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DESIGN AND IMPLEMENTATION OF SEEDING AND FERTILIZING AGRICULTURE ROBOT

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Abstract

In modern globalization, many technologists are trying to update a new development based on automation which works very rigidly, high effectively and within short time period. The progressive invention in agriculture system is becoming an important task especially because of rising demand on quality of agriculture products and declining labor availability in rural farming areas. The designed system is seeding and fertilizing agriculture robot using microcontroller. The aim of the designed system is to seeding, fertilizing and soil ph, temperature, moisture, humidity checking. The robot is controlled by remote. The designed system involves navigation of robot to the destination successfully and does the above functions. The direction of the robot is controlled via remote. The robot and the remote system are connected through internet system. 6 DC motors are used for navigation of the robot. The speed of the DC motors is controlled using controller. The solenoid is used to control seeding and fertilizing.

1. Introduction

India's record of progress in agriculture over the past four decades has been quite impressive. The agriculture sector has been successful in keeping pace with rising demand for food. The contribution of increased land area under agricultural production has declined over time and increases in production in the past two decades have been almost entirely due to increased productivity. Contribution of agricultural growth to overall progress has been widespread. Increased productivity has helped to feed the poor, enhanced farm income and provided opportunities for both direct and indirect employment. The success of India's agriculture is attributed to a series of steps that led to availability of farm technologies which brought about dramatic increases in productivity in 70s and 80s often described as the **Green Revolution** era 1]. The major sources of agricultural growth during this period were the spread of modern crop varieties, intensification of input use and investments leading to expansion in the irrigated area. In areas where 'Green Revolution' technologies had major impact, growth has now slowed. New technologies are needed to push out yield frontiers, utilize inputs more efficiently and diversify to more sustainable and higher value cropping patterns". At the same time there is urgency to better exploit potential of rain fed and other less endowed areas if we are to meet targets of agricultural growth and poverty alleviation. Given the wide range of agro ecological setting and producers, Indian agriculture is faced with a great diversity of needs, opportunities and prospects.

Future growth needs to be more rapid, more widely distributed and better targeted. These challenges have profound implications for the way farmers' problems are conceived, researched and transferred to the farmers. "On the one hand agricultural research will increasingly be required to address location specific problems facing the communities on the other the systems will have to position themselves in an increasingly competitive environment to generate and adopt cutting edge technologies to bear upon the solutions facing a vast majority of resource poor farmers".

The robotic systems play an immense role in all sections of societies, organization and industrial units. The objective of the project is to develop a microcontroller based system that helps in on-farm operations like seeding and fertilizing at pre-designated distance and depths with all applicable.

Traditional Sowing Methods

Traditional methods include broadcasting manually, opening furrows by a country plough and dropping seeds by hand, and dropping seeds in the furrow through a bamboo/meta funnel attached to a country plough (Pora). For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand is practiced. Multi row traditional seeding devices with manual metering of seeds are quite popular with experienced farmers.

2. Proposed system

The measurement of the moisture of soil, temperature of soil and ph value of soil, performing of the seeding and fertilizing in agriculture field is designed in the agriculture Robot. Instead of using line follower, obstacle detecting sensor in the proposed system camera is used for live streaming. Agriculture robot can be control by the internet using raspberry pi. Live steaming can see by computer by typing ip address of raspberry pi and password then it can be control the robot by pressing controlling key in the system. Rhex rover robot is replaced by the wheeled robot.

Rhex rover having 6 legs, in which 3 legs can move instantly at a time and other 3 legs at next time. It can move like a cockroach using 3leg moves at time. Synchronous between legs are maintain by using IR sensor and feedback sensor therefore its can operate in agricultural field easily. Seed and fertilizer can be drop to field by using solenoid switch in seed dispenser and fertilizer dispenser. LDR is used for indicating seeds and fertilizer in the dispenser by glowing the LED. If seeds and fertilizer is empty then led stop glowing.

3. Methodology

The following system design is achieved depending upon the requirements. The block diagram of the robotic end and control section is shown in figure sensors for controlling soil moisture, temperature, sensing the ph value for deciding fertilizer used for seeding. This system has two main sections, robot end and control section, which are inter-communicated using/aided by the internet communication technologies. The control section as well as robotic station possess the amenities viz., temperature sensor, humidity sensor, ph sensor, soil moisture sensor, seed dispenser, seed storage, fertilizer storage, fertilizer dispense, robotic system with motors, microcontroller, and power supply.

The microcontroller is brain of this system, which can dedicates the order of suggestions received to all the networks, and sensible factors processed by their corresponding embedded programs. Robotic mechanism plays by their internal motors and motor drivers that drive the motors in desired directions. The internet wireless protocol used for signal transmitting and receiving functions. Here the one will monitor the robot and send the signal. According to the received signal the robot will move in the direction and it will place the seed and fertilizer on field for specified distance.

