Fabrication Of Multi Purpose Robot For Grass Cutting And Floor Cleaing With Wire Less Communication

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Abstract--*Grass cutter machines have become very popular today. Most of the times, grass cutter machines are used for soft grass furnishing. In a time where technology is merging with environmental awareness, consumers are looking for ways to contribute to the relief of their own carbon footprints. Pollution is man-made and can be seen in our own daily lives, more specifically in our own homes. Herein, we propose a model of the automatic grass cutting machine powered through solar energy, (non-renewable energy). Automatic grass cutting machine is a machine which is going to perform the grass cutting operation on its own. This model reduces both environment and noise pollution. Our new design for an old and outdated habit will help both customer and the environment. This project of a solar powered automatic grass cutter will relieve the consumer from mowing their own lawns and will reduce both environmental and noise pollution. This design is meant to be an alternate green option to the popular and environmentally hazardous fuel powered lawn mower. Ultimately, the consumer will be doing more for the environment while doing less work in their daily lives. The hope is to keep working on this project until a suitable design can be implemented and then be ultimately placed on the market.*

Key words: *Grass cutter, Solar power automated*

I. INTRODUCTION

Main objective of an engineer is to reduce human effort. Even though the lawn mower is connected with solar panel human effort is not reduced. To reduce human effort grass cutter automated. Lawn mower consumes lot of energy and human effort. By using automated   grass cutter energy and human effort are reduced.Automatic solar grass cutter the name itself indicates that the grass cutter is automated and works using solar power. Solar energy is one of the renewable energy source.Hemant Ingale and N.N.Kasatwere expressed that, sun powered power is totally ideal for use with water system frameworks for gardens, portions, nurseries, and polytonal. At the point when the sun is sparkling you require more water thus the sun based power is there for the pump. By including an appropriate profound cycle relaxation/marine battery, power can be made accessible 24 hours for each day empowering watering at night - the best time to water plants in the mid-year with the goal that the water has an opportunity to splash into the ground.

II. MAJOR COMPONENTS TO BE USED

a) *SOLAR PANEL*:

Photo-voltaic effect is the waged opinion of a solar cell, from the micro to the Megawatt level the photo-voltaic renewable energy most power powerful changing energy   nice-looking non-conventional energy foundations of established reliability. In actual usage, renewable plates are interconnected in sequences and similar mixtures to from modules. These modules are hermetically closed for production against corrosion, moisture, pollution and weathering combination of suitable modules constitutes on array.

b) *DC MOTOR:*

A DC motor is a device which converts electric motor power from direct current (DC) to mechanical energy. Current in rotor is changed by commentator and also be stationary in space. This is how the relative angle between the stator and rotor magnetic flux is maintained near 90 degrees, which generates the maximum torque. DC motors having a voltage induced revolving armature winding, non-rotating armature magnetic field and a static magnetic field windings or permanent magnet. There are different connections of the field and the armature winding provided unlike inherent speed or torque regulation features. The speed of a DC motor is regulated by altering the voltage applied to the armature or by altering the magnetic field current.

Figure 1: DC Motor

c) **RELAY:**

Relay is electrically operated switch. The use of relay in this machine is to control the motor connected to machine and a blade. Relays find extensive use initial computers to operate logical performance and telephone exchange. Relays With calibrated multiple performance coils and sometimes operating characteristic are used protect electrical circuit from heavy load, in modern electric power systems these operation are performed by digital equipment called protection relays. Relay also called electromagnetic switch and relay used to low amperage to huge amperage circuit. The less amperage circuit controlled electromagnetic device electromagnetic equipment. "Close (or) open" the huge amperage circuit.

d) **ARDUINO UNO:**

A microcontroller board that consists of Atmel microcontroller chip, power supply on printed board and USB port. Here USB port is used to communicate with PC. By using programmed standard board, this Arduino reduces the control system generating steps. And also it does not require any suitable PCB design and implementation. Following are some features of this board

1) It is an open source hardware, so any one can accessed and modified easily as per the requirement.
2) It is open-source electronics prototyping platform.
3) This is having a single-board microcontroller. So it is more accessible to environment and application interactive objects.
4) It receives the input information from various sensors to sense the environment conditions.

Specifications of Arduino UNO was used to complete fabrication.

