An Effectual Design of Agribot and Novel Implementation for Smart Agriculture

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Abstract

Agribot refers to the robots specifically developed for agriculture purpose to assist the farmers in routine tasks on field. In additionally assist the agricultural scientists in fetching the real time parameters from soil for the further analysis. The key functions associated with farming are implemented by the Agribots which includes weeding, planting, harvesting, picking, grafting and many others. The motivation for this project came from the countries where economy is based on agriculture. Our idea presents a system with high speed of operation for an advanced agriculture process which includes grass cutter, Seed sowing, Sprinkler, Ploughing and solar panel for battery charging.

The robotic system is an electromechanical (conveys a sense that it has agency of its own) and artificial agent which is steered by DC motor which has four wheels. Generally in farm lots of time consumes for grass cutting, seed sowing and spraying work, here is an approach to reduce farmer time for cultivation and increase farm efficiency by using multipurpose agricultural robot. The machine can be controlled remotely and solar panel is used to charge DC battery. Assembly language is used in programming the microcontrollers. The microcontroller is used to control and monitor the process of system motion of vehicle with the help of DC motor.

Introduction

India is one of the prominent countries which is dependent on the agriculture based revenue and more than 70% of people are with the base of agriculture. In agriculture, there are enormous streams and activities which are performed by the farmers in routine ventures including plugging, weeding, cultivating, harvesting and many others. Traditionally, these activities are performed manually by the farmers.

Agriculture is the need of most of the Indians livelihood and it is one of the main sources of livelihood. It also has a major impact on economy of the country. We know there is day by day increase in population. Due to this tremendous growth in population there is huge demand or food. Agriculture is the main source for food production. So, we need to develop the methodologies which are currently uses in agriculture application to increase the efficiency of application. Due to this reason we are going to prepare "multipurpose agriculture Robot" which present four applications are like Grass cutter, Ploughing, Seed sower, Sprinkler. These applications make sure that the time required for it is less than conventional methods.

We prefer robot for carried out these applications because robot is a mechanical, artificial agent and is usually an electromechanical (Mechatronics) system. By using controller we operate whole robot by wireless remote. In that remote we have four buttons for forward reverse motion and one switch for operating sprinkler and grass cutter mechanism. For ploughing mechanism we are going to use hydraulic jack and for sprinkler high pressure liquid is provided with the help of pump. If we use this robot in real time application it save money and time consumption. With this help of robot we can achieve human safety at the night time and we easily perform task which is in complicated location.

Following are the key activities involved in farming

- Harvesting
- Winnowing
- Threshing
- Overharvesting
- Milking
- Pruning
- Weeding
- Spraying
- Monitoring
- Washing
- Castrating and many others

Agriculture Robots

Agriculture Robots or Agribots, sometimes called as Agbots makes use of technology based mechanical engineering with the automation process to implement the farming activities [2]. Now days, such automated devices are implemented in the farms so that the overall process of farming can be effectually implemented without human intervention and higher degree of productivity and accuracy [3].

Figure 2: Automation of Agricultural Activities using Robots

Figure 3: Indoor Farming with the Robotic Integration

Examples of Agriculture Robots

- Agriculture Drones for Monitoring of Crops
- Vinobot
- HortiBot
- Plucking Robots

- Picking robot for Harvesting
- Vinoculer
- Open Source CNC Farming
- Plant Nursing Robot
- Organic Weed Elimination Robots
- Rice planting robot
- Thinning of Lettuce
- FarmBot

Research Goals

Farmers have to face too many problems during the work, at the time of ploughing, spraying the pesticides, sowing the seeds as well as cutting the grass. Also farmers have to pay too much amount of money for this type of work because all having individual equipment for the work. Robots do all the work in minimum time and also in minimum cost because all the four equipment were held in only one single robot. It also reduces the human effort and increase the human safety.