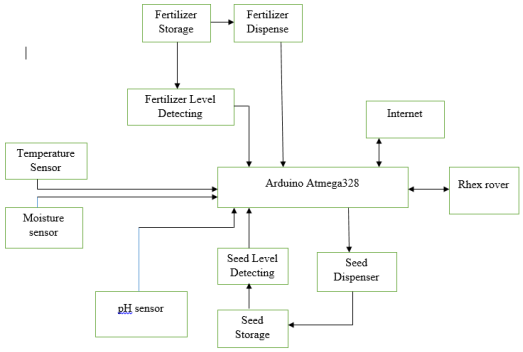

Figure 1 block diagram of robot

The above figure 1 shows the block diagram of robot. Here it can be measure the pH, temperature, soil moisture using ph sensor, temperature sensor and soil moisture sensor respectively. These measured value is input to Arduino microcontroller, depending upon ph value user going to decide which fertilizer is used for seeding and measured soil moisture value is suitable for seeding. Seed dispenser is used for drops the seeds into the land, here solenoid switch is used as dispenser. Fertilizer dispenser is used to drops fertilizer into the lands. Seed storage and fertilizer storage container is used to storing the seed and fertilizer respectively for seeding and fertilizing. Level detector is used to indicate amount of seeds and fertilizer in storage container. Internet is used for communicate between robot end and controlling end. Arduino Atmega328 Microcontroller is brain of project. It process the all input from the sensor and then trigger the actuator to perform particular operation.

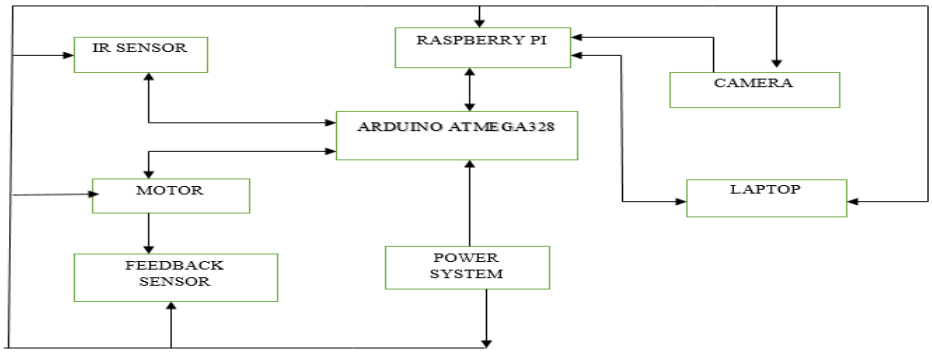

Figure 2 Block diagram of Rhex rover

In the above figure 2 shows the block diagram of the Rhex rover. Arduino Atmega328 microcontroller is used to process the input from the sensors and trigger the particular actuator to perform particular operation. Here 6 dc motors are used for motion of the robot, out of 6 dc motors 3 dc motors are on and 3 dc motors are off at every interval of time. These 6 dc

motors are controller using IR sensors and feedback sensors. Camera is used to see the path of the robot. Raspberry pi wireless module is used for communication between robot end and controlling pc.

4. Hardware implementation

4.1 Sensors Interfacing

The circuitry mainly consists of temperature sensor (LM35), moisture sensor, 6 DC motor responsible for robot movement and solenoids which functions as a valve for seed dispenser and fertilizer interfaced to the ArduinoAtmega328 microcontroller at the Robot end. The raspberry pi module operating on wireless network protocol provides the internet link between the transmitter section and the receiver section.

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (centigrade) temperature. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. The LM35 sensor is interfaced to channel 0 of the ADC0809. The output of LM35 changes by 10 mV for every change of 1°C. Figure shows below the connection of LM35 sensor to the ADC0809.

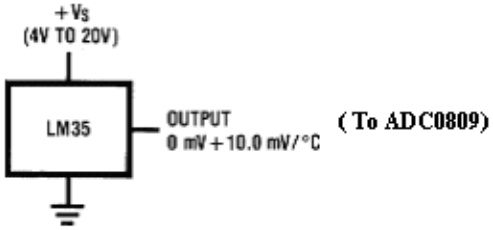

Figure 3 LM35 connected to ADC0809

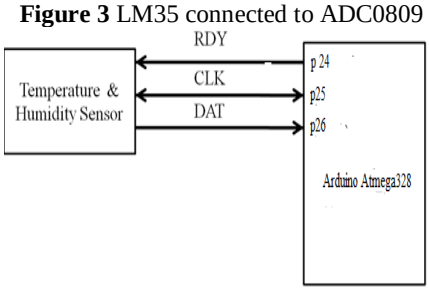

Figure 4 LM35 connected to ADC0809

There are two ways to get the output from sensor. We can use either of the interface depending on our application.

