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Solar Energy based IoT Embedded Multi-Purpose Agricultural Bot

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Abstract- In India around 70% individual are dependent on farming and agricultural product. Different kinds of functionalities are conducted in farming field that are seeding, weeding, plant cutting, ploughing and so on. But in existing system, conducting of these operation is difficult due to equipment's used for these operation is very heavy and inconvenient to handle. Farmers are facing the labour problem due to migration to cities. This system introduces the multi-purpose agricultural robot by using the solar energy. It perform the basic operations like seeding, ploughing and plant cutting. It reduces the effort of the farmer. It helps the farmers to save the time, cost and electricity.
Keywords – Agricultural Bot, DC motor, IoT, L293D

I. INTRODUCTION

The tremendous development in technology has lead cultivation to become more prevalent and critical. Distinctive devices and methods is accessible for improvement in cultivating. According to the survey of UN Food and Agriculture Organization, the goal is to encourage the production rate of food substances for developing populace of the Earth. The world should create 70% more sustenance in 2050 than it did in 2016[3]. Keeping this in concern, cultivators and horticultural industries are using the Internet of Things for investigation and enhancing production capacities. Internet of Things (IoT) is very much important in expanding productivity, getting colossal worldwide business. IoT is system of interconnected network and budgets which can exchange the information effectively without human association.

Now a days numerous agricultural industries embrace IoT innovation to brilliant cultivating for upgrade proficiency, efficiency, worldwide business and other futures, for example, least human mediation, time and cost and so on. This innovation make sure that sensors are getting little, sophisticated and more financial. Smart cultivation is succeed because networks are used worldwide. Concentrating more on innovation in agricultural system, smart farming is the major solution for the problems which industries facing today. The possible utilization of IoT devices and smart phones farmers can get required information and they can monitor their agricultural sector.

The Internet of things (IoT) is most proficient essential procedures to improvement of solution for those issues. IoT developed from various building blocks that incorporates bunches of sensors, software's, organize parts and some other electronic budgets. Likewise it makes information more efficiently. IoT permits to trade the information over the system without human association.

IoT merge the ideas "Internet" and "Thing" and can in this manner semantically be defined as "an worldwide system of interconnected objects uniquely addressable, based on standard communication protocols [3]".

when we referring to "things", it consist of devices and everyday object from small things(sensors, watches) to big things(robots, buildings ,vehicles).all these contains devices that interact with users by generating and retrieving information from the environment.

II. LITERATURE SURVEY

The seeding and fertilizing agriculture robot using microcontroller [1]. The point of composed framework for seeding, treating, moisture level calculation, temperature checking and humidity level detection. The robot system is monitored by remotely. Composed framework includes the route of robot to the goal effectively and does the predetermined functions. The robotic system and the remote framework are associated via networking framework. DC motors are utilized for route of the robotic system. DC motors speed can be managed by utilizing controller. The solenoid is utilized to control the seeding operation and treating.

Seed Sowing Using Robotics Technology[2]This framework presents a control system which drop the seed at specific location which determined separation in two seeds that is row and column while sowing. They utilizes mechanical autonomy innovation in the cultivating framework to decrease the effort of agriculturists and also to reduce time, energy and required cost for the seeding. The issues of the existing system in seeding operation can be removed completely in this proposed system.

"Multi-purpose agriculture machine"[3].This paper proposed the concept of usage of solar energy in the agricultural fields. Solar energy is the very power full energy, it plays very significant role in agriculture. This can be used in irrigation purpose for drawing water in the well remotely to the towns with out power supply. Mechanism includes the utilization of a hybrid energy device between the power source and the work. This system deals with multi-operational irrigation machine for seeding, fungicides, splashing pesticides & fertilizers and plant cutting. Consequently, it is more efficient, economic and multi-operational equipment for agriculturist.
Mahesh R. Pundkar [4] contemplated the execution of seeding, ploughing and plant cutting machine using algorithm of image processing by flash magic. They also declared the impact in depth of seed, spacing between the seed, ratio of miss seeding and proportion and execution seeding gadget on germination of seed and productivity of yield trim.