Key Points of Research

1. Selection of design consideration on the basis of land and crop analysis.

2. Design and selection of various components of robot.

3. Development of Seeding, Sprinkler, Ploughing and Grass cutting mechanism.

4. Testing of Robot.

Methodology and Implementation Perspectives
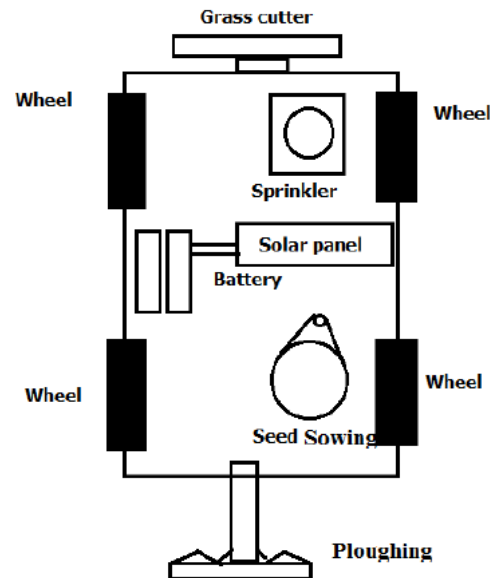
Above diagram shows the overview assembly of our whole robot. It confirms the locations of different application on the chassis. The grass cutter mechanism is in the front of the chassis and the ploughing mechanism is as back end of the chassis. The Seed sowing mechanism is near the ploughing mechanism but it is on the chassis and the sprinkler mechanism is near the grass cutter mechanism on the chassis. The Solar panel and the battery are mounted in between the Seed Sowing and Sprinkler mechanism. This assembly is made as per the maintaining the C.G. of whole robot and aesthetically looking good.

Transmitters
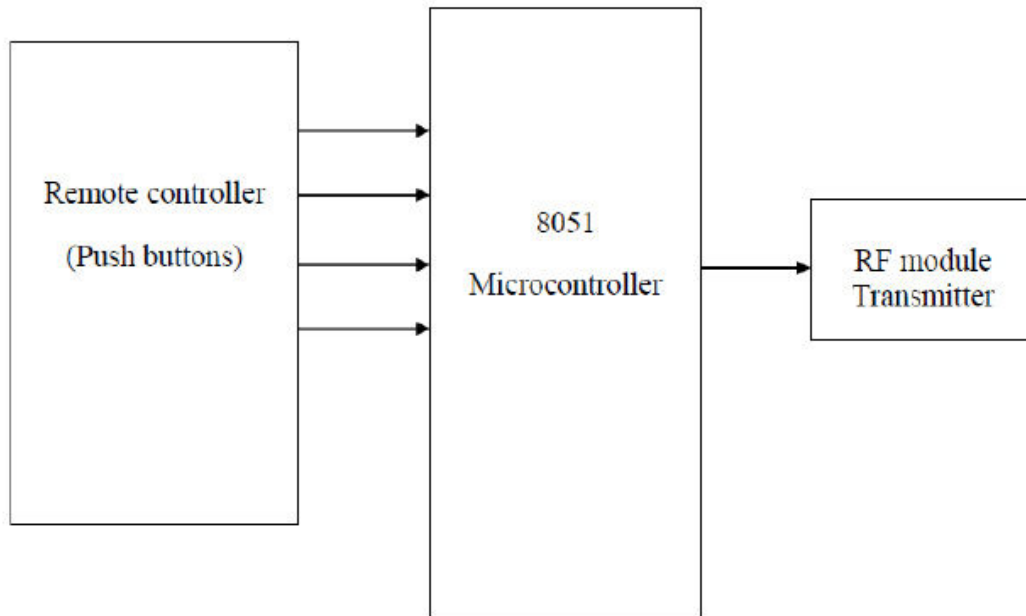
Remote controller

We are using the remote controller for controlling or giving the input the microcontroller 8051. We are using the push button on the remote controller.

8051 microcontroller

We are using the 8051 mc as intermediate device which takes the input from the remote controller and sends it to the RF module. We are using this mc because it is simple to use and cheaper than other.

