Design and Implementation of Automatic Lawn Cutter

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***Abstract*- The automating lawn cutter is a fully automated grass cutting robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass cutting without the need of any human interaction.. The grass cutter and vehicle motors are interfaced to an 8051 family microcontroller that controls the working of all the motors. It is also interfaced to an ultrasonic sensor for object detection. The microcontroller moves the vehicle motors in forward direction in case no obstacle is detected. On obstacle detection the ultrasonic sensor monitors it and the microcontroller thus stops the grass cuter motor to avoid any damage to the object/human/animal whatever it is. Microcontroller then turns the robotic as long as it gets clear of the object and then moves the grass cutter in forward direction again.**

***Index Terms*- Micro controller, Lawn cutter, Ultrasonic Sensor, Solar Panel, Motor Drivers**

I. INTRODUCTION

Grass cutter machines have become very popular today. Most common machines are used for soft grass furnishing. This project aim at developing the Grass cutter operation and construction. The main parts of the Grass cutting machines are DC motor of 75HP capacity, relay switch for controlling motor, Battery for charging it through solar panel. It is placed in a suitable machine structure. The motor have 18000 rpm and it is connected to the electric supply by the use of a roll of wire. The motor rpm increased by the help of gears. Motor controlled by an electric switch for easy operation. The tempered blades are attached in this machine. The raw materials mainly used are GI sheet, motor, switch, wheel, wire, aluminum sheet, square pipe, paint, insulating material and other standard item like nuts, bolts and reverts. The machines required for manufacturing includes welding machine, grinding machine etc.

Working principle of the grass cutter is providing a high speed rotation to the blade, which helps to cut the grass. The blade will get kinetic energy while increasing the rpm. The cutting edges are very smooth and accurate. Also Electric Grass Cutting Machines are much easier to be used in garden,lawn and grass fields. In order to enhance the beauty of home-lawns and gardens, Grass cutting machines are the best available option in the industry. With the help of a 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 hassle.

Now-a-days, there are plenty of options starting from the simplest push along mower to the most advanced electric grass cutting machine. According to world energy repOort, we get around 80% of our energy from conventional fossil fuels like oil (36%), natural gas (21%) and coal (23%). It is well known that the time is not so far when all these sources will be completely exhausted. So, alternative sources should be used to avoid energy crisis in the nearby future.

So introduce solar energy for the machine process to work. A solar panel is a large flat rectangle, typically somewhere between the size of a radiator and the size of a door, made up of many individual solar energy collectors called solar cells covered with a protective sheet of glass. The cells, each of which is about the size of an adult's palm, are usually octagonal and colored bluish black. Just like the cells in a battery, the cells in a solar panel are designed to generate electricity; but where a battery's cells make electricity from chemicals, a solar panel's cells generate power by capturing sunlight instead.

They are sometimes called photovoltaic cells because they use sunlight ("photo" comes from the Greek word for light) to make electricity (the word "voltaic" is a reference to electricity pioneer Alessandro Volta).

As small engines became more powerful, a new type of lawn mower that could cut larger and longer swaths of grass became more popular. Instead of

cutting grass like scissors cut paper as a reel mower does, the rotary mower spins a horizontal blade around fast enough to cut the grass as it hits it. The blade sits within a casing called a deck, which keeps the grass and other objects from flying in all directions when struck. Typically, the deck rides on four wheels, with a motor sitting on top of it and a bag attached to it to collect the cut grass. The basic version of a rotary mower has a handlebar attached to it that the operator stands behind and pushes to make it move forward. Self-propelled versions have a transmission that turns the wheels using the power of the motor.

1.1 SOLAR ENERGY:

Solar energy is very large, inexhaustible source of energy. The power from the sun interrupted by earth is approximately 1.8/10MW, which are many thousands of times larger than the present consumption rate on the earth of all energy sources.

