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AgriBot - Farmer Friendly Agricultural Robot with Watering System

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***Abstract*—Aim of this paper is to build a multitasking agricultural robot that can perform tasks such as detecting, extinguishing fires and water spraying for irrigation systems. The emphasis of this paper is on the improvement of agricultural methods. In this dissertation we investigate that farmers spend a lot of manpower on field. India, as we all know, is a country where agricultural production is the most significant sector. Our main goal is to reduce their strenuous activity and struggling by recreating an improved irrigation system that could save all or most of the effort and time. This paper proposes a comprehensive agricultural approach based on the farmer's needs. The proposed system is based on embedded system.**

Keywords*— *Micro-controller, Embedded System, DC motor, Watering, H-Bridge motor driver.

I. INTRODUCTION

As per recent statistics, crop cultivation land in India is shrinking at an unprecedented rate. The main causes of incoherent development are outdated irrigation methods and lack of water supplies. Moreover solar-powered technology developments for farming process automation can provide significant environmental benefits in India [1].

Several agricultural robots are developed in the late 1980s for development and research. The fruit growing robot developed by kawamura and his colleagues. The apple growing robot was created by grand and his co-workers. They were followed by a slew of various works. Agriculture has progressed from a traditional occupation to something like a rapidly industrializing sector that employs a wide variety of equipment and machinery over time.

Agriculture entails a variety of operations that necessitate the handling of durable loads. For instance, farmers utilizing powerful plow equipment in hand plowing. Furthermore, farmers continue to use the conventional method of bringing massive water pipes to irrigate their crops. Such activities are boring, tedious, or involve the workers strength and abilities.

A Robot is often a computer that could be configured and reconfigured to perform specific tasks. It usually comprises of the manipulator, such as with a hand or tool, claw, that is connected to a stationary body or a static base. Autonomous robots are regulated entirely by a computer algorithm. In order to navigate, they sometimes use sensors to collect data regarding the environment. Tele-driven robots are managed by corporations or computer algorithms. Human controls cellular modem robots using a controller like a joystick or even other hand-held gadget. The term "robot" is derived from the latin verb "robota", that implies "forced labour" [2].

Since we all realize, water use has been one of the world's most pressing concerns. Water management algorithms have been employed in variety of ways. Any area necessitates the use of water. Water is indeed an integral part of our daily lives. As a result water is defined as a fundamental human need. In the agricultural sector, a large amount of water is needed. Among the most serious issues in agriculture is water waste. This water waste occurs when the fields are given an excessive an amount of water [3].

Section II outlines the Literature Survey; Existing scheme is mentioned in Section III. The proposed framework is defined in Section IV. Section V of this research paper contains the methodology. The result interpretation and discussion are present in the VI segment. This research paper's conclusion is found in section VII. Section VIII outlines the research paper's future reach.

II. LITERATURE SURVEY

"Muzammil Hussain, S.P. Gawate, P.S. Prasad and P.A. Kamble" develops a Smart Irrigation System with Three Level Access Mechanisms in which operation of the system necessitates minimal manpower. This system only provides water whenever the ground humidity falls underneath the threshold value. The soil proportion just at root zone kept constant to some degree by giving direct water transfer to something like the root zone, as a consequence less water is used by the roots and this system aids in reducing overall watering, crop damage and price of output. This method is known to have been cost-effective and helps for the production of agricultural products and crops in water scarce areas. It needs

very little maintenance and can be adjusted according to change in climate [3].

'Pallaviram Sure, Sudarshan S K, R Kirthana, Nandan K N, Meghana K and Rahul D S' develops "IoT based solar powered Agribot for irrigation and farm monitoring" in which agribot functions as an IoT system designed for remote farming management and irrigation. The designed agribot was solar powered and hence when it is not irrigating, it collects solar energy. The Agribot introduced in this paper could irrigate farmland and transfer collected data at different geographical locations towards the cloud. The data is then analyzed and interpreted in the cloud for useful knowledge and prediction [1]

'M.B. Srinivas and Akhila Gollakota' develops 'Agribot - A Multipurpose Agricultural Robot' in which the robot is turned on and put in the area. As a result of this its wheels are able rotate, to begin plowing some other switch is switched on. This cause the spiked wheels to rotate, after that it starts plowing that occur simultaneously as when the robot goes forward. The seeds are stored in a container, when the spike wheels will be in the forefront. This container has a hole drilled within bottom that is sealed with a thin metal or steel sheet. This sheet serves mostly as flip flop and allows seeds to fall at regular intervals. There are two ways to control the flip-flop, the first is by using stepper motor and the second is by using relay [4].

