



IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY



VOLUME : 1 ISSUE : 6 Print / Issue Publication Date: 09-Oct-2016



ISSN : 2455-2143



Indexed In



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SOLAR POWERED AUTOMATIC LAWN MOWER

Makare Vikas Ganesh
E & TC department
SITRC, Nashik
Pune University, India

More Anil Sanjay
E & TC department
SITRC, Nashik
Pune University, India

Mugale Maruti Gunderao
E & TC department
SITRC, Nashik
Pune University, India

Patil Aniket Anil
E & TC department
SITRC, Nashik
Pune University, India

Prof. S. Y. Kanawade
Asst. Prof.
E & TC department
SITRC Nashik,
Pune University, India

Abstract— The fully automated solar grass mower is a fully automated grass mowing robotic vehicle powered by solar energy that also avoids obstacles and is capable of fully automated grass mowing without the need of any human interaction. It is an automated system for the purpose of grass mowing. The source is driven from the solar energy by using photovoltaic panels. Rapid growth of various high-tech tools and equipment makes our jobs done comfortable and sophisticated. The DC-DC converter is used to convert the low level DC voltage into the high level DC voltage. High level DC voltage helps to operate the whole system. The system control is done by the microcontroller. Automation is achieved by using sensors and microcontrollers. Wheels and mowing operations are done using DC motors. DC battery is utilized for powering and standby mode operation of the system.

Keywords— Automatic lawn mower, solar based mower, Accelerometer, DC Motors, Lawn Mower using PIC, Solar plate etc.

I. INTRODUCTION

In the time where technology is developed with environmental awareness, consumers are looking for ways to contribute to the relief from pollution. Pollution is man-made and can be seen in our own daily lives, more specifically in our own homes. Fuel powered lawn mowers are in 90% of India homes and they create 5% of the total India pollution. Green technology is being supported by both the government and corporate business. Our new Fuel less Solar Powered Automatic Lawn Mower for an old and outdated habit will

help both the consumer and the environment to reduce pollution.

This project of a solar powered automatic lawn mower will free 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 gas 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. Mowing the lawn with a standard motor powered lawn mower is an inconvenience in terms of heavy weight and no one takes pleasure in it. Motor powered push lawn mowers and riding lawn mowers create noise pollution due to the loud engine, and local air pollution due to the combustion of fuel in the engine. Also, a motor powered engine requires periodic maintenance such as changing the engine oil. Along with motor powered lawn mowers, electric lawn mowers are also hazardous and cannot be easily used by all, mainly the person who has a breathing problem. Also, the electric lawn mower is corded; mowing could prove to be problematic and dangerous. It is not possible to have a lawn mower with a long cord. The solar powered automatic lawn mower is robotic, user friendly, cost efficient, safe to use and environmentally friendly. The prototype will also be automatic and will run on a charged battery with no cords to interfere with operation. This robot lawn mower design is safe to use. There is no need for fuel, and the engine to use this device because it is solar electric powered. The rest of the paper is organized as follows. Proposed embedding and extraction algorithms are explained in section II. Experimental results are presented in section III. Concluding remarks are given in section IV.

II. LITERATURE REVIEW

The lawn mower was invented in 1830 by an engineer named Edwin Beard Budding (1). Budding obtained the idea of the lawn mower after seeing a machine in a local cloth mill which used a cutting cylinder mounted on a bench to trim cloth to make a smooth finish after weaving. Budding realized that a similar concept would enable the cutting of grass if the mechanism could be mounted in a wheeled frame to make the blades rotate close to the lawn's surface (2). This realization allowed Budding to produce lawn mowers made of cast iron. These lawn mowers featured a large rear roller with a cutting cylinder in the front. Cast iron gear wheels transmitted power from the rear roller to the cutting cylinder.

Nowadays, lawn mowers are useful pieces of machinery that employ a revolving blade to cut a lawn at a smooth, even length. Since 1830, there have been various lawn mower designs that have been created. These designs include push lawn mowers, which are suitable for smaller lawns, and the ride-on mowers, which are capable to cut grass in larger lawns (3). Other more recent models of the lawn mower contain corded and cordless electric power. Cordless electric powered lawn mowers are powered by 12 volt rechargeable batteries. Cordless mowers have the maneuverability of a fuel powered mower and the environmental friendliness of a corded electric lawn mower.

The latest design of the lawn mower is the programmable robotic lawn mower. A programmable robotic lawn mower is a lawn mower that is designed to mow a lawn automatically, without any need for human involvement or interaction. The mechanism of a robotic lawn mower contains wheels which allow the lawn mower to navigate the lawn, along with sensors which are used to detect changes in terrain, fences, and other foreign objects which should not be mowed. Some of these robotic lawn mowers are equipped with sensors which can interface with other sensors installed around specific areas to control the robotic mower to stay within its boundaries of the lawn(5).