The quantum of energy India's land area receive from sun is equivalent to 15,000 time sits consumption requirement (500 billion kWh) as projected for 2004. In addition to its size, solar energy has two other factors in its favor. Firstly, unlike fossil fuels and nuclear power, it is an environmentally clean source of energy. Secondly, it is free and available in adequate quantities in almost all parts of the world people live. But there are some problems associated with its. The real challenge in utilizing solar energy is of and economic concern. One has to strive for the development of cheaper methods of collection and storage so that large initial investments required at preset in most applications are reduced, solar energy in India.

A large amount of solar radiation fall on India and for most of the country very few days are without sunshine. India lies within the latitude of 7 N to and 37 N with annual average intensity of solar radiation as 500 to 600 cal/cm/day with more such insulations available in arid and semi-arid regions. Average solar radiation falling on India in arid and semiarid regions is 7.5 K w h/m/day. Solar energy 5× 10 K w h/year potential to meet basic energy needs of teeming millions who live in rural India. Solar energy is an important, clean, cheap and abundantly available renewable energy. The sun radiates heat and light. The heat, light received from the sun supports the environment on the earth through the following well known natural effects.

- Temperature balance on the earth.
- Photo-synthesis by biological plants production of oxygen and organic materials, production of organic chemicals and bio-mass.
- Wind due to unequal heating of water, land surfaces.
- Heating of ocean water: ocean thermal energy (OTEC).
- Waves in ocean: ocean wave energy.
- Tides in ocean: ocean tidal energy (due to gravitational forces)

The sun produces enormous amount of energy of heat and light through sustained nuclear fusion reactions. The solar energy received on the earth in the form of radiation is used for heating and producing an electrical energy.

Among the non-conventional sources of energy solar energy is the most promising. Hence our project is based on the solar energy conversion to mechanical energy to run a grass cutter.

II.LITERATURE SURVEY

The self- powered design objective is to come up with a mower that is portable, durable, easy to operate and maintain. It also aims to design a self-powered mower of electrical source; a cordless electric lawn mower. The heart of the machine is a battery-powered dc electric motor. It is also useful method for our lawn mower. It is similar to our lawn cutter using display[3].

For designing of Automatic Lawn Cutter we referred various literature, papers etc. The review of previous method used given below: In this lawn mower uses an solar based energy source, which is easier to use, more advantageous comparing to other energy source especially for gas based source of power. This is useful to our project [4].

In this hydrogen based lawn mower, the advantage of powering a lawn mower by hydrogen rather than by gasoline is mainly ecological. We not used this for our lawn cutter because it is very old method and many overcome produced from this type lawn cutter [6].

III.DESIGN METHODOLOGY

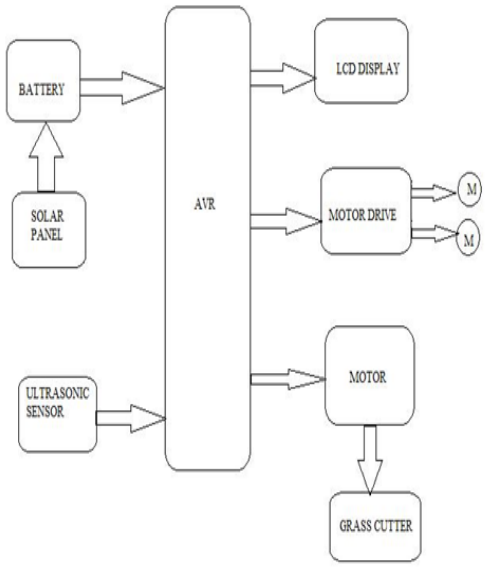


Figure 3.1: Block diagram BLOCK DIAGRAM

EXPLANATION:

Solar panel receives solar energy from the sun and it converts solar energy into electrical energy by photovoltaic principle. Electrical energy is then stored in the battery. The battery used here is rechargeable battery, the vehicle can be powered on either by using solar energy or by using external power supply. Here 12v supply is converted into 6v which is enough to power on and working of our lawn cutter .

