Solar Power Autonomous Lawn Mover

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Abstract: The present technology commonly used for trimming the grass is by using the manually handle device. In this paper we have automated the machine for trimming the grass. The device consists of linear blade which is operated with the help of the motor the power supply for the motor is by using battery. The battery can be charge by using power supply and solar panel. In case of any obstacles in the path it is sensed by using ultrasonic sensor. Due to the continuous increase in the cost of fuel and the effect of emission of gases from the burnt fuel into the atmosphere, this necessitated the use of the abundant solar energy from the sun as a source of power to drive a lawn mower. A visual, wireless, autonomous mower system via machine vision is designed which collect the image information of locale dynamically by the real-time camera.

Keywords: Battery, Power Supply, Solar Panel, PC machine

1. INTRODUCTION

In recent years, outdoor robots become more populous. The autonomous mower is a kind of wheeled outdoor robots which has the most practicality. By applying this kind of robots, one can save much time in mowing of golf coursed or prairies. It possess the function of obstacle avoidance and optimal planning capability. We design visual wireless independent lawn mower based on machine vision [1] Hardware of the system mainly consists of PC machine, vision subsystem, mowing subsystem, wireless communication subsystem. The device consists of linear blade which is operated with the help of the motor the power supply for the motor is by using battery. The battery can be charge by using power supply and solar panel. Solar powered lawn mower can be described as the application of solar energy to power an electric motor which in turn rotates a blade which does the mowing of a lawn. Making the process of cutting grass easier over the years, many individuals have added modification to the original design speed, efficiency and power of a mowing machine. The solar powered lawnmower is an improvement on cordless electric lawn mower. The sun provides sustainable amount of the energy used for various purposes on earth for atmospheric system. The solar powered lawnmower is based on the same principle that other early inventions of lawn mowers works on. The difference is just the application of the energy source. It uses the photovoltaic panel to generate the energy needed to power the mower. It is assumed that a lawnmower using solar as the energy source will address a number of issues that the standard internal combustion engine and electric motors lawn mowers do not. A lawnmower with solar energy will be easier to use, it eliminates down time by frequent trips to the gas station for fill ups and danger associated with gasoline spillage. The dangerous emissions generated by the gasoline spillage and that of the internal combustion engine into the atmosphere are eliminated. The solar powered lawnmower will help to reduce air pollution as well as noise pollution produced by other types of lawnmowers. In addition, it will help to reduce the running cost of using and maintaining a lawnmower.

2. EXISTING SYSTEM

The portable Electric Grass cutter machine with electric power supply is used in this system. The battery gets charged through the power supply. The power supply is given by the charging circuit. The switch is used for the operation of system by charging the battery. There is only one temperature sensor is used in this system. It is used to sense the temperature under working condition and gives the output to the comparator which compares this temperature with the present value. Relay is used as the protection device for the system. The DC motor is interfaced with the blades for cutting purpose [2]. A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The input of a DC motor is current/voltage and its output is torque. Height adjustment purpose is not proposed in this system. Here the path planning scheme is not implemented.
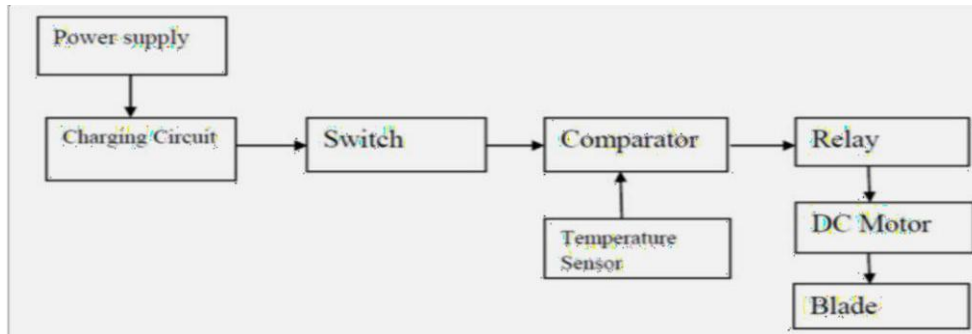
Fig1. Block Diagram of Existing System

