International Journal of Innovative Research in Engineering
Volume 4, Issue 3 (May-June 2023), PP: 279-283.
www.theijire.com ***ISSN No: 2582-8746***

Precision Agriculture Using Hanging Robot

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How to cite this paper:
Dhivyadharshini S[1], Shalini S[2], Radhakrishnan C[3] Precision Agriculture Using Hanging Robot", IJIRE-V4I03-279-283.

https://www.doi.org/10.59256/ijire.2023040389

Abstract: *The precision agriculture monitoring system is an emerging concept. The sensors are capable of providing information about agricultural fields and then Artificial Intelligence takes decision automatically based on the sensor values. Monitoring environmental conditions is the major factor to improve yield of the efficient crops. In this project, we present a new approach by using hanging robot with virtual assistance in the agriculture field by monitoring moisture, temperature etc.It further provides a review on the most common sensing principles that can be used for in-situ and real-time temperature and and humidity level, as well as an overview of the difficulties for deploying these sensing systems and their electronic interfaces in the harsh soil environment. It reviews existing agricultural circuits and sensing systems designed for agricultural monitoring and their limitations whilst highlighting remaining challenges in order to make automated, decision- making systems for precision agriculture, a reality.*

Key Word: *Integrated circuit, Motor driver supply, Sinusoidal signal, Communication port, Integrated Development Environment.*

I.INTRODUCTION

Precision agriculture, which aims to solve the issue, is an agricultural management approach focused on monitoring and reacting to inter- and intra-field variability in plants and soil. There are now two key obstacles standing in the way of the widespread adoption of PA. First off, mapping several soils, crops, plants, and environmental variables inside a field or greenhouse causes a farmer to experience "data overload." Therefore, the creation of automated decision-making systems and data integration tools is necessary. Second, data collection for variables affecting soil, crops, plants, and the environment is feasible but expensive and labor-intensive because the majority of them need soil sample and laboratory examination. The development of sensing devices and accompanying electronics to monitor soil quality in real time within the system requirements of the application is therefore the key challenge for adopting Precision agriculture..

II. PROPOSED SYSTEM

In the system that is being presented, we create a precision agricultural system employing a hanging robot and virtual help, which involves the use of numerous sensors and microcontrollers. Instead of using humans to make decisions and take action, sensors are employed.Programming may be used to track the growth of plants in real time.When the temperature and humidity are excessive, a buzzer will sound to warn people.

By using a motor and receiving orders through a serial monitor, the robotic kit may move forward and backward while simultaneously sending an image to the microcontroller unit through serial communication. If the plant's development slows, the fertilizer will also automatically come on. Our suggested system includes a gas sensor that aids in keeping track of the atmospheric concentrations of greenhouse gases. In this study, greenhouse gases in the environment are tracked using a gas sensor.

Because of the growth of the plant will be greatly impacted by the rise in greenhouse gases. Different sensors are utilized to monitor the environmental state of the agricultural field, such as temperature and humidity. So, our wireless network-based suggested system for precision agriculture sensors may be put into practise.

III.HARDWARE REQUIREMENTS

Micro controllers play a major role in today's advanced technological world, serving as heart and brain of an embedded system. Most of the devices which are embedded system utilizes micro controllers as their CPU.

Arduino uno: A microcontroller board called the Arduino Uno is built around the ATmega328. It contains a 16 MHz crystal oscillator, 6 analogue inputs, 14 digital input/output pins (of which 6 may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It has everything required to provide support. to get started, just use a USB cord to connect it to a computer, or power it using an AC-to-DC converter or battery. The FTDI USB-to-serial driver chip is

not used by the Uno, which is how it differentiates from all earlier boards. Instead, it has an Atmega8U2 that has been configured to act as a USB-to-serial converter.

Humidity sensor: A capacitive type humidity sensor, a CMOS capacitor to frequency converter, and an EEPROM used to store the calibration variables make up the HH10D relative humidity sensor module. The system can react to a change in humidity extremely fast because to the properties of capacitor type humidity sensors. Two distinct sensor-related coefficients are saved in the EEPROM on the module after each sensor has been calibrated twice in two different precise humidity chambers. When there is water in the air, there is humidity. Numerous industrial production processes as well as human comfort can be impacted by the amount of water vapour in the air. Water vapour also affects a number of physical, chemical, and biological processes.

Fig1.Humidity Sensor

Temperature Sensor: The initial slave was linked to an LM35 temperature sensor. This measures the engine's temperature and gives the current temperature. Precision integrated-circuit temperature sensors of the LM35 series provide an output voltage that is directly proportional to the temperature in Celsius (Centigrade). Thus, compared to linear temperature sensors calibrated in Kelvin, the LM35 has an advantage since the user does not need to deduct a significant constant voltage from its output to get suitable Centigrade scaling.