Sudheer Kumar Nagothu develops 'Weather based Smart watering system using soil sensor and GSM' in which ARM microcontroller was initially equipped with weather information from an Indian metrological page. With this information, expected six day weather information could be interpreted such as temperature and rainfall. Based on this information this system will control the flow of water. Drip irrigation or sprinkler irrigation may also be used to water the plants. The watering device can be turned on or off by data analysis out from the soil detector, human input and web forecast data. The commands created by automation system will be over written by human input. A mobile application or just the human's personal computer can be used to have inputs. The results will be sent to smart watering device via GPRS [5].

III. EXISTING SYSTEM

In certain regions of the country, majority of agricultural operations are carried out by hand with simple and traditional tools and implements such as wooden plough and a sickle. Ploughing, irrigating, thinning, sowing and harvesting threshing , pruning, weeding, and exporting the crops. This is especially true for rural poor and marginal farmers. It leads to significant waste of human labour and low labour yields per capita.

IV. PROPOSED SYSTEM

The proposed system is built on Arduino mega Microcontroller and it is based on Embedded system. We have developed a portable automate irrigation robot system that performs the tasks of the farmers such as detection of fire and automatically extinguishing the fire and watering the fields automatically.

V. METHODOLOGY

A. Block Diagram

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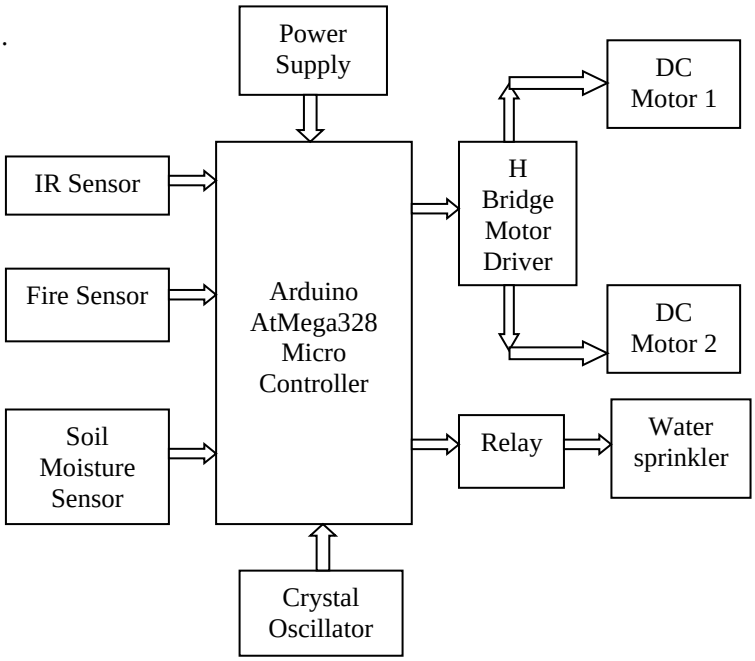


Figure1: Block diagram

Figure shows the block diagram of this system which consists of Arduino AtMega328 Microcontroller, Power supply. IR sensor, Soil moisture sensor, Fire sensor, Relay, Crystal oscillator, Water sprinkler, DC Motors and H Bridge motor driver.

B. Working

The primary Aim of this paper is to build a multitasking agricultural robot that can perform tasks such as detecting, extinguishing fires and water spraying for irrigation systems.

This project explains the agriculture techniques and robots we listed many disadvantages that we are overcoming with our proposed idea which is Agri-Bot programmed on single chip with multiple functions. The block diagram of proposed system consists of a vehicle controlled by atmega328 microcontroller as master controller, humidity sensor for irrigation, indicators such as LCD etc. and other accessories. The proposed system integrates all the functions such as fire detection and watering into a single robot and performs the operations automatically. Agro-Bot will automatically move in field provided length and width of field. It gives us the option to choose the mode of its operation. It will be convenient for farmers to operate in their desired mode. Like moving front, back, left and right in which command we provide through the program.