3. PROPOSED SYSTEM

The prototype will also be automatic and will run on a charged battery with no cords to interfere with operation .This cordless electric lawn mower includes Wi-Fi control capability which has high efficiency than a robotic lawn mower with sensor capability. There is no need for gas, oil, and engine to use this device because it is solar powered .Lawn mowers are useful pieces of machinery that employ a revolving blade to cut a lawn at a smooth, even length. This self-propelling lawn mower design is comprised of Wi-Fi control and autonomous capability that is user friendly so most consumers will be able to use this. The ESP8266 Wi-Fi module is used to access the Wi-Fi network. The microcontroller used is, ARM controller which has the high storage capacity. It stores the data permanently and having high efficiency. It is a 64 bit microcontroller which controls the movement of motor through drivers. A real time Wi-Fi camera is used for image processing for the required lawn area. There are two sensors are used, the PIR sensor and ultrasonic sensor. PIR sensor is used to detect the moving objects to avoid danger and the ultrasonic sensor is to detect the obstacles using the ultrasonic waves produced. Three ultrasonic sensors are fixed on both sides and frond portion of the lawn mower. The12V battery source which gets charged through the solar energy by t 40W solar panel there are five motors and two motor drivers are used. The motor drivers are L298 and L293. Two motors are for the movement of the lawn mower which is interfaced with the L298 driver. The remaining three motors for height adjustment of the knife, rotation of knife and for the flap movement. The L293 diver is interfaced with the motor for the movement of knife and flap. The cutting edges of knife are very smooth and accurate .With the help of this lawn mower which is a machine with revolving blades to help us cutting lawns at even length, people can easily maintain and beautify their lawns and gardens without any chassle .The lawn mower is safe to use, as well as efficient because it solar powered and cordless. The self propelling solar powered robotic lawn mower is environmentally friendly.
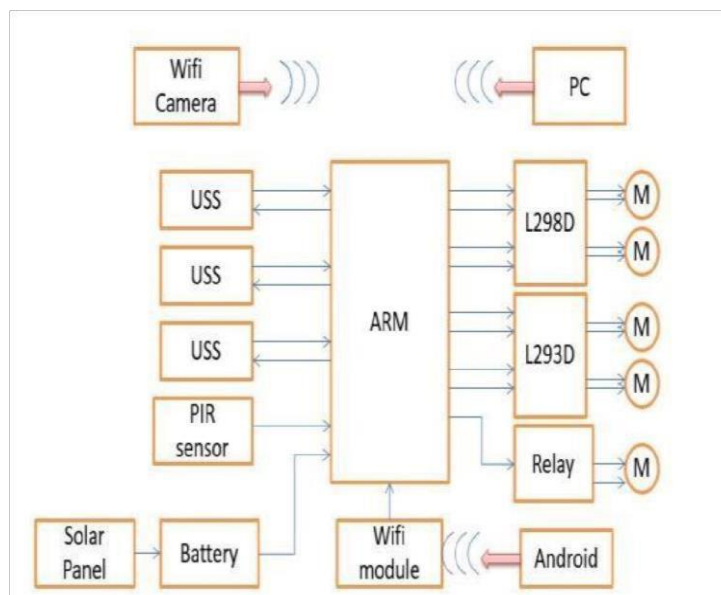