Ultrasonic sensor is the eyes of lawn cutter. It is a trans receiver, it will detect the obstacles present in front of it by receiving echo signals and take deviation until obstacles is cleared.

The grass cutter and vehicle motors are interfaced to a microcontroller that controls the working of all the motors.

That is when the obstacle is present the blade should stop rotate and after the obstacle clears the blade should rotate again. It should also take right deviation when obstacles is present so to take right deviation motor 1 should be made forward direction and motor 2 should be made reverse direction.

2*16 LCD display is used, initially it will display initialization message when we power on the vehicle soon after it will display protect title. Once it receives the signal from RF transmitter then vehicle starts moving in forward direction at that time the distance between sensor and obstacle is calculated and that value is displayed using LCD display.

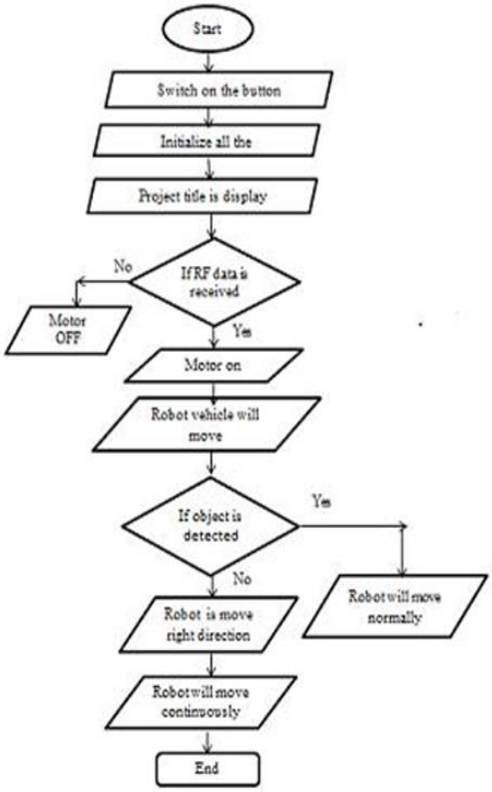


Figure 3.2: Flow chart

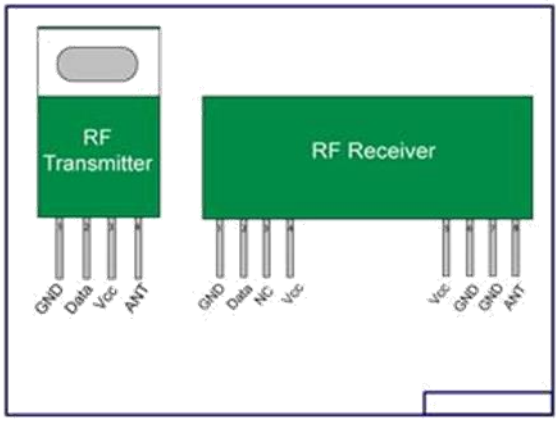


Figure 3.3: RF transmitter and receiver

The RF module as the name suggests operates at radio frequency. The corresponding frequency range varies 30khz and 300Ghz. The digital data is represented as variation in the amplitude of carrier wave, this kind of modulation is known as amplitude shift keying. The transmitter or receiver pair operated at a frequency of 434Mhz. an RF transmitter receiver serial data and transmits it wireless through RF through its antenna connected at pin number 4. The transmission occurs at the rate of 1Kbps-10Kbps. The

transmitted data is receive by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder; the encoder is used for encoding parallel data for transmission feed, while reception is decoded by a decoder.