III. PROPOSED SYSTEM

In India, almost 70% individuals are subject to agriculture and it's items. So the rural methods in India ought to be progressed to decrease the efforts of farmers. The main motive for in building up this system is diminishing the work power, and time. The aim is provide requirement for enhanced nourishment quality. Robotic technology along with IoT, provide solutions in agricultural operation related to seeding, harvesting, weed control, plant cutting, etc. to enhance productivity and efficiency.

IV. OBJECTIVES

To design a smart agriculture bot for basic farming operations such as seeding, ploughing and plant cutting task.
To design agriculture bot that is remotely controlled reducing the manpower and time needed to perform the tasks.
To avoid obstacles present in the surroundings.
To design a system that optimizes power and makes use of solar energy.

V. ADVANTAGES OF PROPOSED SYSTEM

Operation mechanism of this system is very simple.
Labour problem can be reduced.
Wastage of seed is less.
It is easy to handle and don't require fuel, Wastage thus cost is decreased.
It is solar energy based device and not require electricity.
Time efficient to perform the functions compared to traditional method.

Software and hardware requirements
Software used:
Renesas Flash Programmer
Renesas Cube suite+
JDK, SDK and eclipse.
System Requirements

Operating System : Windows 7 and higher
Processor : Any Intel Processor
Ram : 2GB and above.
Disk consumption : 14.5 MB space.

Hardware components used
Reneses microcontroller board
Ultrasonic Sensor
IR Sensor
GSM module
DC motor along with motor driver

5.1 System Design

In this section we discuss the system design model and block diagram of this system. After specific software and hardware requirement the next important step is to design the architecture of the system.

This system mainly consist of the seeding, ploughing, mud leveling and plant cutting functions. The block diagram of the system is described in the Figure 1. The ultrasonic sensor device is utilized to detect the obstacle present in the surroundings. LCD monitor is used to display the error message and the corresponding functionality names. The IR sensor is used to sense the seeds in the seed container.