Fig 2. Block Diagram of Proposed System
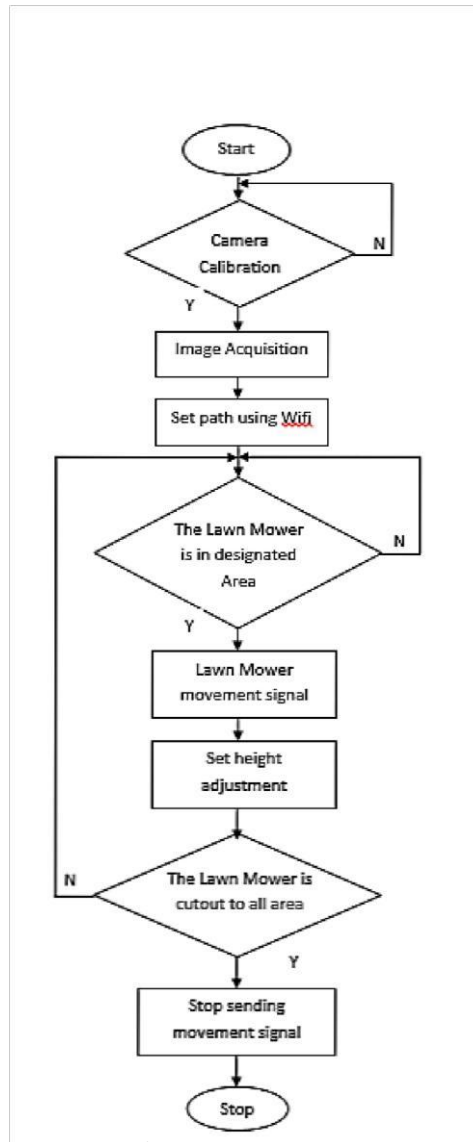
4. FLOWCHART

A. Host computer part

Fig3. Host Computer Part

Algorithm

Step 1   : Start
Step 2   : Check for camera calibration, If calibrated go to
Step 3   : else repeat the step.
Step 3   : Image Acquisition
Step 4   : Set area to be trimmed using Wi-Fi
Step 5   : Check whether the lawn mower is in the designated area, If Yes, go to next step else repeat the current step.
Step 6   : Passing the Lawn mower movement signal.
Step 8   : Check whether the Lawn mower is cutout to all area, If yes go to next step else to step 5
Step 9   : Stop sending movement signal
Step 10   : Stop

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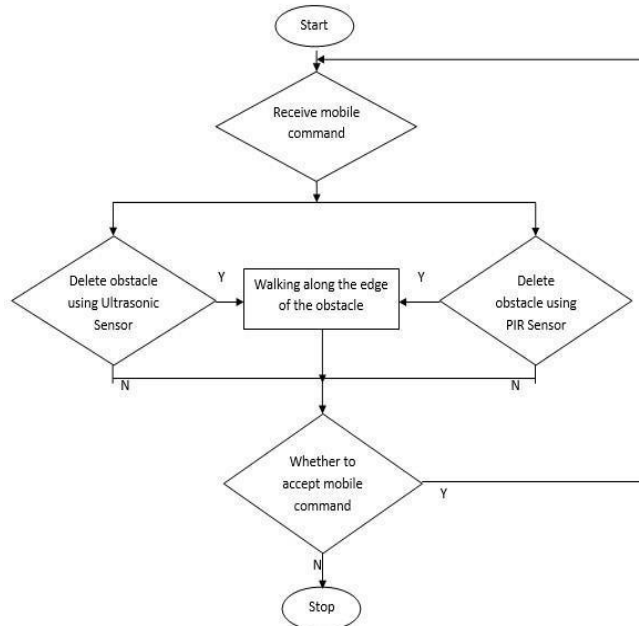**Vol. 1, Special Issue 2, March 2018**