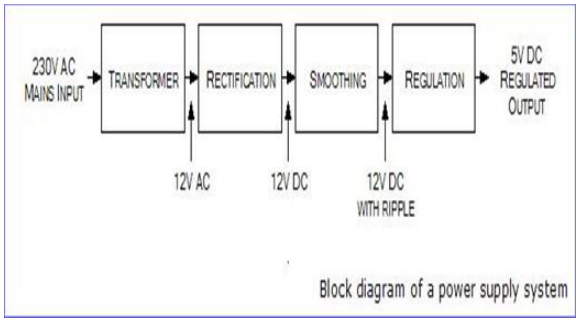


Figure 3.4: Generation of power supply

Transformer – steps down high voltage AC mains to low voltage AC. Rectifier- converts AC to DC but the DC output is varying. Smoothing- smoothness the DC from varying greatly to a small ripple. Regulator- eliminates ripple by setting DC output to a fixed voltage

IV. RESULTS

We are successfully completed this project that is automatic lawn cutter. The robotic vehicle will mown in forward direction automatically to cut the grass uniformly and also calculate the distance of obstacle. If any obstacle is present, it takes deviation towards right direction. After the obstacle is cleared the vehicle moves forward direction automatically to cut the grass.

Figure 4.1: Automatic lawn cutter

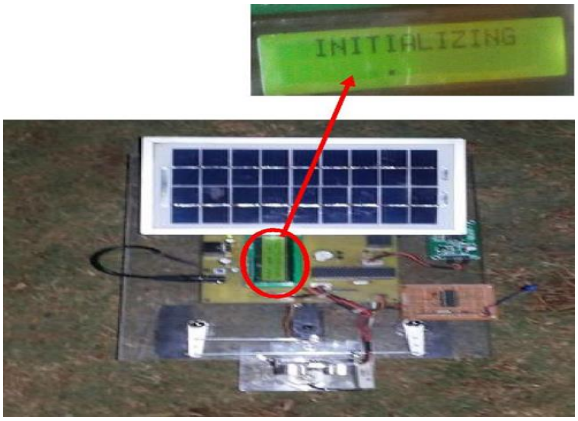
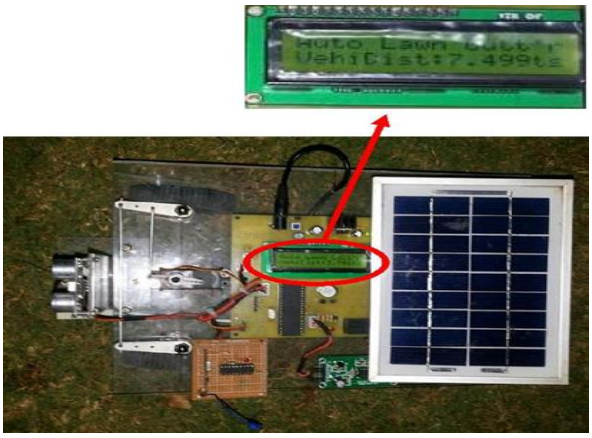


Figure 4.2: Initialization message is displayed when vehicle turns in vehicle



4.3: Displaying measured distance between sensor and obstacle on LCD display

Figure 4.4: Taking deviation when obstacle is present

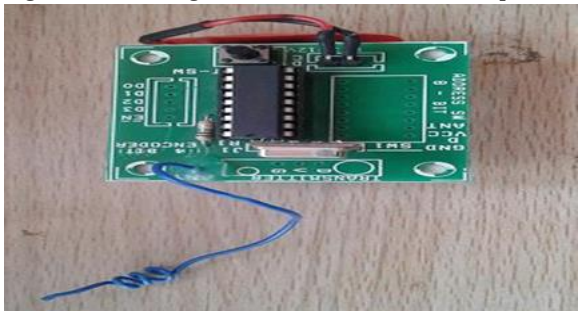


Figure 4.5: RF transmitter

V. CONCLUSION

This lawn mower will meet the challenge of environmental production and low cost of operation since there is no cost for fueling. A lawn mower has been developed for the use of residences and establishments that have lawns where tractor driven mowers could not be used. The machine's capacity is adequate for its purpose. The machine has proved to be a possible replacement for the gasoline powered lawn mowers. We are developed "Automatic Lawn Cutter" by using keypad and LCD display and for this we are using battery hence it works automatically.

VI. FUTURE SCOPE

In future we can implement lawn cutter by specifying the area that is to be mown and also the height of grass as per the requirement.

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