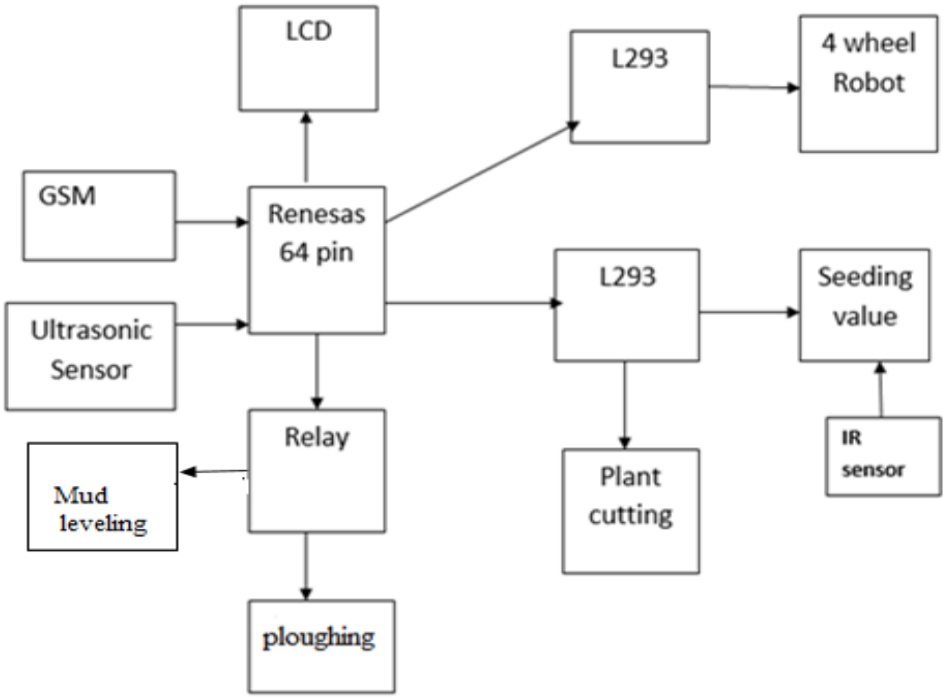

Figure 1: Block diagram of multi-purpose agricultural robot

Reneses 64 pin micro-controller

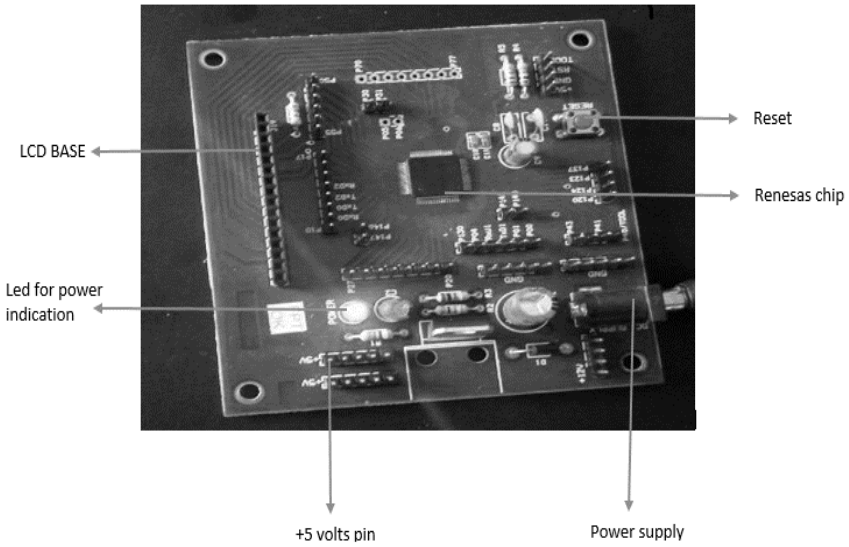

Figure 2:Reneses 64 pin micro-controller

The microcontroller is brain of this framework, which can got the request of suggestion from the systems, and sensible devices processed by their corresponding embedded programs. The parts of the Reneses board is shown in the Figure 2

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GSM module

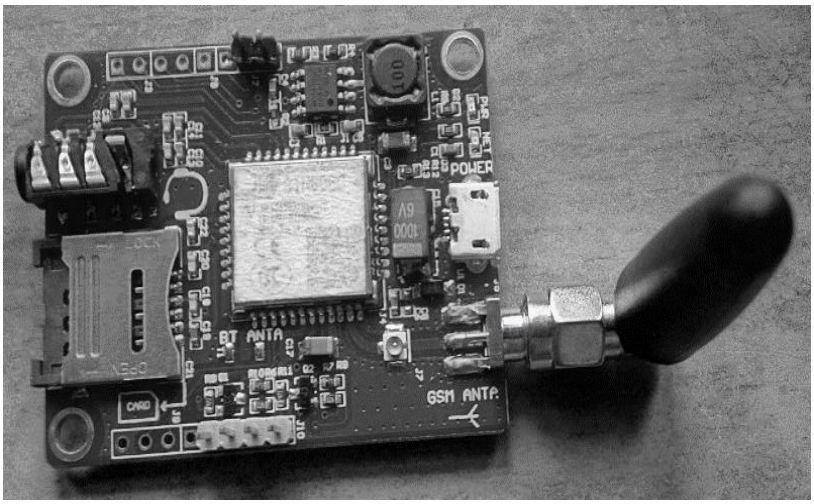

Figure 3: GSM module.

GSM stands for Global System for Mobile Communications commonly called as Groupie Special Mobile.
The figure 3 shows the GSM module. The primary key highlights of GSM is the Subscriber Identity Module (SIM card). The SIM is a smart card that containing the user membership information and phonebook details. It enable the user to hold data subsequent to switching the devices. We can utilize the "AT" (consideration) Commands, to communicate with the SIM card.

Ultrasonic sensor

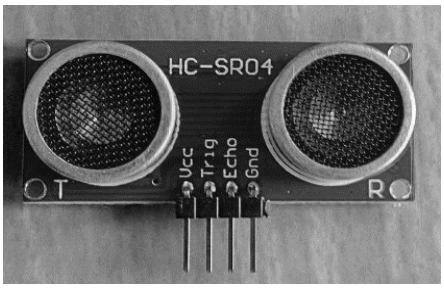

Figure 4:Ultrasonic sensor

Ultrasonic sensor is a device, which can quantify distance from an object by detecting the sound waves. The ultrasonic sensor is shown in Figure 4. This device measures the distance by conveying the sound wave at a predefined frequency and tuning in back at specific sound wave. This device contains the ultrasonic receiver, transmitter and control circuit.

