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An Autonomous Robot for Agriculture Purpose

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Abstract— Robotics in agriculture is not a new technology in controlled environmental parameters it has an antiquity of so many years. Research has been made to progress reapers for various types of items like vegetables and fruits. In agriculture, automatons have been presented to yield different types of fruits. In this paper, an autonomous robot for agriculture purpose is a model and executed for carrying out many agricultural actions like seeding, drilling, spraying of fertilizers or insecticides and also test the soil moisture, rain fall intensity and also measure temperature and humidity. Agriculture robot is accessed with an ARM 7 controller. The ARM 7 is placed on the robot to have access to all the modules for the efficient operation. DC motors are used to control the motion of the robot and also independently move in any direction, avoiding objects with IR sensor. It consists of an underbody sensory array that lets the robot to recognize that a seed has been placed in the specific depth of the soil. The bot can then dig a hole in the soil, place the seed in the soil and the seed is enclosed with soil, pre-emergence fertilizers are sprayed. Agriculture robot can be operated and data is communicated through Wi-Fi module.

Keywords: ARM 7, Agriculture Robot, Automation, Wi-F, sensors.

I. INTRODUCTION

Implementation of Wi-Fi Agriculture Robot Integrated System is developed to control various agricultural parameters monitoring through different type of sensors. Agriculture Robot is controlled with ARM7. According to the sensor information of the robot it is transmitted through Wi-Fi to the owner and the same sensor information will be displayed on the LCD display.

This project “An Autonomous robot for agriculture Purpose” is used to dig a hole in soil by drilling mechanisms and plants seed and cover the seed with soil and sprays pre-emergence fertilizers. The robot is equipped with soil moisture sensor, humidity sensor, temperature sensor and rain drop sensor. The data from these sensors is sent to the owner through Wi-Fi. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

II. METHODOLOGY

A. Simulation with Proteus

1. Hit the ISIS 7 Professional icon in Start Menu.

2. Designing the connections: To design the robot it is essential to identify the modules. All the essential modules are selected from the component library. The contacts among the modules are set by wire pencil.

To choose the modules, hit on Library then Pick Device/Symbol or just press “P”. The modules that are used in this design are:

- Microcontroller LPC2148
- DC Motors
- Sensors
- LCD
- Capacitor
- Crystal oscillator
- Power source
- Grounding.

The chosen modules are place on left side of the window. In order to place the modules on the design sheet, just left click the module and place it on the design sheet. To place the modules in the perfect position, just right click on the module and pull the module to the wanted place. From the library the power and ground terminals are chosen. Choose POWER for Vcc and GROUND as ground. Every module must be fixed regarding to the terms.

Edit the module by choosing the module and left-click the module to open the "Edit Component dialog." Give the lowest and highest values in the dialog box.

3. The most important part of Proteus simulation is setting up the microcontroller. The Configuration needs to be correct to cross out any setting error in time for program simulation. To edit the parameter for ARM 7 controller, right click on the ARM 7 controller to select the component and then left-click. In this dialog, two things that need to set are: Program File: Your program's hex files location. Processor Clock Frequency: The oscillator frequency that you used. At the Program File box, click the folder icon. Select the directory where you compiled your source code. Then select the corresponding hex file. Set the Processor Clock Frequency to 16MHz.

4. Simulation

After concluding the circuit assembly and configuration, we should check whether the source code compiled is practically precise or not. Here virtual HyperTerminal is used to show how the code works in real world without making the hardware segment yet. Click the play button, to initiate simulation. Primarily the LEDs are ON. As the push key is clicked the LEDs are blinked at fast rate. In order to cease the simulation, click the stop key or click ESC. The file could be outputted in HTML or ASCII files.

B. Working of Agriculture Robot

The Autonomous robot for agriculture purpose is implemented using ARM 7 Pro Development Board (LPC2148) as shown in Fig. 1. For displaying purpose an LCD is interfaced to ARM 7 board. The Agriculture Robot is interfaced with Seeder, Fertilizer Tank and Driller to complete the operation of agriculture actions. The driller can dig a hole in soil by drilling mechanisms and plants seed and the seed is covered with soil and sprays fertilizers using Fertilizer tank. For the movement of the robot motor drivers are interfaced between ARM 7 and DC Motors.