B. Working part

Fig4. Working Part

ALGORITHM

Step 1   : Start
Step 2   : Check for mobile command
Step 3   : Check for obstacles using US sensor, If yes go to step 5 else to step 4
Step 4   : Check for obstacles using PIR sensor, If yes go to step 5 else to step 6
Step 5   : Walking along the edge of the obstacle
Step 6   : Check whether to accept mobile command, If yes go to step 7 else go to step 2
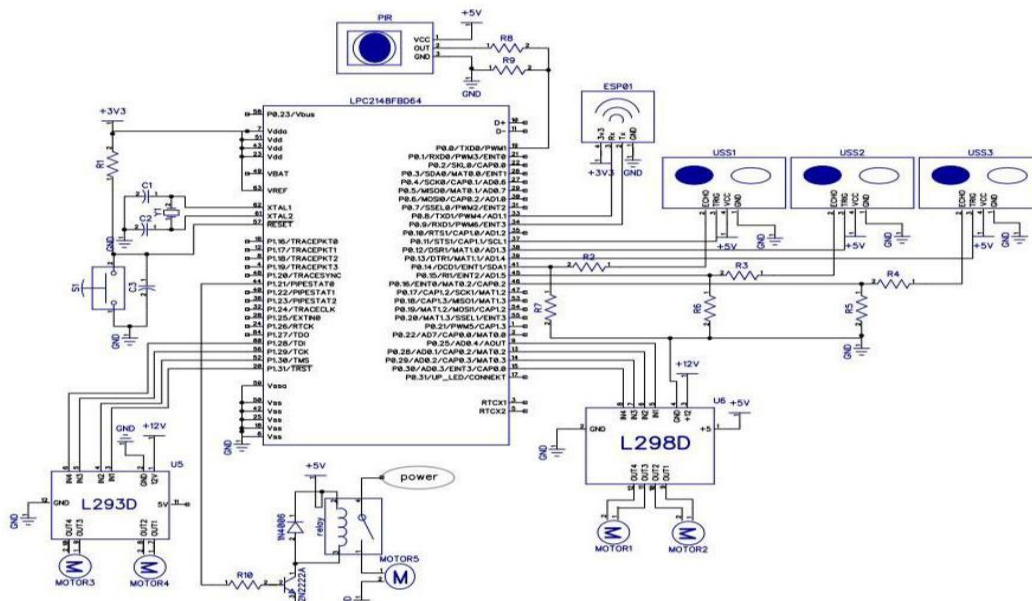Step 7   : Stop

5. CIRCUIT DIAGRAM

Fig5. Circuit Diagram

A.   Power supply: A basic power supply is constituted by four elements. A transformer, a rectifier, a filter and a regulator put together. Transformer is used to step up or step down (usually to step down) the supply voltage as per the need of the electronic devices and circuits to be supplied by the dc power supply. Rectifier is a device which converts the sinusoidal ac voltage into either positive or negative pulsating dc. The output voltage from rectifier circuit has a pulsating character i.e., it contain unwanted ac components along with dc components. To reduce ac component from the rectifier output voltage a filter circuit is required. Thus filter is a device which passes dc component to the load and blocks ac components of the rectifier output. The magnitude of output dc voltage may vary with the variation of either the input ac voltage or the magnitude of load current. So at the output of a rectifier filter combination a voltage regulator is required to provide an almost constant dc voltage at the output of the regulator. However, it also rejects any ac ripple voltage that is not removed by the filter.
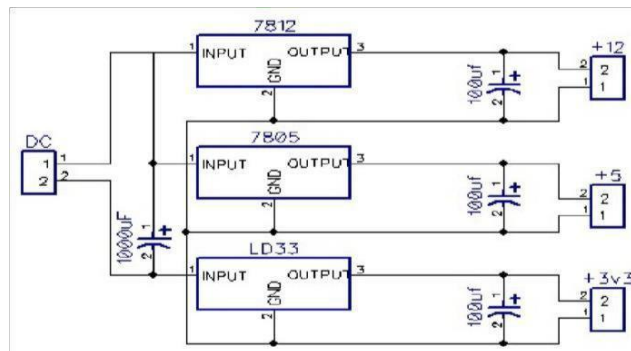

