consits of a solar powered revival release reaper that uses suitable power to work itself. This robot is provided with 34 solar cells established on top of the frameworks scheme and has the ability of processing possessions up to 13, 500 Sq-ft. The device works at the same rule as the Lawn Ranger exclude it employs a cabel under the surface of a persons lawn. The mower utulize this cabel along with its sensors to permit the robot to shunt around while conservation the system on the path. The mower will keep to run as long as the mower has capacity, from the sun. The robot is provided with elastic absorber that when stimulated backs the mower up and keeps the robot on a several tracks.

In paper [2], authors have automated instrumnet for clipping the grass. The machine comprises of linear blade which is worked with the aid of the motor which is using battery as power supply. Power supply and battery can be used for chargung the battery. Infra red sensor is used for sensing any obstecles in the track. If there is any changing in the track, then the instrument employing free trend sensor and discover the fresh way to departure. The main advantage of this device the damage of this device is avoided. In paper [3], authors presented a review of researches done on the subject of automated tractor. An autonomous tractor is a car that can worke with least posiible human monitoring, self-propelled and controlled automatically along a required route. The advantges from such a device are benefit for agriculture industry by decreasing the time and work cost, as well as enhancing output efficiency

In paper [4], author illustrated how an automatic lawn cutter can aid the employer to clip the grass in their lawn with minimal labors. Distinct sensors are used, they will discover and evade targets and humans while clipping . The major goal of this automatic lawn cutter is that the employer can assign the region that is to be clipped and also the height of grass.

In paper [5], author developed an autonomous lawn mower that will permit the employers to clip their grass with less time and labor. Disimilar other robotic lawn mowers in the shop, this scheme needs no circumfernce wires to keep the robot within the lawn. Through an array of sensors, this robot will not only remain within the lawn, but it will also evade and discover targets and humans. This scheme is yet in the prototype speriod due to financial and time reconstructions.

In paper [6], author invented grass clipping tool with rotary blades by utilizing solar energy.The solar energy is trapped in the photovoltaic cell to produce electricity. The cells may be gathered in the shape of plates or arrays. Solar panel is designed such that to absorb high intensity from the sun. The major job of solar charger is rised current during batteries after that solar is charging and releasing when they are totally charged.

II. HARDWARE

Arduino Mega:

The Arduino Mega 2560, which is shown in Fig. 1 is another microcontroller broad based on ATmega2560 which has 256 KB flash memory for storing code. ATmega2560 also makes it easier to connect Arduino mega chip with computer by providing four hardware UARTs (Universal Asynchronous Transmitter-Receiver). One of the most important features of Arduino mega is that it contains.

Many pins (54 pins) with each one of them can be used as an input or output (I/O). This feature makes it suitable for projects that need many inputs and outputs. Programming this chip is based on Arduino language. It's characterized by the ability of changing the code without needing to use hardware.This chip is powered in two ways: USB connection with computer or by connecting it to an external AC-to-DC power supply or battery. The existence of these

two methods increased the simplicity and flexibility in using this chip.

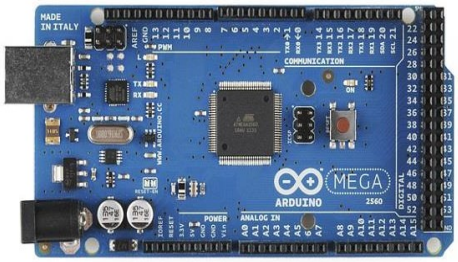


Fig. 1: Arduino mega

Solar Panel: DC 18V Solar Panel 4.2W 18V 130 x 200 Solar Charger Polycrystalline Siliconfor Battery Charger high quality, which is shown in Fig. 2.



Fig. 2: Solar Panel

LM2577: Auto step down step up Single Ended Primary Inductor Converter (SEPIC) Input: 3 to 35 V Output: 1.25V to 30V, the maximum current is 2A, transformation efficiency 92%, the operating frequency 50KHz, Output ripple 40mV, Temperature range from: -40° to +85°, the main feature of this module: low Erythrocyte Sedimentation Rate (ESR)Sanyo, appropriate forall types of processing. Perfect for solar, which is shown in Fig. 3.

Color Sensor: TCS 3200 Color Sensor is complete color detector, including a TAOS TCS3200, (RGB) Red Green Blue sensor chip and 4 white Light Emitting Diode (LED). The color sensor scales an almost infinite area of visible colors. The main implementations of this type of color sensors are: test strip reading, ambient light sensing, calibration, and color identification.

The TCS 3200 has a layout of photo detectors, each with either a red, green, or blue filter, or no filter (net). The filters of each color are divided equally throughout the layout to remove position alignment among the colors. Inside the module is an oscillator which generates a square-wave output whose frequency is proportional to the intensity of the chosen color. This chip is shown in Fig 5.



