



IoT based Agricultural Crop Protection

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Abstract: Crop monitoring is just harvesting the crop to get the best yield possible with the resources available. However, nowadays, crop monitoring also includes protecting the crop against theft or damage caused by unplanned weather changes. Farmers can employ cost-effective and user-friendly technological solutions such as highly dependable sensing equipment and their interaction with mobile networks to suit their monitoring needs. Farmers are more involved in many unproductive activities nowadays, such as defending the crop from human or animal intrusion, which may result in theft or harm to the crops that the farmers have grown over time

Keywords: IoT, Agriculture, Crop Protection, Arduino, Sensors

I. INTRODUCTION

Due to a scarcity of agricultural land and the loss of finite natural resources, increasing farm production has become critical. The agriculture industry is concerned about the shifting structure of farming labour. Furthermore, in most countries, agricultural labour has reduced. Because the farming workforce is dwindling, internet connectivity solutions have been applied in agricultural processes to reduce the need for physical labour. Farmers might be able to break the supply-demand gap by raising yields, earnings, and environmental preservation with Internet of Things technologies. Smart agriculture is a method that uses Internet of Things (IoT) technologies to increase agricultural production while lowering operating expenses. The Internet of Things in agriculture includes wireless access, sophisticated technology, software, and IT services.

II. LITERATURE REVIEW

- [1] Nikhil Shindhe, Rounaj Saraf, Pooja Yadav, S.MKulakarni: Farm monitoring and Crop disease diagnosis (2016), Farmers can employ cost-effective, user-friendly technical solutions such as highly dependable sensing equipment and their interfacing with mobile networks to suit their monitoring needs. Farmers are more involved with non-productive duties such as protecting the crop from human/animal instruction, which could result in agricultural theft or damage.
- [2] Wesley H. Huang and Benjamin Axelord: Autonomous Door Opening and Traversal (2016), Mobilerobots must be adept at opening doors, traversing the doorway, and closing the door afterwards in order to reach many areas in human contexts. This method is developed in such a way that it can be used to protect the crop in this case.
- [3] Prof. Devendra Potnuru: Design a front-end dc-dc converter with fuzzy gain scheduling for a permanent magnet dc motor (2017). The motor's input voltage source converter is a dc-dc buck converter, and fuzzy gain scheduling is often used to regulate the motor's trajectory for a particular reference speed in this study. This mechanism is used to cover the crop when rain is detected.
- [4] Guguloth Devial, P. Rama Rao: Using sound agricultural technologies to protect crops from birds (2017). The safety of agricultural fields is crucial. Crop damage by birds and animals is a serious concern, and this system is essential to control it. The range of hearing refers to the frequency range that humans and other animals can hear, but it can also refer to a range level.
- [5] Tatsuya Usui, Hiroki Ishizuka, Takumi Kawasetsu, Koh Hosoda, Sei Ikeda (2017): Osamu Oshiro, Tatsuya Usui, Hiroki Ishizuka, Takumi Kawaset Soft capacitor tactile sensor regarding the air contact displacement - The dispersion of an air-water contact is used to create a soft capacitor tactile sensor. This soft tactile sensor consists of a soft contact portion with a water-filled chamber and duct, as well as a cuff monitoring component that reads the interface's location. When a contact force is given to this tactile sensor, the air-water interface in the canal moves. A change in the capacitance of the sensor component detects movement. This sensor design eliminates the need for hard electrical elements to be embedded in the soft silicone rubber body, providing greater flexibility and cost savings.



III. METHODOLOGY

The tarpaulin system is utilised to cover the crop here, which means that anytime any changes in the environment are recognised, the tarpaulin mechanism is activated. Rain, temperature, day-night, and PIR sensors are the key components of our concept. The rain sensor will detect rain and send a command to the Arduino to perform the appropriate action. The temperature sensor will determine if the temperature has changed. If the temperature falls below the minimum required for the crops to dry, the process kicks in again. The day-night sensor is used to cover the crop at night because moisture levels will be higher, potentially affecting the crop. Any movement of an object will be detected by the PIR sensor. It will identify and close the crop if any birds get close to it. As a result, this device protects the crop from all of the aforementioned threats. Following these steps, the farmer will receive a notification stating that the crop has been covered, along with the date and time.

Monitoring and control are possible via an online IoT cloud platform. This device can be used both manually and automatically.

