Smart Grass Cutter

Asha N[1], Monica J S[2], Saraswathi R[3], Rahul R[4], Mr. Ravikiran[5]

[1.] Department of ECE, CBIT College, Kolar, ashanklr5566@gmail.com

[2.] Department of ECE, CBIT College, Kolar, jsmonicajs@gmail.com

[3.] Department of ECE, CBIT College, Kolar, saraswathimilkyr@gmail.com

[4.] Department of ECE, CBIT College, Kolar, rahulvarambil916@gmail.com

[5.] Assistant Professor, ECE, CBIT College, Kolar, ravikiran.blore@gmail.com

Abstract- The purpose of this proposed project is to design a programmable robot that can work either autonomously or can be operated wirelessly using an Android Smart phone via Bluetooth from a safe distance which is capable of cutting the grass in certain required shapes, the cutting blade can also be adjusted to maintain different length of the grass. Three ultrasonic obstacle detectors are used to detect obstacles, if any obstacle is found in front of the robot while travelling; it avoids the obstacle by taking a right or left turns automatically appropriately thereby avoiding collision. The robot is also fitted with a Raspberry Pi and 5Mega pixel camera that captures live video and streams either on an Android Smart phone or PC using Wi-Fi which is connected to LAN. It also has the option to stream the live video over Internet with authentication if it is connected to net through Wi-Fi. Robot is dual powered with a Solar panel & a rechargeable battery.

Keywords: Bluetooth, ultrasonic obstacle detector, Programmable Robot, Wi-Fi.

I. INTRODUCTION

A robot is an electromechanical system that has the ability to interact with its physical environment and which can be programmed or controlled electronically to do a specific task or to do an entire range of actions. All robots share the features of a mechanical, movable structure under some form of control. The control of robot involves three distinct phases: perception, processing and action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board micro-controller or processor, and the task (action) is performed using motors or with some other actuators. We are using Arduino Mega 2560 it has 54 digital inputs outputs.3 ultrasonic object detectors are used to detect obstacles.

Raspberry-pi and 5mega pixel camera enables for live streaming on android smart phone or PC using Wi-Fi and Bluetooth. 5 dc motors are used were 4 motors are connected to gear drives so that less speed and more power can be attained. And the other one is used for grass cutting. An individual attempt to make a grass cutter, solar grass cutter, and automatic grass cutter has already implemented. Here we are trying to implement all features in a single system, how a programmable robot will work accurately according to the commands.

Robot is dual powered with a Hybrid Solar panel & a Lithium Ion rechargeable battery which provides power supply to the Circuit, Motors etc. When sufficient sunlight is falling on the Solar panel the robot runs on Solar Power and whenever there is no light or low intensity of light the robot runs on Battery power. The battery is also recharged when the robot is in Light thereby avoiding the robot from frequent recharging and provides an uninterrupted power.

II. METHODOLOGY

In this approach three ultrasonic object detectors used to detect the obstacles. So that we can avoid collision, hurting of animals. 5 DC motors are used four are connected with L293D gear drives to attain less speed and more power; another is used for cutting grass. A 12V Hybrid Solar Panel and Lithium Ion rechargeable battery gives uninterrupted power supply. 7805 Regulator IC gives 12V, 5V supply and automatic change over battery and solar panel. . DIP switch is used to select autonomous and non-autonomous mode.

In non-autonomous mode Bluetooth module enables a manual operation using smart phone certain operations are assigned for specific characters in programme. So that by giving those characters as input we can operate the Robot. In Autonomous Mode work to be done is previously programmed and dumped in kit so that it works according to the programme. Arduino Mega 2560 is used to control and operate all the analog components used. It has in built programmer the software IDE sketch is free of cost and compact. 16X2 LCD is used to display current status of the Robot. Raspberry-pi module 3 and 5 Mega pixel provides live video streaming over Wi-Fi.

Perspectives in Communication, Embedded-Systems and Signal-Processing (PiCES)
ISSN: 2566-932X, Vol. 1, Issue 6, September 2017
Proceedings of National Conference on Emerging Trends in VLSI, Embedded and Networking (NC-EVEN 17), May 2017
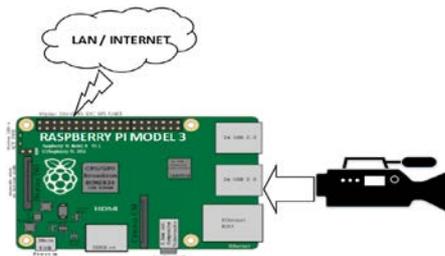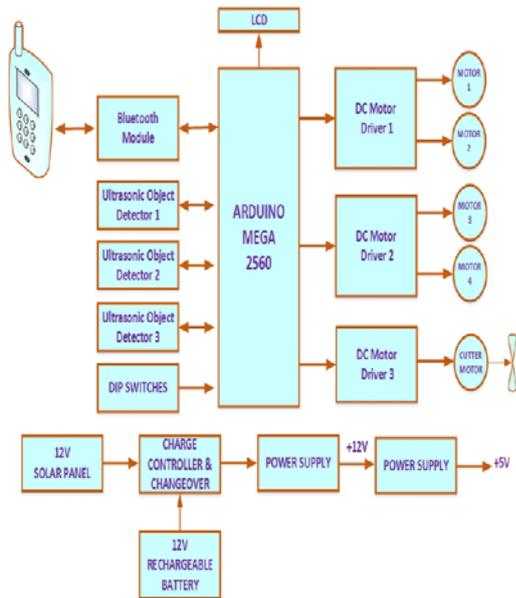
III. BLOCK DIAGRAM