Microcontroller	ATmega328
Operating Voltage	5V and 3.3 V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (of which 0.5 KB used by Boot loader)
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

e) **SENSORS:**

It is a device that converts the physical quantity into electrical signal. Ex.: Light sensors transduce light into voltage. In this fabrication project gyroscopic sensor was used. When objects are rotate around the axis they are called angular velocity. The spinning wheel is measured in Revolutions per Second (RPS) or degrees per second (° / s).If you add the sensor to wheel shown above, you can measure the angular speed of z axis. The other two axes did

not measure any rotation.Imagine if wheel spins once per second. It would have an angular velocity of 360 ° / s. The spinning direction of wheel is also essential. Is it clockwise around the axis, or is it counter-clockwise?

Triple axis MEMS gyroscope (ITG-3200) can measure the rotation around three axes x, y, and z. Some Gyros come with single dual axis varieties, but a single chip triple axis gyro is less expensive, and more popular.Gyros are often used on things that are not very fast spinning. Aircrafts (hopefully) do not spin. Instead they rotate a few degrees on each axis. By detecting these small changes gyros help stabilize the flight of the aircraft. Also, note that linear velocity or acceleration of aircraft does not affect measurement of the gyro. Gyros measured the angular momentum.
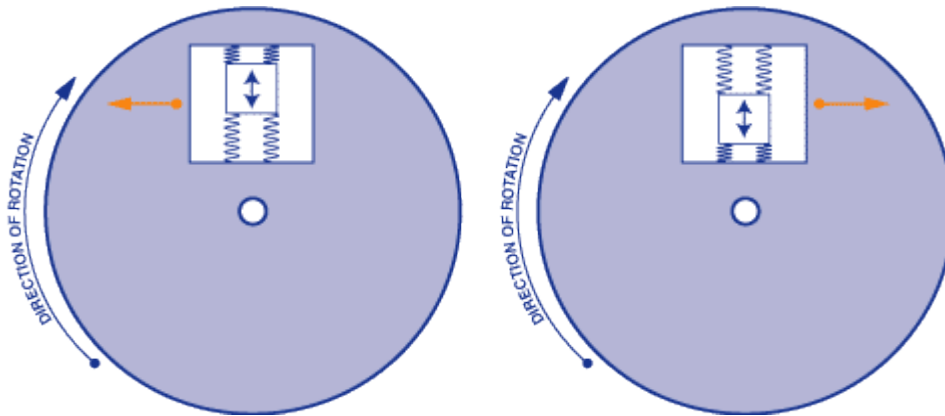
How does gyro sense angular velocity?

Figure 2: Internal operational view of a MEMS gyro sensor

The Gyroscope sensor is small in the MEMS (1 to 100 micrometres) it is equivalent to size of human hair. When the gyro rotates, the small resonance mass changes as angular speed changes. This movement is converted into very low-current electrical signals, improved and read by the source microcontroller.

f) *PLASTIC WHEELS:*

The plastic wheels are used to move grass cutter from one place to another place in an ease manner and these wheels are carried out the entire machine. Advantages with plastic wheels are

- Compact size and portable
- Easy to move from one place to another place
- Operating principle is simple.
- Non-skilled person also operate this machine
- Eco friendly
- no fuel required
- Consume less time to cut grass

Specifications of the wheels used in this project are

Wheel diameter   : 70mm
Weight of the each wheel: 200 grams

g) *HBRIDGE:*

An H-bridge is an electronic circuit which enables DC electric motors to be run forwards or backwards. These circuits are often used in robotics. H-bridges are available as integrated circuits, or can be built from discrete components

The two basic states of a H-bridge. The term "H-bridge" is derived from the typical graphical representation of such a circuit. An H-bridge is built with four switches (solid-state or mechanical). When the switches S1 and S4 (according to the first figure) are closed (and S2 and S3 are open) a positive voltage will be applied across the motor. By opening S1 and S4 switches and closing S2 and S3 switches, this voltage is reversed, allowing reverse operation of the motor.

Using the nomenclature above, the switches S1 and S2 should never be closed at the same time, as this would cause a short circuit on the input voltage source. The same applies to the switches S3 and S4. This condition is known as shoot-through.

OPERATION OF HBRIDGE:

The H-Bridge arrangement is generally used to reverse the polarity of the motor, but can also be used to 'brake' the motor, where the motor comes to a sudden stop, as the motors terminals are shorted, or to let the motor 'free run' to a stop, as the motor is effectively disconnected from the circuit. The following table summarizes operation.