Fig. 3: DC-DC Solar Voltage LM2577

MPU 6050:

The characteristic of this module is shown in Fig. 4, MPU 6050 combines a Micro Electro Systems (MEMS) with three axis gyroscope and three axis accelerometer on a single microchip.

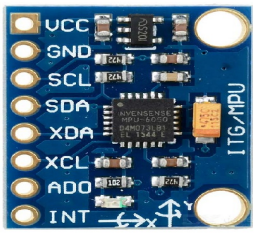


Fig. 4: MPU6050



Fig. 5: Color Sensor

Ultrasonic sensor HC-SR04:

Ultrasonic sensor consists of a 4 pin module, whose pin names are: Trigger, Echo and Ground respectively. This sensor is a very widespread sensor utilized in numerous purposes, where computing range or sensing articles are desired as shown in Fig 6. The device composes from two eyes in the front which forms the Ultrasonic transmitter and Receiver. The sensor runs with the natural equation given by:

Distance = Speed × Time.



Fig. 6: Ultrasonic sensor HC-SR04

Motor Driver L 298:

The Motor Shield is based on the L298 as shown in Fig. 7, which is a dual full-bridge driver prepared to drive inductive loads such as relays, solenoids, Direct Current (DC) and stepping motors. The main function of this module is to drive two DC motors, controlling the speed and direction of each one independently.

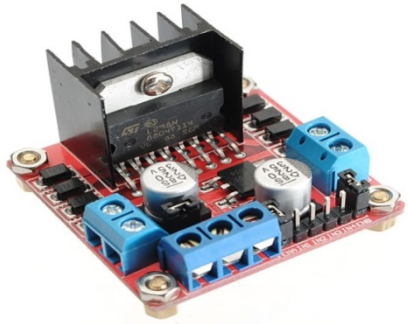


Fig. 7: L298 Motor Driver

For our design also we used the following equipment's: on-off switch, DC gear motor, rechargeable lead acid battery and wires.

Robot Movement:

The controller is programmed to walk in a straight line and when it detects any obstacle, moves away from it and returns to the track and completes the end of the piece. The console gives commands to the engines so that one stops working so that it can turn 180 degrees and then complete the path in a straight line. The robot stops at the end of the piece.

CONCLUSION

In this paper, we design a new solar crass cutter robot, the main objectives of this project is to develop an easy to use control system, so that anyone automatically cut grass, build a cheap little robot compared to those in the market. Using a powerful Arduino microcontroller can handle more data. Reduce the time and effort on users during the cut process. The size of robot is compact and portable. Also we using a lighter batteries and solar panels to make the robot much less weight. Finally, we used engines with high torque and lower speed. The disadvantages are that sometimes response of the system is slow so in real times high DSP processors is needed to faster the system, extra weight of the robot where it needs great torque movement to remove the grass with small time.

Item	Price
Arduino MEGA 2560 with cable	**20**
Triple Axis Accelerometer and Gyro Breakout	**6**
Ultrasonic Sensor	**6**
DC gear motor 12VDC 300RPM all steel-gear	**30**
Motor drive- L298 motor drive	**5**
Color sensor -TCS3200	**7**
Lead acid battery	**15**
solar panel	**70**
DC-DC step Up step down Converter Module Solar Voltage LM2577	**8**
ON-OFF Switch	**2**
WEIRS AND JUMPERS	**3**
DIY PROTOTYPE PCB	**2**
Total costs for project	**175 $**

Table I. Components list for robot's cost

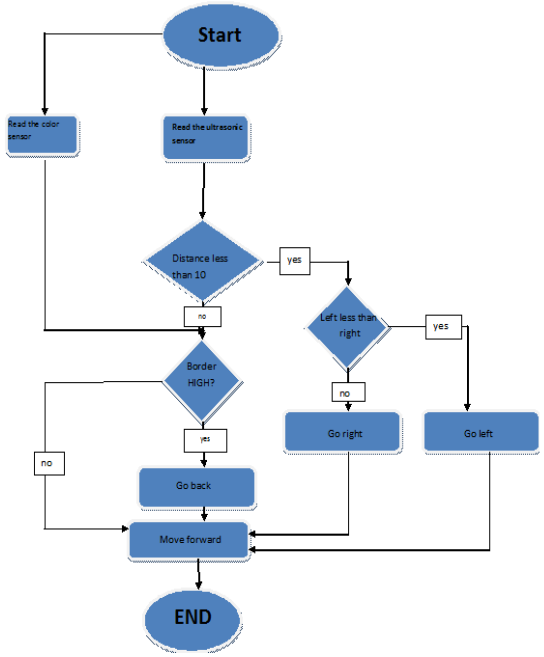


Fig. 8: Flow Chart for the robot movement

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