Fig 1.   Block diagram of Smart Grass Cutter

IV. ULTRASOUND OBSTACLE DETECTOR

Ultrasonic devices transmit and receive sound waves above the frequency range of human hearing which is typically much above 20 kHz. Ultrasound devices require line-of-sight and have a much smaller effective angular range. However, the delay of sound propagation is far easier to measure, and ultrasounds can be transmitted in the range of distance required for the present application. Ultrasound transmitters and receivers come in a much variety. Since the common types of ultrasound devices fit our specifications nicely, this made it much easier to select devices.

Fig 2.   Ultrasound obstacle detector

V. ULTRASOUND

Ultrasound is a cyclic sound pressure wave with a frequency greater than the upper limit of the human hearing range. Ultrasound is thus not separated from "normal" (audible) sound based on differences in physical properties, only the fact that humans cannot hear it. Although this limit varies from person to person, it is approximately 20 kilohertz (20,000 hertz) in healthy, young adults. Ultrasound devices operate with frequencies from 20 kHz up to several gigahertz.
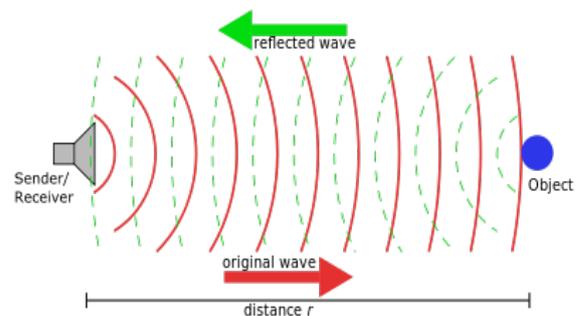

Fig 3.   Ultrasonic range finding

VI. ARDUINO MICROCONTROLLER ATMEGA 2560

It has advanced RISC architecture with 135 powerful instructions and 32x8 general purpose registers. Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can be communicating with software running on your computer (e.g. Flash, Processing, and MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.
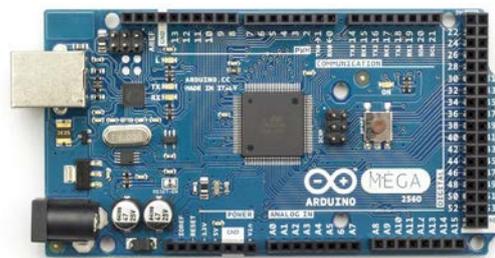

Fig 4.   Arduino Board

VII. RASPBERRY PI MODEL 3 AND RASPBERRY PI CAMERA

Raspberry Pi an ARM based single-board computer, developed for educational purpose. It has a unique port id, user name, and password. It enables secure live video

streaming over Wi-Fi, 5 mega pixel camera to captures and send video.

Fig 5.   Raspberry pi

VIII.   ADVANTAGES

1. Dual powered (battery & Solar) for uninterrupted working.

2. Dual mode of operations i.e. Autonomous or non-autonomous.

3. Automatic changeover of Load to battery or Solar panel depending upon light intensity.

4. Automatic Obstacle detection and avoidance.

5. Live video streaming over Wi-Fi on LAN or Internet with authentication.

6. Adjustable blade.

7. Adjustable cutting area.

IX.   APPLICATIONS

1. Used for cutting grass.

2. Lawn cleaning.

3. Lawn decorations.

4. Ground maintenance for outdoor games like Football, Cricket, Tennis.

5. Agriculture: Seeding, Weed Cutting.

X.   CONCLUSION

Automation in Electronic gadgets has made human life easier and faster. By designing a fully automated system we can reduce the risk while operating manually. This programmable Robot is used to decorate the lawn. Encouraging the use of renewable energy resources to save non-renewable resources. The basic Robot system designed can be used for other applications also like firefighting, Land mine detection, seeding in agriculture. By replacing grass cutting motor.

REFERENCES

[1] Yuki Iwano,Takashi Hasegawa, "Akihiro Tanaka Development Of Trimmer-Type Mowing System Against A Slope", proceedings of the 2016 international conference on advanced mechatronic systems, Melbourne Australia. November 30 to December 3 2016.

[2] Shinya OHKAWA Conference ISR ROBOTIK 2014 on "Development of the Autonomous Brush-Cutting Robot Using Articulated Steering Vehicle".

[3] Y. Nakatsuchi, et al. (2012) "Development of Grass Cutter Robot for Steep Slope", Proceedings of 2012 JSME Conference on Robotics and Mechatronics, 1A1-H05.