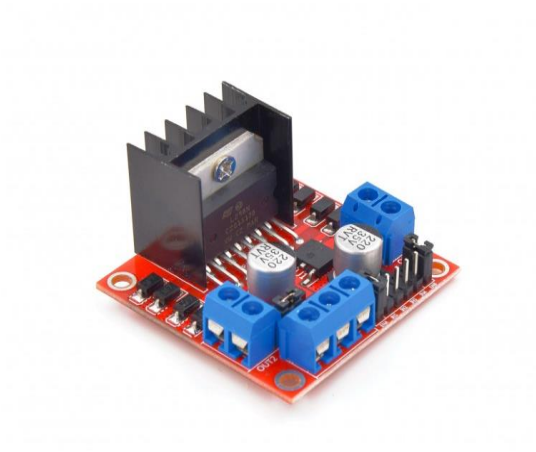
Algorithm:

1) Step1: Start
2) Step2: Initialize the system on Arduino microcontroller ATmega328.
3) Step3: DC motor will run forward
4) Step4: IR sensor will detect the obstacle and make a decision to turn by the allocation of programming sequence.
5) Step5: If fire is detected
6) Step6: DC motor will stop and dc pump motor will start to extinguish the fire.
7) Step7: after extinguishing the fire again dc motor will run forward.

8) Step8: If the soil moisture level is low, the sensor sends the information to the controller.Dc pump motor at that time. Motor flows the water to the field.
9) Step9: Dc pumps motor start at that time. Motor flows the water to the field.
10) Step10: If the field reaches the threshold level the sensor and motor will automatically OFF.
11) Step11: If step10 is complete, it will go to step3.

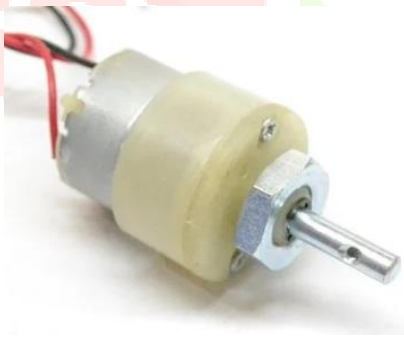
C. Hardware Equipments

1) H-Bridge Motor Driver



H Bridge motor driver seems an electronic device. The polarity of operating voltage to a load is switched by an H Bridge motor driver. These devices are frequently seen in robotics as well as other systems to activate DC motors to move forward or backward [6].

2) DC Motor



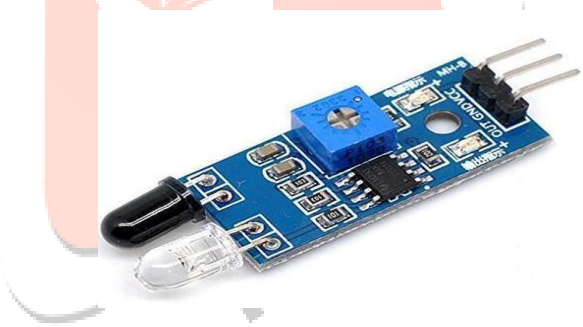
Any rototary electrical motor which transforms direct current electrical power into mechanical power is referred to as DC motor. The most popular forms depends on magnetic field to produce forces. Almost all DC motors having internal system, whether in electronic or electromechanical , that changes its resistance of current in a portion of motor on a regular basis[7].

3) Arduino Mega 328

Atmel's megaAVR category contains the ATmega328 singular microcontroller. It has an 8-bit 'RISC Processor' based on Harvard Architecture. Specifications of Arduino Mega328 are as follows

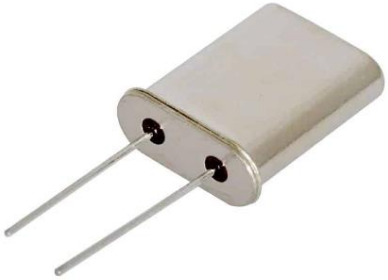
1. 5V is a operating voltage
2. 6 pins for analog inputs
3. 14 Digital I/O pins
4. Suggested Input voltage 7-12V
5. 32kb flash memory, among which 0.5kb is used by the bootloader.
6. 2 kb of SRAM
7. 1 kb of EEPROM
8. clock speed is 16MHz [8][9].