ADC: Analog to Digital Converter is the data acquisition component, designated ADC0808 and ADC0809, is a monolithic CMOS device featuring an 8-bit analog-to-digital converter, an 8-channel multiplexer, and control logic that is compatible with microprocessors. The 8-bit A/D converter converts data via sequential approximation. The conversion method used by the 8-bit A/D converter is sequential approximation. Any of the eight single ended analogue signals can be accessed directly by the eight-channel multiplexer. The gadget does away with the necessity for external full-scale and zero adjustments. The latched and decoded multiplexer address inputs and latched TTL TRI-STATE outputs make it simple to interface with microprocessors. The ADC0808 and ADC0809 designs have been optimized by combining the best features of several A/D conversion methodologies.The ADC0808 and ADC0809 provide good long-term precision and repeatability, high speed, high accuracy, little temperature sensitivity, and little power consumption. This device is perfectly suited for applications ranging from process and machine control to consumer and automotive ones thanks to these qualities. See the ADC0816 data sheet for a 16-channel multiplexer with a common output (sample/hold port).

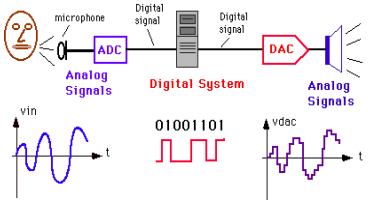

Fig2.Working of ADC

Gas Sensor: Gas sensor to detect the presence of gas vapors for use in breath analyzers or alarm units. This sensor device has an extremely high sensitivity and a quick reaction time. The device has high stability and extended life and may be operated using a straightforward driving circuit. The equipment is prepared to analyse a new sample after all of the acetic acid has been removed from the fuel cell.

Fig3.Gas Sensor

Buzzer: The word "buzzer" derives from the rasping sound that buzzers made when they were electro-mechanical devices, operated by stepped-down AC line power at 50 or 60 cycles. A buzzer or beeper is a signaling device. A ring or a beep are two additional noises that are frequently employed to signal that a button has been pressed. This innovative buzzer circuit connects a speaker, a tiny audio transformer, and a relay in series. The relay will turn on when the switch is depressed using the transformer primary and closed relay contact. The typically closed contact will open as soon as the relay is in operation, disabling it. The contacts will then shut, and the process will continue. Because everything happens so rapidly, the pulse of current creates variations in the transformer primary and, therefore, secondary. Thus, the speaker tone and relay operating frequency are inversely related. You may "tune" the note with capacitor C. The buzzer's tone is lowered when capacitance rises from its nominal value of 0.001uF.

B.O Motor: Battery-operated DC motor. Electrical energy is transformed into mechanical energy by a dc motor. Why is a robot's motor control circuit using a DC gear motor. Gear reduction is a DC MOTOR idea in which the vehicle's speed is decreased while its torque is increased. A DC motor's assembly includes numerous gear arrangements. RPM stands for revolutions per minute and measures the speed of a motor in terms of 16 15 1 4 14 13 11 10 rotations per minute. RPM is short for revolutions per minute. The set-up assembly aids in boosting torque while lowering motor speed. This kind of DC motor may be utilized with any robot that is micro controller based. RPM and torque are inversely related in all DC motors. Every DC gear motor uses a PWM (Pulse Width Modulation) circuit.

Motor Drive: These four quadruple high-current half-H drivers are the L293 and L293D. At voltages between 4.5 V to 36 V, the L293 is intended to provide bidirectional driving currents of up to 1 A. At voltages ranging from 4.5 V to 36 V, the L293D is intended to deliver bidirectional driving currents of up to 600 mA. Bipolar and dc stepping motors, solenoids, relays, and other devices are only a few examples of the inductive loads that both products are intended to drive in positive-supply applications. All inputs are compatible with TTL. Each output features a full totem-pole driving circuit with a pseudo-Darlington source and a Darlington transistor sink. Drivers are activated in pairs; for example, 1,2EN activates drivers 1 and 2, whereas 3,4EN activates drivers 3 and 4.

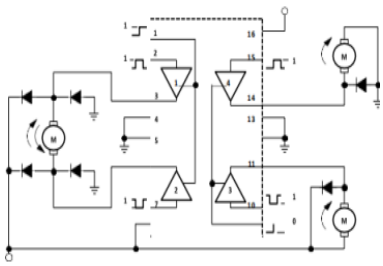

Fig4.Motor Drive Circuit Diagram

UART: A computer hardware component known as a universal asynchronous receiver/transmitter, or UART for short (/jurt/), converts data between parallel and serial modes. UARTs are frequently used in combination with TIA (previously EIA)RS-232 and other communication protocols. The adjective "universal" suggests that the data format and transmission speeds are both configurable.. A driver circuit that is separate from the UART manages the electric signaling levels and techniques (such as differential signaling, etc.).A UART is often an individual integrated circuit (IC) or a portion of an IC used for serial communications across a serial port on a computer or peripheral device. Nowadays, UARTs are frequently seen in microcontrollers. A dual UART, sometimes known as a DUART, integrates two UARTs into one chip. The NXP SCC2698 is an example of an octal UART, or OCTART, which integrates eight UARTs into a single device. USARTs, or universal synchronous/asynchronous receiver/transmitters, are a common feature of contemporary integrated circuits (ICs) that allow synchronous communication.