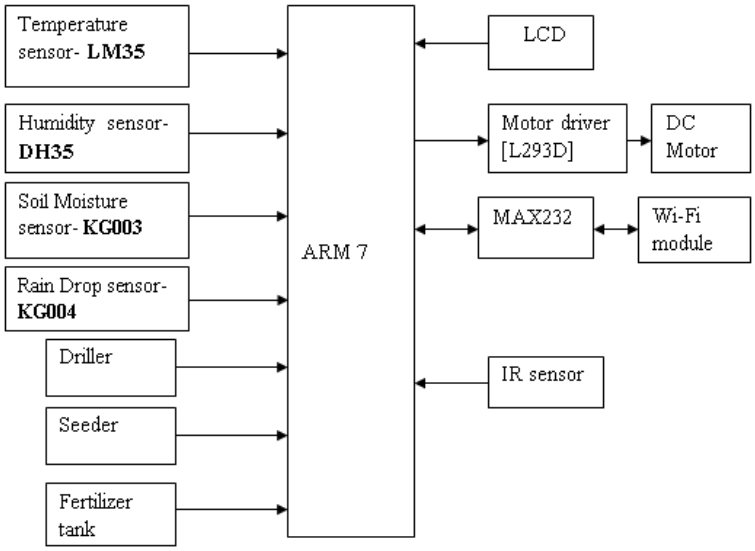


Fig. 1 Block Diagram of Agriculture Robot

L293D is a motor driver IC which permits DC motors to drive in either direction. One L293D IC can control two DC Motors simultaneously. The ARM 7 is interfaced with Temperature Sensor, Humidity Sensor, Soil Moisture Sensor, Rain Drop Sensor and Object Detection sensor as IR Sensor. The data retrieved from these sensors is transmitted to the owner through Wi-Fi. "MAX232 is interfaced between ARM 7 and Wi-Fi. MAX232 is an integrated circuit which converts the signals from RS232 serial port to the proper signal which are used in the TTL compatible digital logic circuits".

As shown in Fig. 1, there are 5 sensors.

Temperature sensor (LM35) - for displaying temperature

Soil moisture sensor (KG003) - it is used to verify whether the soil is in wet or in dry state.

Humidity sensor (DH35) - it is used for displaying the environmental temperature value.

IR sensor – it is used to detect the obstacle in the path.

Rain Drop sensor (KG004) - it is used for measuring rainfall intensity.

SOFTWARE TOOLS:

1. Keil Micro vision
2. Proteus ISIS 7
3. Flash Magic

C. Description of the transmitter and receiver

Before switch on the kits first we have to enable the Wi-Fi module. When switch on the kit LCD shows as “WELCOME TO THE PROJECT" and then shows temperature, rain intensity, humidity and soil sensor values. The Wi-Fi module is used in the operation of the robot. It can drive in either direction with the help of L293D. Seeding, drilling and spraying fertilizer are the tasks performed by the robot.

The power supply, which is DC voltage power, is provided by the battery. However, the circuit functions at 5V DC voltage. Therefore, a regulator is used to diminish the voltage. LM7805 regulator creates 5V DC. This 5V D.C voltage is given to the all blocks present in the block diagram. In this project we use LPC2148 microcontroller. This is the heart of this project. Sensors, Wi-Fi, LCD, and DC motors, seeder, fertilizer and driller all are connected to this microcontroller. Sensors are used to sense the bounds of temperature, humidity, rainfall intensity, soil moisture and also agriculture process of seeding, driller, seed dropper functions.

III. AGRICULTURE PROCESSES

1. Seeding

It mainly operates two mechanisms, one is drilling and other is dropping the seed.

2. Driller

It is present underneath the surface of robot. The head portion of the driller is a sharp shovel that’s connected to a DC motor through a shaft and executes the ploughing process by the robot. The up and down movement of the driller is linked with the appendages of the robot. This digging changes from crop to crop as shown in fig. 2.