III. PROPOSED SYSTEM

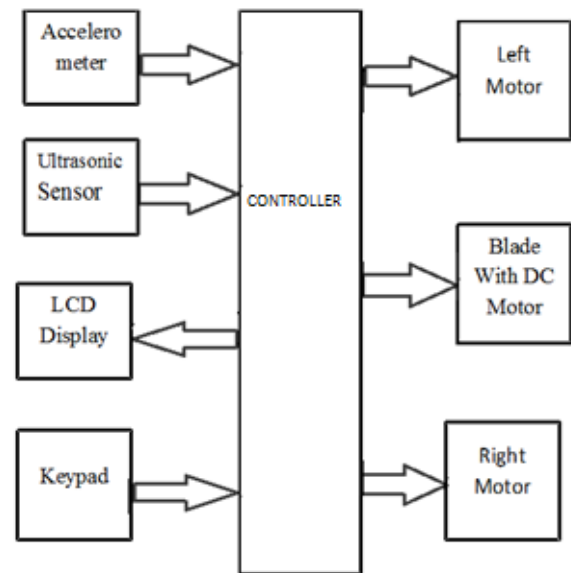


Fig.1. Block diagram of solar powered automatic lawn mower

This design contains a microcontroller, multiple sensors. Adding these elements together, we get our robotic lawn mower. The sensors are the eyes of our robot. The goal was to let our robot see the difference between grass and concrete while monitoring its surroundings continuously. Initially, we had an idea what type of sensors we wanted to use. We wanted object detection an ultrasonic sensor to detect if the robot was heading into an object. Safety is the main concern when designing a robot with blades. We wanted our robot not to start operating if it was being held in the air by the user. Knowing that the user would be randomly holding the robot we needed a sensor to detect orientation. The accelerometer was thought of being used because it can detect its orientation based on pre calibrated axis orientation. For inserting input we use a pad of three buttons. The programming will be in both C language & Assembly language by using controller board.

The another feature of our lawn mower is the user can cut grass by adjusting height blade assembly as per height grass for e.g. if the user has lawn which having height near 7inches but user want grass only up to 3inches then lawn cutter adjusted height of blade assembly then it starts cutting the grass.

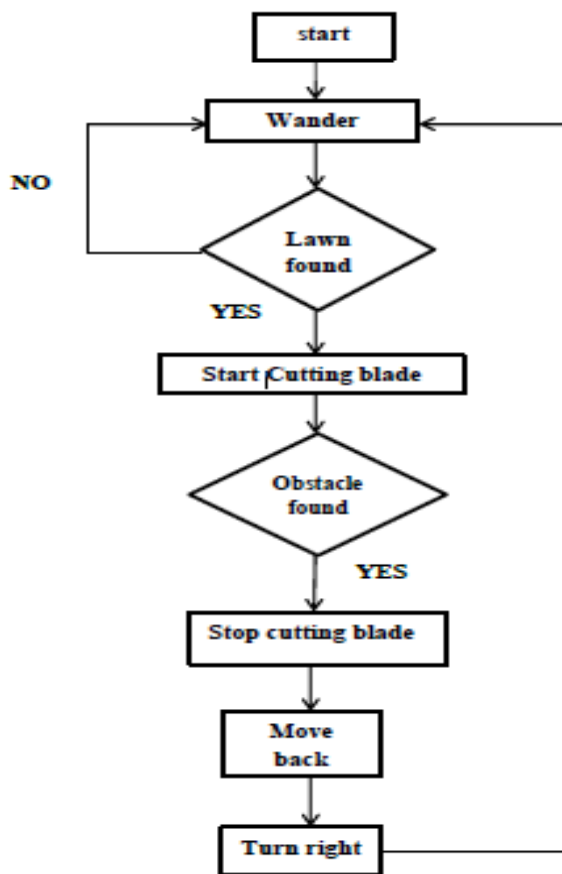


Fig.2. Flow chart of solar powered automatic lawn mower

IV. HARDWARE EQUIPMENT

The ADXL335 from Analog Devices is an accelerometer that has 3 axis in which it can be measured. It is used for orientation so when lawn mower is pickup by anyone without switching it off then it should not be harm. Essentially, this chip outputs analog signals which correspond to the orientation of the chip. Each axis has its own pin. Having the chip rest on its back produced a signal that is 50% of the supplied voltage.

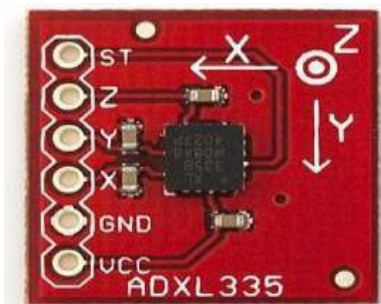


Fig.3. ADXL335 Accelerometer

The LV-MaxSonar-EZ1 from Maxbotix is a high performance sonar module. It is used to detect object in front of lawn mower. In this design we will want to detect objects that are in the path of the lawn mower. We decided that detection should start at 5 inches from the robot. When powered at 6V, this sensor outputs 11mV per inch of object detection distance. There are seven pins but we are only using three.



Fig.4. LV-MaxSonar-EZ1 Ultrasonic Sensor

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2455-2143