RF module Transmitter

We are using the RF module to transmit the wireless signal to the RF module receiver which is held on the robot assembly. It takes the signal from the mc and send to the robot.
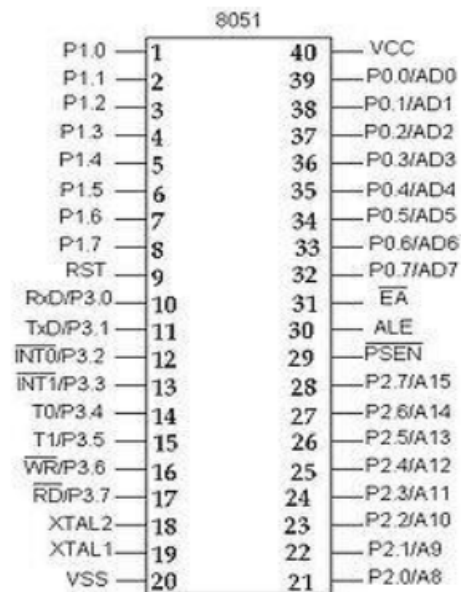
Receiver Robot
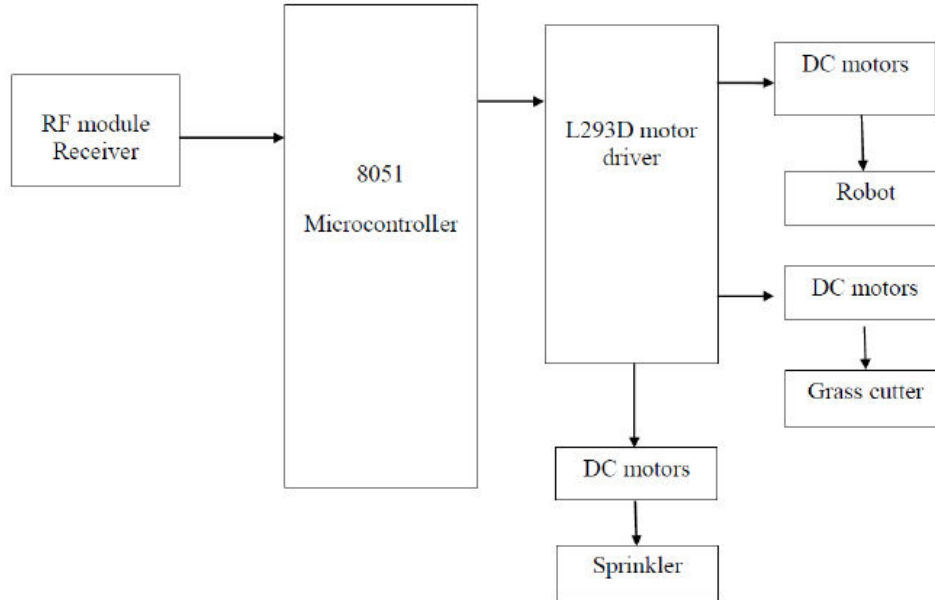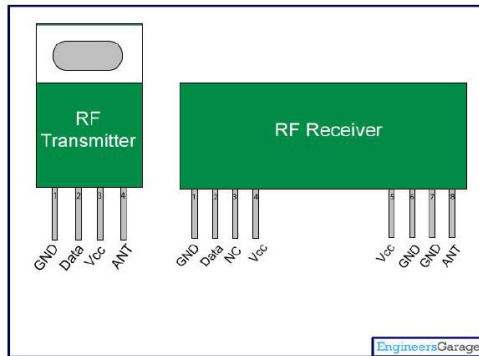
RF Module Receiver

We use the RF module receiver on the robot to take the wireless signals which are sent from the RF module transmitter. It sends the signal to the mc.

L293D motor driver

It is used to drive the motor in either direction. It is connected to all the dc motors which are connected to the Robot, Grass Cutter and Sprinkler.

Microcontroller

RF Module

As the name suggest the RF module works as the Radio Frequency. The range of the RF module which may varies from 30 kHz to 300 GHz. The transmission of signal through RF module is better than IR (Infrared Rays) due to many reasons. . Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

The RF module is divided in two modes Transmitter Section and Receiver Section. The transmitter/receiver pair operates at a frequency of 434 MHz an RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

