Solar Powered Vision Based Robotic Lawn Mower

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Abstract: **This "solar powered vision based robotic lawn mower" 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 and also with less human effort in the manual mode operation. There are some preset pattern installed in the robot, in the automatic mode operation no human effort needed for the operation and helps to cut different patterns in the lawn very easily with less time.. Through an array of sensors safety takes major consideration in the device, this robot will not only stay on the lawn, it will avoid and detect objects and humans. And also it detect the land boundaries and start mowing upon the predefine pattern with the help of installed camera and MATLAB programming.**

I. INTRODUCTION

In the 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 manmade and can be seen in our own daily lives, more specifically in our own homes. Gas powered lawn mower are in 90% of U.S. home and they create 5% of the total U.S. pollution. And also for electrically powered mowers it consumes large amount of energy for the working. Nowadays everything going under automation so here also I tried to reduce the human effort for the mowing job. Green technology initiatives are being support by both the government and cooperates business. Our new design for an old and outdated habit will help both the consumer and the environment. This robotic mowing device is solar powered which gets charged its battery while mows on the lawn from sunlight and also we can charge it manually from main supply. There are lots of research are going on in this field the available technology are using GPS system[2] and perimeter wire[3] to find the boundary of the lawn. This makes the mowing more complicated. And there is preset pattern installed on the device which helps to cut the lawn in different design with less time and less human effort which is a added advantage.. In this paper research has been done to know how much successful it will be in different lawn. Ultrasonic sensors are used for obstacle avoidance and humidity sensor for checking humidity level in the lawn. PIR sensor here is used to detect human interaction near the device in operation. Android smart phone is used for image capturing of lawn at random sequence.

This research aim to develop a device that will relieve the consumer from mowing their own lawns and will reduce both environmental and noise pollution. It also helpful to reduce the human effort for the mowing work and designing of the lawn. In this project there will be implementation of MATLAB for the image processing of land image and to find the boundary regions of the land automatically. Also there will be some preset patterns or design in the robotic mower upon selecting the desired design from the selection input then the robotic mower will mows the land in that pattern. There are also different sensor arrays implemented in means of safety matter. 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.

II. PROBLEM DEFINITION

A **lawn mower** is a machine that uses a revolving blade or blades to cut a lawn at an even height. Lawn mowers employing a blade that rotates about a vertical axis are known as *rotary* mowers, while those employing a blade assembly that rotates about a horizontal axis are known as *cylinder* or *reel* mowers.

Many designs have been made, each suited to a particular purpose. The smallest types, pushed by a human, are suitable for small residential lawns and gardens, while larger, self-contained, ride-on mowers are suitable for large lawns, and the largest, multi-gang mowers pulled behind a tractor, are designed for large expanses of grass such as golf courses and municipal parks.

The problems with available mower are

1. Power consumption: The available mowers are petrochemical powered or electrical powered which will consume large amount of conventional energy Source.
2. Human effort: The mowing work always needs to get control with a worker for the proper mowing.
3. Time consumption: For mowing the land in different patterns and design it takes larger time and human effort
4. Safety