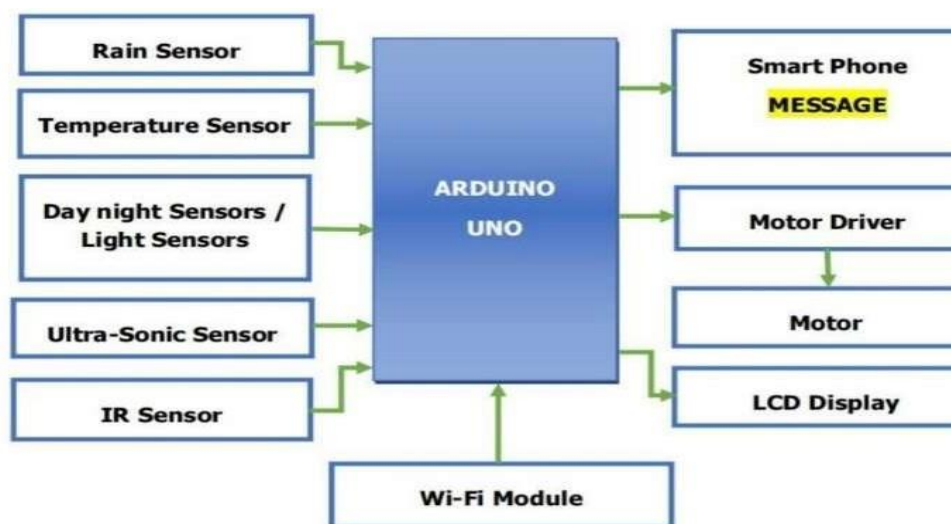


Fig. 1 : Block diagram of the product

II. COMPONENTS

A liquid-crystal display (LCD) is a flat-panel projection or electrically controlled optical system that allows liquid crystals' illumination properties in conjunction with polarizers. Liquid crystals do not emit light directly; instead, they utilize a backlight or reflector in order to create colour or monochrome images.

The Arduino UNO microcontroller board is made up of ATmega328P CPU. This consists of 14 digital input/output pins, 6 analogue inputs, a ceramic resonator of 16MHz, a USB port, an electronic circuit, a power jack and a reset button on it. It comes with all of it you will have to get started with the microcontroller; simply connect it to a computer by USB or dc adapter or battery adapter or battery. It has an analogue and digital input and output pin set that is used to connect the board to other components. There are fourteen I/O pins onboard, six of whom are analogue input ports. The board contains a USB port that can be used to connect to a power supply.

Module for Wi-Fi: The ESP8266, a low-cost Wi-Fi microprocessor with built-in TCP/IP networking software and microcontroller functionality, is manufactured by Espressif Systems in Shanghai, China. The ESP-01 module, developed by Ai-Thinker, first drew the attention of Western manufacturers in August 2014. The ESP-01 module, created by a third-party producer Ai-Thinker, first caught the attention of Western makers in August 2014. Nodemcu lua ESP8266 cp2102 Wi-Fi serial wireless module ESP-12e Easy to programme, built-in micro-USB with flash and reset switches Wireless 802.11 is supported, and there is no need to reset the device. Compatible with the most recent Arduino IDE, Mongoose IoT, and Micro Python.

8.5 gramme weight Lowest-cost WI-FI / A fantastic set of development tools ESP8266 Smart Link Smart Networking and Remote Firmware Upgrade Support (OTA) UART / GPIO data transmission interface support / 110-460800bps transfer rate 4 Mbyte flash size

An infrared sensor is a type of electrical gadget that receives and analyses infrared radiation in its surroundings. IR is



invisible to the naked eye because of wavelength is greater than visible light. Anything that generates heat emits infrared radiation. There are two types of infrared sensors: passive and active. Active infrared sensors produce and detect infrared radiation. Active infrared associated with the work of a receiver and an emissive diode. When an object approaches the sensor, the LED's infrared light reflects off it and is recognised by the receiver. Active infrared sensors are vicinity sensors that are commonly employed in obstacle detecting devices, such as robots.

Day-Night Sensor: For automatic lighting at night, it can be utilised in passage lights, street lights, factories, gardens, shops, and other areas. It turns on at dusk and turns off at sunrise. It only works in the dark, so it saves energy throughout the day by turning off the lights when there is enough natural light. This little day-night switch can automatically turn on any electrical gadget as darkness falls and turn off in the morning. A day/night switch automatically turns on and off outdoor lighting. It is made up of a light-sensitive element that detects the brightness of the surrounding light.

An ultrasonic sensor is an electrical device that detects ultrasonic waves and generates ultrasound waves and interprets the rebounded signal into an electric signal in order to compute the distance to a target item. Ultrasonic waves travel quicker than sound waves that can be perceived. The transmitter (which generates sound using piezoelectric materials) and the recipient are the two main components of ultrasonic sensors (which encounters the sound after it has travelled to and from the target). By monitoring the duration between the transmitter's sound emission and its impact with the receiver, the sensor estimates the distance between the sensor and the item. Combinations allow for different measurement ranges, but they lack the precise accuracy of individual measurements.