EXPERIMENTAL SETUP AND FLOW

The Robot contains components Key board; microcontroller, battery etc. will work as shown in block diagram. Key board of remote which works as transmitter transmits the signal given to it. This signal is captured by robot which works as receiver by microcontroller. As robot senses signal with help of h bridge circuit D.C motor will actuate and motors get revolution. Wheels which are connected through D.C motors also revolve. Wheels are rotated as given order reverse, forward, left, right. When voltage is given to circuit as right wheel, motor of right side actuates and wheel takes right turn. For left turn repeat this procedure simultaneously. As the carrier of robot travels in the field, the robot sprays the liquid on the crops with help of sprinkler at particular distance and we also provide a switch for operating grass cutter and ploughing. When we on the switch of ploughing it actuate the hydraulic jack which is brings down the plough to the ground.j
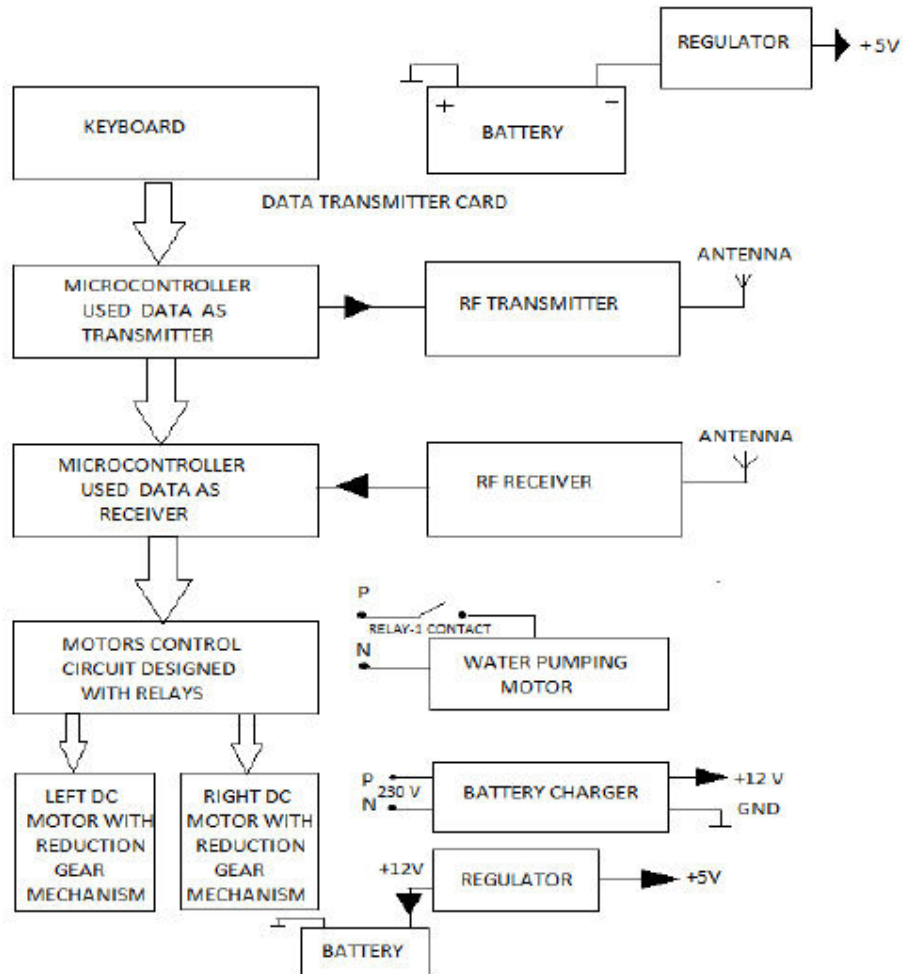
Advantages of the Projected Novel Approach and Implementation

- Farmer to sow the Seeds large areas of land in minimum amount of time.
- We can perform automated Seed Sowing and Sprinkler process.
- It replaces manual effort by agriculture robot for Seed Sowing purpose.
- It replaces the conventional techniques to perform the same tasks with efficiency.
- It is pollution free.
- No consumption of fuel.

Conclusion and Future Work

With the advancements in agricultural technologies, a number of devices and machines are developed so that the farming

activities can be escalated with the higher degree of accuracy and performance. The robot for agricultural purpose an Agribot is a concept for the near the performance and cost of the product once optimized, will prove to be work through in the agricultural spraying operations. Workload on the farmers is decreased and health problems also. Successful in constructing robot which can be travelled on rough surfaces also and weighing enough loads of compressor and other equipment. Successful in developing a robot whose construction is enough to withstand the challenges of the field. Sure about that once this concept will be presented in a manner suitable to Indian market, it will definitely help in bringing down the 15% molality rate found in the Indian formers associated with the agricultural applications like grass cutter , ploughing, seed sower, sprinkler.

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