Fig6. Power Supply

B. Ultrasonic sensor

Fig 7.Ultra Sonic Sensor

Ultrasonic is the sound wave beyond the human ability of 20KHZ. Ultrasonic transmitter emitted an ultrasonic wave in one direction, and started timing when it launched. Ultrasonic spread in the air, and woulFigd return immediately when it encountered obstacles on the way. At last, the ultrasonic receiver would stop timing when it received the reflected wave. As ultrasonic spread velocity is 340m/s in the air, based on the timer record t, we can calculate the distance(s) between the obstacle and transmitter, namely:

$$S = 340/2 * t$$

Set low the trig and echo port when the module initializes, firstly, transmit at least 10µs high level pulse to the trig pin (module automatically sends eight 40K square wave), and then wait to capture the rising edge output by echo port, at the same time, read the time of the counter, which is the ultrasonic running time in the air according to the formula: Test distance = ½ high level time * ultrasonic spreading velocity in air.

C. L293D Driver: Motors require more current than the controller, hence a motor driver is incorporated. Motor driver is basically a current amplifier which takes a low current signal from the microcontroller and gives a proportional current signal which can control and drive the motor. The L293D IC receives signal from the microprocessor and transmit the relative signal to the motor. It switches its output signal according to the input received from the micro controller. L293D contains two inbuilt H-bridge driver circuit. The two DC motor operation can be controlled by input logic at pin 2 and 7 and 10 and 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise direction respectively. Enable pin 1 and 9 must be high for motors to start operating. When Enable input is high, the associated driver gets enabled. As a result, the output becomes active and work in phase with their input.

D. L298D Driver: The L298 is an integrated monolithic circuit in a 15-lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.
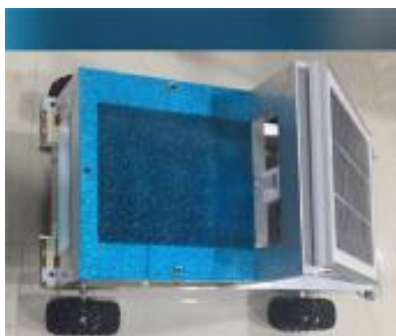
6. RESULTS AND DISCUSSION

Fig8. Prototype

This project is an autonomous lawn mower that will allow the user to the ability to cut their grass with minimal effort. Unlike other robotic lawn mowers on the market, this design requires no perimeter wires to maintain the robot within the lawn. Through an array of sensors, this robot will not only stay on the lawn, it will avoid and detect objects and humans. This design is still in the prototype stage due to financial and time constraints. It uses the photovoltaic panel to generate the energy needed to power the mower. This cordless electric lawn mower includes remote control capability which is less expensive than a robotic lawn mower with sensor capability. This robot lawn mower design is safe to use. With its remote control capability the lawn mower stays within the boundaries of the lawn because the user is able to have fun control over the lawn mower with the controller. This prototype is also environmentally friendly. There is no need for gas, oil, and engine to use this device because it is electric powered

7. CONCLUSION

In this paper, we study the application of machine vision in the lawn mower, design a visual, wireless, independent mower system based on machine vision, solve the problem of complex operation and covering the lawn area of traditional intelligent mower, the practical application shows the effectiveness of the proposed scheme. The adjustable blade system can improve the efficiency and also minimize the working time. This autonomous lawnmower installed with a GPS mode which provide the real-time position for self-navigation of the mower. Since this is solar powered it will meet the challenge of environmental production and low cost of operation since there is no cost for fueling. A solar powered lawn mower has been developed for the use of residences and establishments that have lawns where tractor driven mowers could not be used.

FUTURE SCOPE

This project can be implemented with enormous results in large scale. The size can be reduced to make it compact. The efficiency can be improved by increasing the battery capacity .More sensors can be incorporated for accurate results and improved automation. The programming can be enhanced to make the device perform different operations.

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[3]   R. K. Mandloi, Rajesh Gupta & A. Rehman, Design, Development and Testing of Low Capital and Operational Cost Shrub Cutting Machine, Journal of Rangeland Science, (2011) Vol. 1, No. 2.Planning has been verified with experiments. In future a grass collection box can be mounted.
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