LCD Display

Figure 5: LCD Display

A liquid crystal display (LCD) is a flat panel display, electronic visual display, based on Liquid Crystal Technology. The LCD display is shown in Figure 5. A LCD comprises a variety of small sections known as pixels and it can be controlled to exhibit data.

Motor driver and DC motor

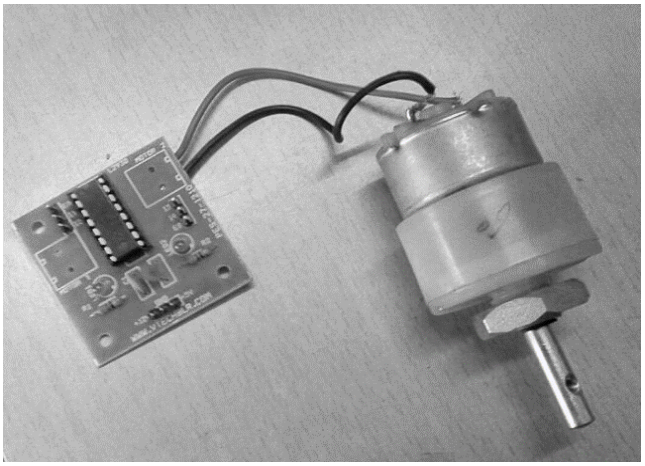

Figure 6:Motor driver along with DC motor.

L293D(L293) is a dual H-bridge integrated circuit motor driver and is utilized for synchronous bidirectional control of two small motors. Figure 6 illustrate the L293 motor driver along with DC motor. An external power supply input permits to operate at lower voltage. L293 acts as current amplifiers. It takes the lower current control signals and provides higher current control signals. This higher current signal is utilized to drive the motors. L293D is limited to 600 mA.

VI. IMPLEMENTATION

In this section we discuss about the embedded environment to build the framework architecture.

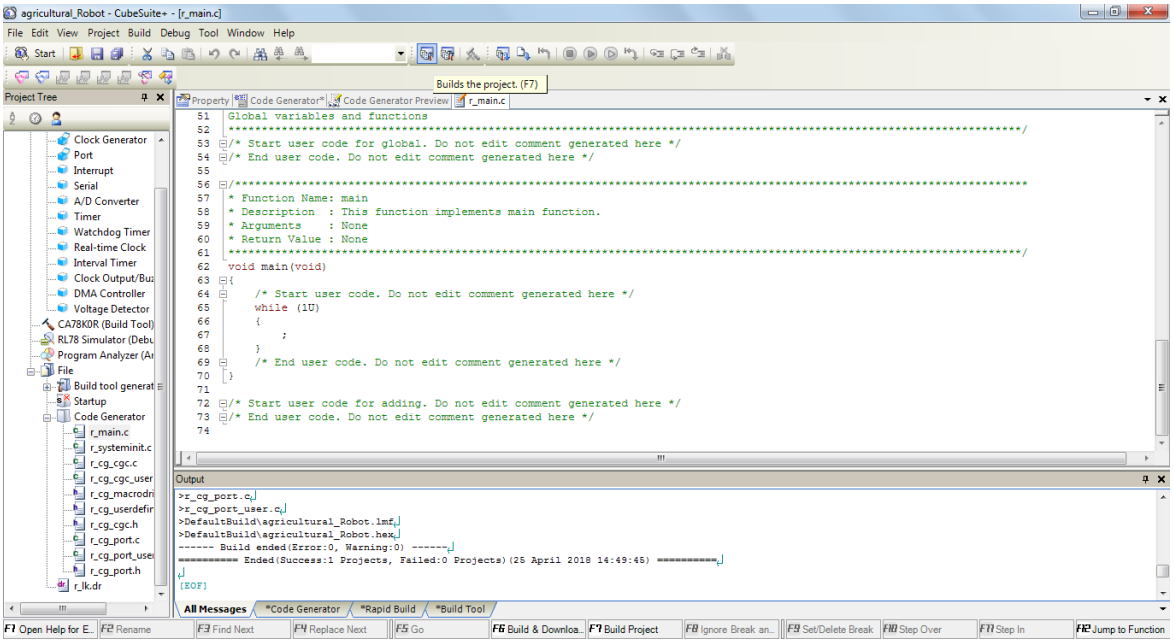

figure 7: build the source code in cube suite+

The programming language should support both hardware components and the application functions. The below software tools and programming language is used to implement this system.