4) Infrared Sensor



An IR Sensor or Infrared sensor is a device that senses and monitors infrared radiation within the immediate surroundings. Whenever an object approaches the sensor, the LED's infrared light bounces off it and is identified by receiver [10].

5) Crystal Oscillator



Crystal oscillator seems to be an electronic circuit that generates a constant frequency electrical signal by using the mechanical resonance. Inverted piezoelectric effect causes crystal oscillators to vibrate at their natural frequency whenever an ac voltage is applied around the crystal surfaces. Such vibrations are gradually transformed as oscillations [11][12].

6) Relay

The Agribot uses relay a relay to complete the irrigation task. A relay module is indeed an electrically controlled device that can turned on or off a connection with far higher current and/or voltage than a micro-controller can manage [1].

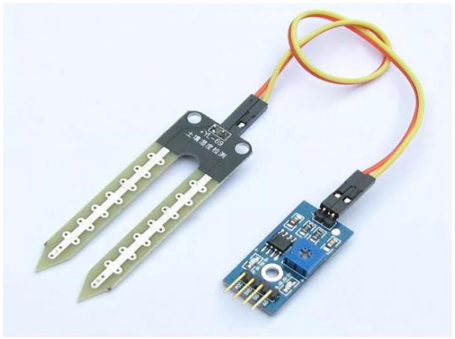
7) Fire sensor

Fire sensor is a device which senses the presence of a fire or flame and reacts accordingly or it detects fire and sends out a High signal when it detects it. All possible responses to a detected fire are raising an alarm or disabling a fuel line or enabling a fire alarm system [13].

8) Water sprinkler

Sprinkler irrigation seems to be a form of irrigation water technology that mimics natural rainfall. Pumping is used to convey water through a series of pipes. The water is then sprayed via sprinklers, breaking into little water drops that falls down to the ground [14].

8) Soil Moisture sensor



A Soil moisture sensor has been used to determine how much water is in a given volume of soil. Whenever the water is drawn out from sensor, the soil moisture decreases and resistance increases. In contrast, resistance decreases as soil moisture decreases [15].

D. Software

The Arduino IDE (Integrated Development Environment) software is used to program the microcontroller.

VI. RESULT ANALYSIS AND DISCUSSION

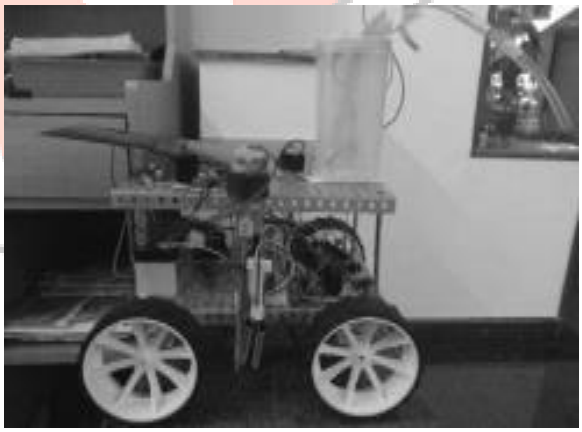


Figure2: Agribot

We developed an agriculture robot. A robot is a simple autonomous robot that moves in the agriculture field and checks for fire and water in the agriculture field. The right amount of water will be spread over the seed. When the robot starts moving in the forward motion if it detects any obstacle it changes the direction automatically as per the program. After this it moves again in the forward direction and if it detects any fire then it will stop there and dc pump motor will start and extinguish the fire, there is a soil water level sensor also there if soil is dry then it starts the pump motor and watering the field till it gets the wet soil. This procedure continues until the user switches off the circuit.

VII. CONCLUSION

This Automatic seed irrigation Agribot has increase productivity for Indian farmers. The chassis handles the complete weight of battery and the hardware mounted on agribot which is able to perform each and every operation skillfully and successfully. The irrigation process is done better than before to yield the proper production done before and usage of water level is limited and increases the production rate.

VIII. FUTURE SCOPE AND DISCUSSION

For further development of this paper, we can add GSM and GPS modules as whenever the fire is detected gps will take the location of fire within 6m radius and it will send the sms to the concern person to take necessary action as if the there is large fire then Agribot cannot extinguish it then there me be a chance of lot of damage to the fields/crops.

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