III.   SOLARGRASS CUTTER:

Figure 3: solar grass cutter

The system receives energy from the solar panel and stores in the battery with the help of a solar charge controller. Before switching the system on, it should be kept at bottom right corner to the field. Once the device got switched on, the cutting blades were activated by the microcontroller through the relay. Later the microcontroller signals the L298N driver board to turn the wheels forward and the wheels starts moving straight until it reaches the opposite side of the field. When it approaches the opposite side of the field, ultrasonic sensors fitted to the front senses the distance between the vehicle and the boundary of the field and it closes the boundary, the vehicle takes a perfect left turn. The perfect right angle can be obtained by using gyro sensor. The motors were allowed to take the left turn while the microcontroller continuously measures the gyro sensor values, when it reaches to 90o, the microcontroller will stop the wheels from turning and moves the wheels forward to skip the previously cut area and again turns the wheels for further 90o to make the vehicle parallel to the previously cut path. The vehicle then moves forward until it reaches other end and now it takes a right turn instead of left. This process repeats continuously and the vehicle takes alternate left and right turns until it reaches the other corner of the field.

VI. WORKING PRINCIPLE

a)   *WORKING PRINCIPLE WITH GYRO SENSOR:*

Automatic solar grass cutter the name itself indicates that the grass cutter is automated and works using solar power. Solar energy is one of the renewable energy source. Grass cutter uses the solar energy to power three dc motor where grass cutter blade is connected to one of the dc motors. Two dc motors are connected to run the grass cutter machine. Arduino board works as a microcontroller and controls all the components of the grass cutter. Ultrasonic sensor is used to sense the obstacles. Microcontroller is programmed in such a way that the machine takes left turn twice single turn is 90° accurately i.e U turn when ultrasonic sensor senses the obstacle for the first time. The next it takes right turn as same above and vice-versa. So whenever the automated solar grass cutter is placed in right bottom most corner of a rectangular grass field and switched on then the grass cutter will cut all the grass without human intervention. Gyroscopic sensor is used to take left and right turns. After the ultrasonic sensor sensing the obstacle for the left turn until two and half rotations the left wheel runs backward and the right wheel runs forward then two wheels moves forward. In the same way the automatic solar grass cutter cuts all the grass in the rectangular grass field when placed in bottom most right corner of the field.

b)   *WORKING PRINCIPLE WITH BLUETOOTH:*

As mentioned from above the solar grass cutter can cut the grass only in a rectangular lawn. Grass lawns are different types like circular so it may not be useful in such fields. To overcome this disadvantage a Bluetooth is connected to the radio board. The solar grass cutter is communicated with Bluetooth by using a phone or a laptop but a controller need to control the machine. Four basic commands are used to control the machine all the four are to make the machine turn in desired direction. One new direction is added and that is backward motion for the grass

cutter. If required the grass cutter can come back where the wheels rotates backward motion. After grass is cut the waste is still in the ground. To clean the waste the cutting blade is replaced with brush. In advance the cutting blade is replaced by a floor cleaning cloth. The grass cutter can be used in three way that is grass cutter, cleaner or sweeper.

VI. CONCLUSION

Automated solar grass cutter was fabricated and tested on different grass conditions. The obstacle detecting feature is also tested at different ranges and was connected to a mobile phone via Bluetooth for controlling the motion of the system automatically with in specified range of 10m. The functioning of solar grass cutter was extended to floor cleaning by replacing the brush in place of a blade. The system worked effectively at outdoor conditions for half an hour on fully charged battery and up to one hour with solar energy depending on the sunlight.

At indoor conditions the system works continuously at an average of 30 to 45 minutes. Due to the unavailability of the cooling effect to the microcontroller and the motor driver there is a sudden drop of the power supply and malfunctioning of the system is identified. This can be eliminated by providing an external cooling fan to the setup. The speed of the wheels is maintained at 25 rps as minimum and speed of the blade is maximum of 300rps. Any change in the speeds of motors leads to improper cleaning of the floor and improper cutting of the grass. Based on the road conditions, repeated replacement of the wheels is identified. Since the profile of the blade is straight the improper cutting of the grass is identified and this can be eliminated by designing a inclined blade or assembly of number of cross blades.

To increase the range of the wireless connectivity the Bluetooth is replaced with wifi module and the arduino programming is modified with respect to the module used.