We are using the java code for the front end development using android application. The embedded C is used for the main programing function in the cube suite+. The main program contains mainly seed dropping function, ploughing, plant cutting, obstacle detection using Ultrasonic sensor ,IR sensor function is used to detect the seeds in the container and GSM module is utilized to send/receive message .Figure 7 shows the building of system in cube suite+.

VII. RESULTS AND DISCUSSIONS

we will be detailing the results and outputs obtained. The below are the experimental results and outcomes of the different operations carried out in the paper by using the GSM module and front end communication.

Figure 8:GUI for remotely based Agricultural Bot

GUI for this system is shown in Fig 8.In this system first we have to registered the user mobile number.
We can select the operation and number of steps and lines for Agricultural Bot movement to conduct the selected operation.

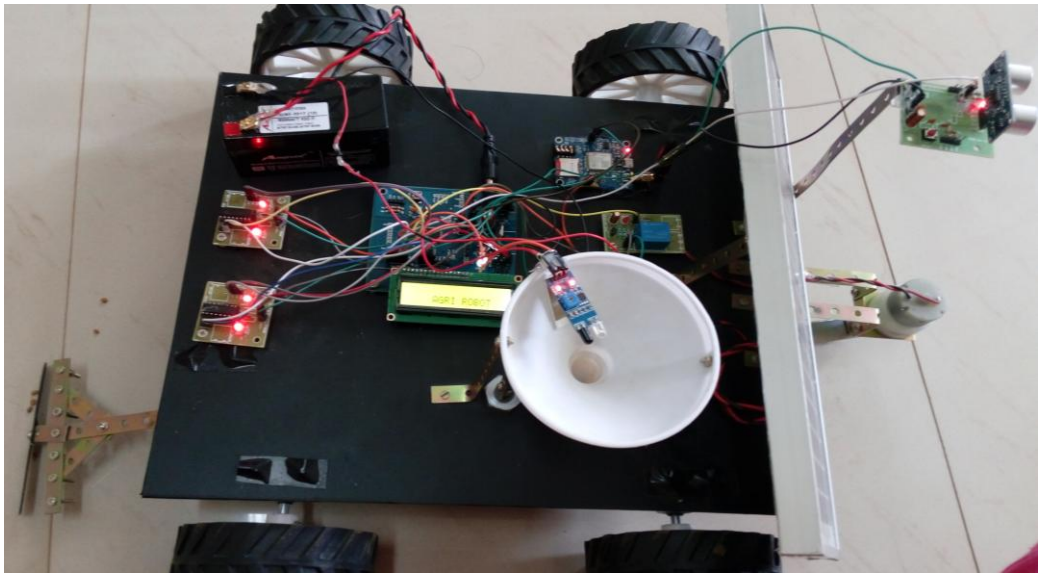

Figure 9: Agricultural Bot

The integration of all components and software application of Agricultural Bot is shown in Fig 9.

VIII. CONCLUSION AND FUTURE WORK

This system introduces the multi-purpose agricultural robot using the solar energy. It mainly consist of plant cutting, seeding, ploughing and mud levelling operation. By executing this framework in the field of agriculture it can help the agriculturist in the underlying phase of farming that is during the seeding , ploughing and plant cutting. This

system is extremely valuable for the farmers who are interested to do agriculture, but facing the labour problem. It can used towards investigating the utilization of little and lightweight machines in the other agricultural operations. Future work will concentrate on advancement of fine-tuning of robot control algorithms (path following) and field tests for different process. Moving to Real Time system in agricultural fields it can be successfully implemented with certain modification. We can implement other futures like soil moisture sensor and temperature sensor.

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