Interface #1: It is Serial Data at 9600 bps at 5V level. We can also use the serial data to interface to PC using MAX232 level convertor for serial port or use USB-TTL chip to get a virtual serial port on PC to which many software like Hyper terminal can be connected. Custom software can also be made to monitor the incoming data. Also serial interface directly used with a microcontroller when you have a dedicated serial input pin available on your application to get the data for display or processing.

Interface #2**:** It is Serial Shift Interface, which consist of three pins. In this interface by monitor RDY pin to low, new data can be arrived. Then shifting of output data using DAT and CLK pins. Any I/O of application microcontroller can be used for interface.

4.2 DC Motor Interfacing:

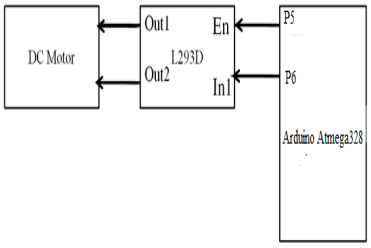

Figure 5 DC motor interfacing to MC

6 DC motors have been used for moving the robot. While at the first movement of the robot, initially 3 dc motors are on and other 3 dc motors are r will get off. In the next movement of robot on and off the 3 motors are will get reverse. For maintaining the synchronization of the dc motors IR sensor and feedback sensor are used.

These DC motors interfaced to microcontroller using L293D motor driver circuit which can drive two DC motors. A simple schematic for interfacing a DC motor using L293D is shown below.

4.3 Moisture sensor

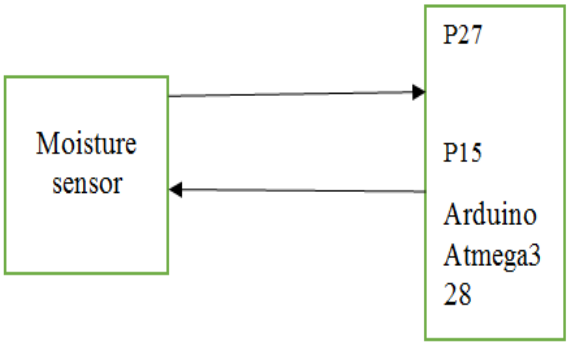

Figure 5 Soil moisture interfacing to MC

The moisture sensor is used to measure the soil moisture to sawing the seeds and fertilizer. Moisture is fixed to low and high value if measuring value cross this limit then buzzer alarms to indicate it is not suitable for seeding and fertilizing.

4.4 Solenoid

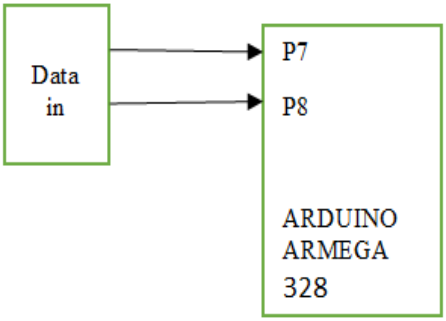

Figure 7 Solenoid interfacing to MC

Using solenoid switch, seeds and fertilizer can be dropped from the container .when robot moves seed dispenser open and close the solenoid at a predetermined distance.

5. Result

The measurement of the moisture of soil, temperature of soil and ph value of soil, performing of the seeding and fertilizing in agriculture field is designed in the agriculture Robot. Instead of using line follower, obstacle detecting sensor in the proposed system camera is used for live streaming. Agriculture robot can be control by the internet using raspberry pi. Live steaming can see by computer by typing ip address of raspberry pi and password then it can be control the robot by pressing controlling key in the system. Rhex rover robot is replaced by the wheeled robot.

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6. Conclusion

In this project we made an effort to overcome some problems in agriculture. The rapid growth in the industries is influencing the labors who are situating in the villages to migrate to the cities. This creating the labor problem for the agriculture. The wages for the labor is also more. As the prices of commodities such as food grains, fuels, cloths and other essentials of daily life is increasing rapidly the labors demand for the more wages from the owners. This factors influencing the farmers who are interested in agriculture activity to leave their land uncultivated. By implementing this project in the field of agriculture we can help the farmers in the initial stage of agriculture i.e. during the seeding and fertilizing. This project can be a better substitute for the human who performs the seeding and fertilizing. This project is very useful for the farmers who are intended to do agriculture activity but facing the labor problem.

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