III. SYSTEM DESIGN
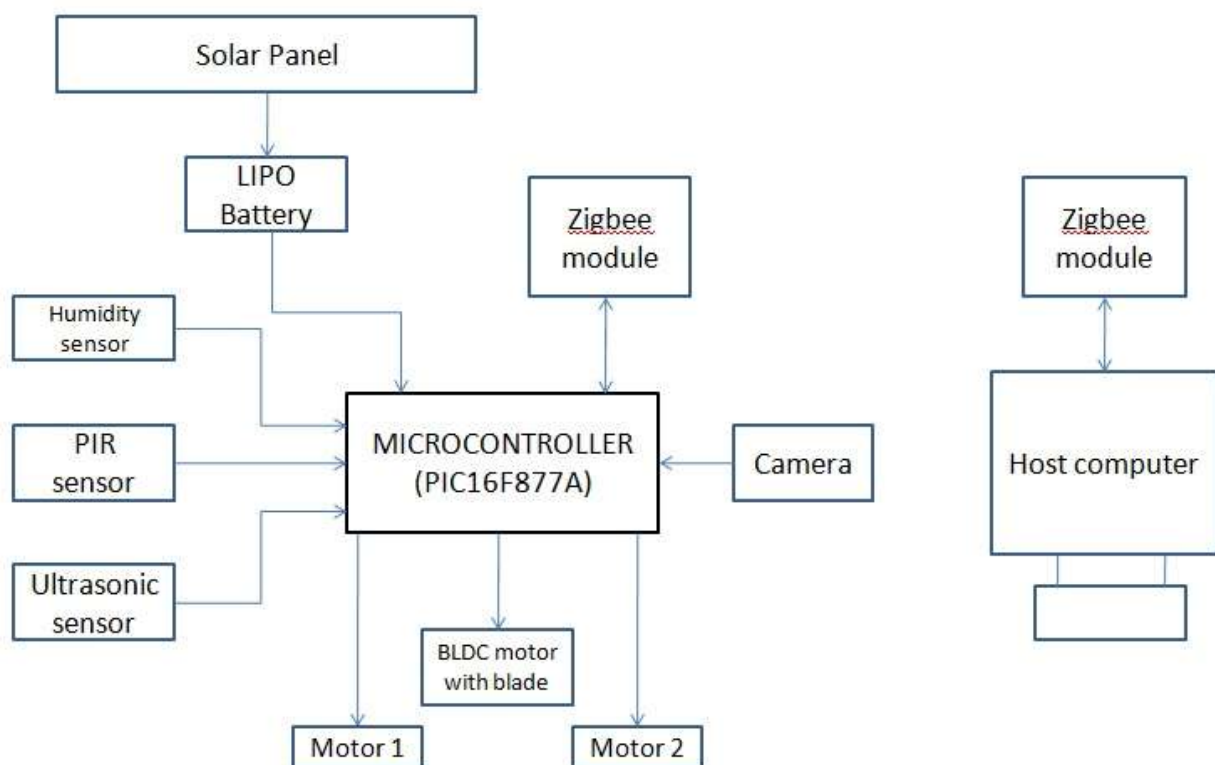
Fig.1

Fig.1 represents the block diagram of the proposed system. The brain part of the system is the micro-controller (PIC16F877A), there are a array of sensors arranged for the safety issue humidity sensor is used to detect the humidity level in the field. If the humidity is higher then the system will automatically shut down and give an alarm to the user. PIR sensor is used to detect the human interaction near the device while it on working. If any child or external parameters comes near the system then it will goes to shutdown mode automatically. Similarly ultrasonic sensor is used to detect the obstacle in the path of the robotic mower. In the device Lithium polymer battery is used because its gives an higher power for the motor. For the movement of the system stepper motor with 200 rpm rating are used. And for the cutting blade it

choose BLDC motor with 1200KV rating which gives 19980 rpm at 11.V supply..solara panels used is 12v 2300ma rated one . the image processing down with MATLAB with the help of a host computer.

IV. IMPLEMENTATION OF PROPOSED SYSTEM

Fig2.

The schematic diagram of proposed solar powered robotic lawn mower system can be seen in Fig. 2. It is built up on a mobile robot; the basic robot hardware for movement is RoboCar, designed by brain bitz electronics. Co., Ltd. It has the function to communicate with the laptop through zigbee module the range of communication is restricted to 100m. In the MATLAB section there created a GUI (graphical user interface) which helps the user to control the robot system easily and the selection of the desired patterns from the memory.
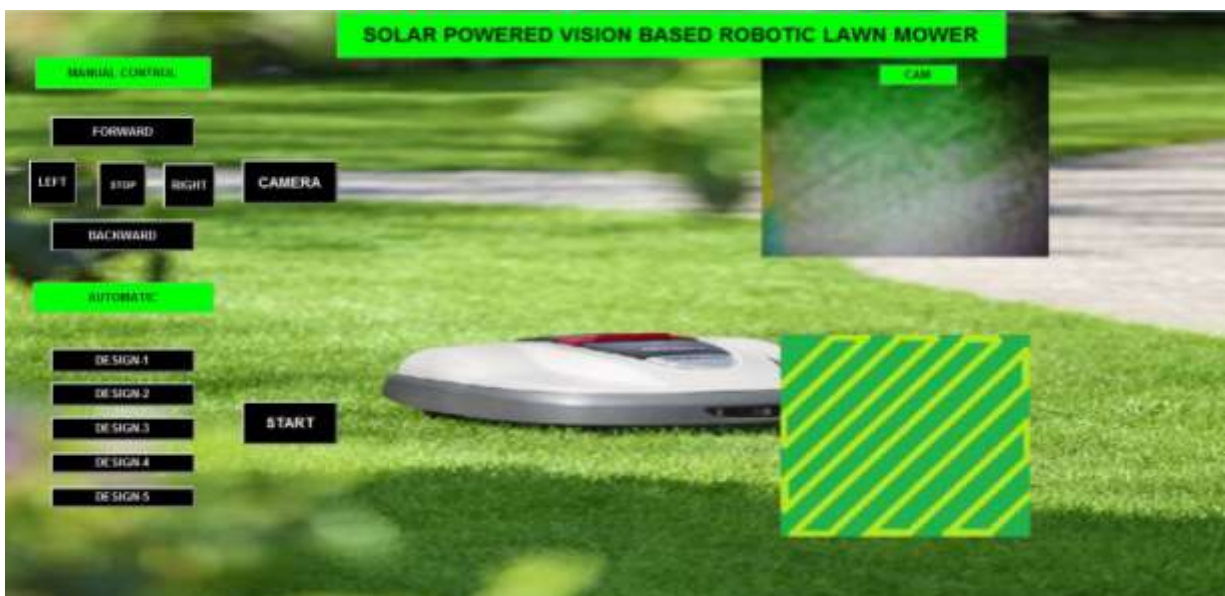
Fig.3 UI created for controlling the robot system

V. ACKNOWLEDGMENT

VI. CONCLUSION

Robotics is very vast field which comes with different combinations of technology this will helps to reduce the human effort and gives maximum efficient output for the work, Nowadays lot of energy is wasted for mowing lawn in different areas of the world and also takes lots of human effort for the work. The main aim of this project is to make a solar powered automated robotic lawn mower system which will helps to mows the lawn in different design with lesser human effort. Advantages of this system are used components are of low cost so and in bulk production and adding of few more sensors doesn't makes any difference. but the disadvantage is that sometimes response of the system is too slow so in real time high end DSP processors is recommended that can process much faster.

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