IV.METHODOLOGY

System work flow: The suggested technique keeps track of three crucial factors needed for plant development. These three factors include soil humidity, plant environment temperature, and greenhouse gas concentration.

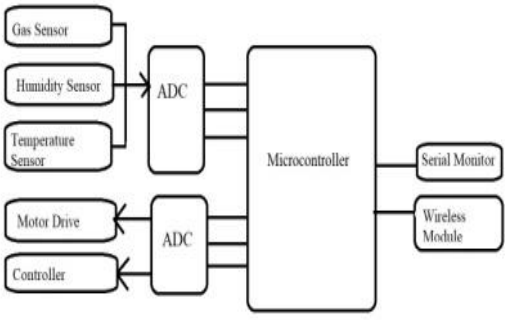

Fig5.Work Flow Circuit Diagram.

The micro controller is updated with the many types of necessary data from the environment by the sensors that are linked to it.

Prior to being sent to the micro controller, the analogue data collected by the sensors is converted to digital form by an ADC.

Every piece of data that is input to the microcontroller using Arduino code is compared to the threshold data.

The Serial monitor, which is built into the circuit, shows the read data with an indicator of some form whether the threshold data is then reached or exceeded.

The actuators then start acting in accordance with the steps necessary to address the stated situation.

V.WORKING

1. Data Collection: The parameters which are required to be monitored and controlled are handled by respective sensors. These sensors are integrated to the micro controller. In our system these sensors are connected to Arduino uno board via connecting jumper wires.

2. Monitoring water level in plant: The adequate water level required for the plant is set in the microcontroller. When the water level or humidity of the soil falls below the given level, the buzzer gives indication displaying the current humidity level of the soil.

This then turns on the motor which supplies the required water to the crop. This process continues until the required amount of humidity is obtained.

Alternately when the humidity in soil attains its maximum level, the humidity level is displayed in Serial Monitor giving the indication ”HUMIDITY LEVEL HIGH” and the buzzer turns on.

3. Monitoring Temperature: Some plants can survive only at certain temperature limit. For such plant maintenance temperature monitoring can be of great use. The temperature sensor monitors the environment temperature when certain temperature is read, the system displays the temperature in the serial monitor and gives the indication via buzzer. This then turns on the motor which provides water supply to the plant hence cooling the temperature. The serial monitor displays the message ”TEMPERATURE HIGH” when the temperature hits it limit.

4. Monitoring Gases: In our system the Greenhouse gases are monitored using the gas sensor which is displayed in Fig.3.This gas sensor monitors the Greenhouse gas reaches its maximum limit the sensor alerts the system. This hence displays the read data in the serial monitor along with the indication action i.e buzzer.
The output of the action is displayed as follows.

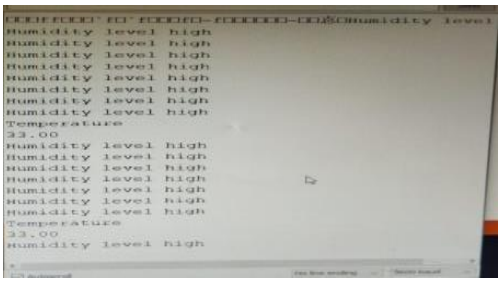

Fig5.The output displayed in the serial monitor

VI.HARDWARE SETUP

The figures shows the hardware setup of the project where the sensors and actuators are integrated to the microcontroller for the required action.

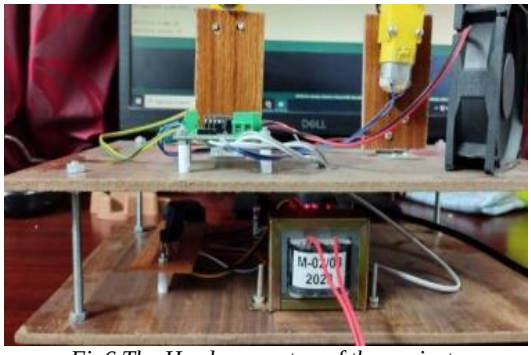

Fig6.The Hardware setup of the project.

VII.CONCLUSION

The early results of the irrigation control method's testing indicate that it is a good replacement for the present methods for controlling irrigation and fertilizer supplies. Tuning the irrigation system is done using a feed-forward loop alone. Since feedback is solely utilized for fine-tuning the parameters of the model, instability issues brought on by feedback loop delays are avoided. In comparison to robust control design, the suggested approach practically takes no effort to apply to a given problem, which is handled in a very simple manner. The user-friendliness and openness of control mechanisms is another important benefit. As a result, the approach on rock-wool substrates achieves the same accuracy as other systems that directly monitor the water level. Faults in the hydro mechanical gear or the plant physiology itself and run fault detection might be blamed for a sudden big inaccuracy or a quick change in the model parameters. The concept is currently being used on industrial production sites to assess grower feedback and operational data from various crops.

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