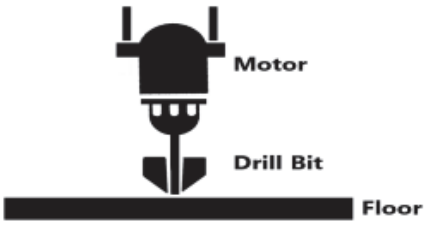


Fig. 2 Drilling mechanism

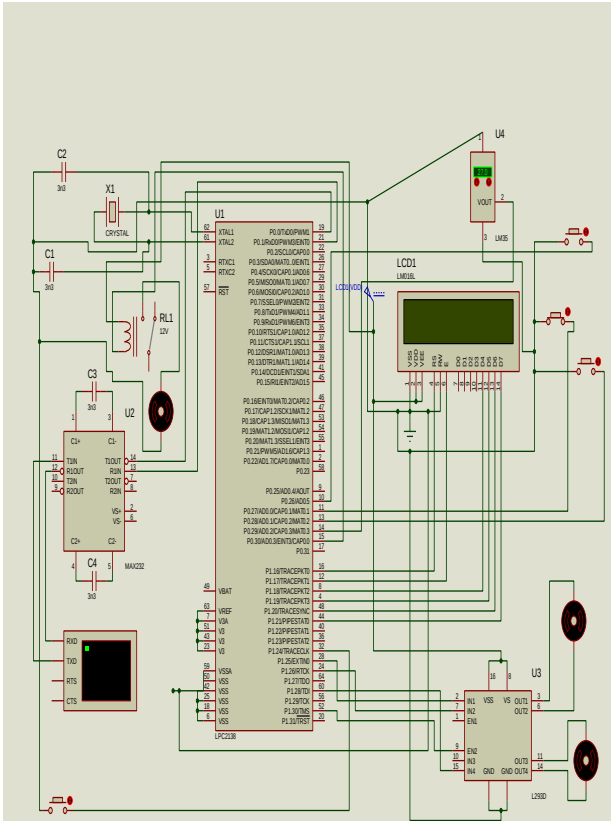
3. Seed Dropper

Seed dropper mechanism involves three dissimilar methods. A seed tank is binded to the dropping mechanism that implements the seeding procedure. The device is represented in such a way that only one seed is dropped at once as shown in fig. 3.

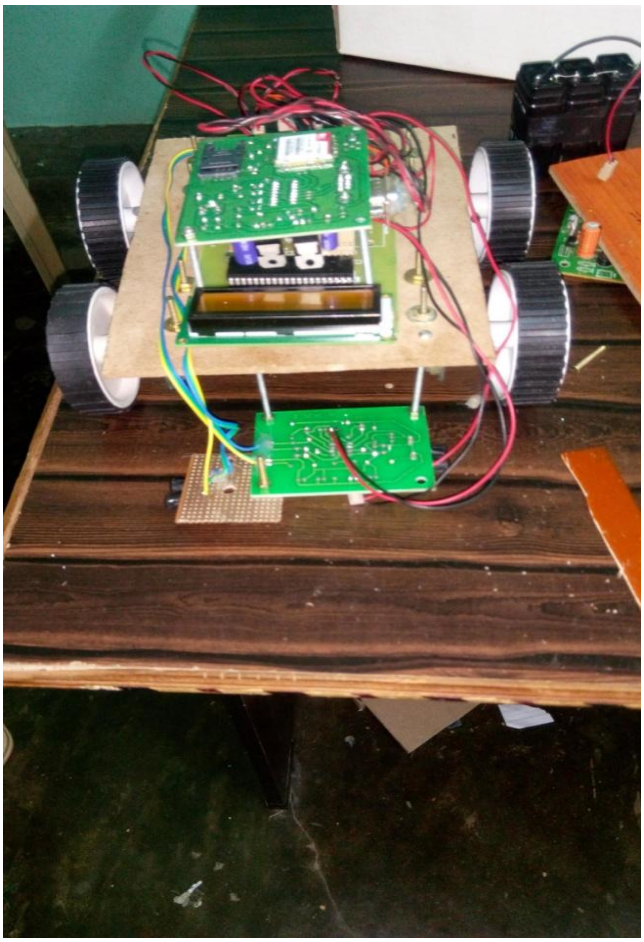
Fig. 3 Seed Dropping mechanism

It is a servo dropping mechanism which takes the seed from the tank when in vertical position and turns 90 degree to horizontal position and releases the seed into the pipe though which the seed is expelled to the soil. This is a high accuracy mechanism.

IV. **RESULTS**



LPC2148 interfacing with robot peripherals



V. CONCLUSIONS

In conclusion, I have done an autonomous robot for carrying out all kinds of agricultural actions like drilling, seeding, and spraying of fertilizers. This project was implemented in both simulation and hardware structure. The robot has two DC motors intended for moving in either direction. Drilling sequence consists of a usual DC motor along with a drill bit. Robot consists of a seed tank used to drop the seed in the soil after drilling and a fertilizer tank is sited on the robot to shower the organic liquids after seeding operation. This robot also does object detection procedure whenever necessary.

Future Enhancement:

Solar panels can be connected to this system to enable it to work for more hours in agriculture fields and therefore it is ecofriendly too.

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