NTCs and RTDs are the least precise of the three types of sensors. Temperature probes are a popular and versatile type of temperature sensor. They can be finished with a terminal head and contain a thermistor, thermocouple, or RTD sensing element. All three types of sensors are available in a range of housing options, both stock and custom. This enables them to be more useful in a variety of settings and media.

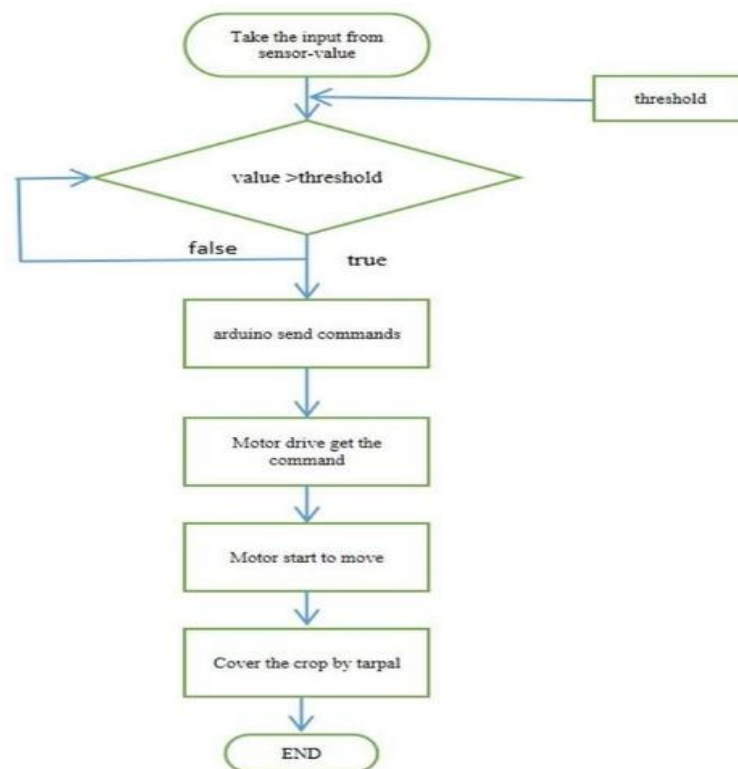


Fig. 2 : Flowchart

A potentiometer is a three-terminal resistor with a moving or rotating contact that may be adjusted to behave as a voltage divider. Even though only two inputs, one end and the wipers, are often used, it consists of a coil or rheostat. A potentiometer is a voltage divider used to detect electromotive force (voltage); the component's evaluation found that it is



an embodiment of the same concept. Potentiometers are commonly used to control electrical products such as audio equipment volume buttons. A controller, for example, might employ a potentiometer with such a function as a position transducer. Because the current drawn inside the potentiometer is similar to the current in the circuit, they are rarely also used regulate considerable power (greater than a watt).

A motor drive is a type of machinery that attaches rotors to controlling circuitry. The controller circuit is designed with low-current signals however the engine takes a lot of power. Motor drivers are used to transform a low-current control signal into a higher-current signal that can drive a motor. We need to interface the motors with wireless technologies such as Bluetooth, 2.4 GHz Rf modules, and so on in order to control the robot remotely with a remote controller. Here are thorough comparisons amongst the proposed motor drivers to assist you in selecting the best motor and motor driver pairing.

IV. SIMULATION



Fig. 3 : Alert message in Blynk IoT

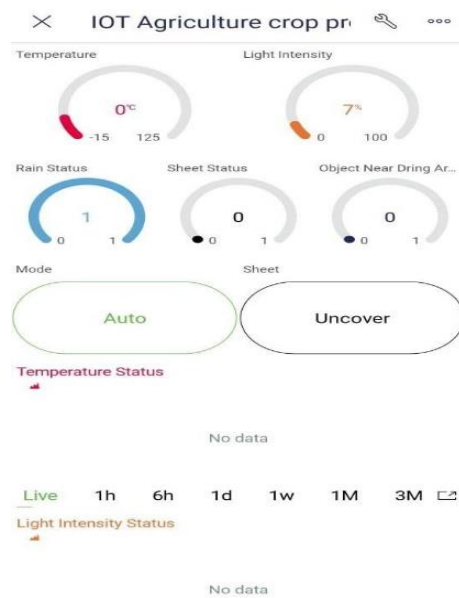


Fig. 4 : Reading of the sensors

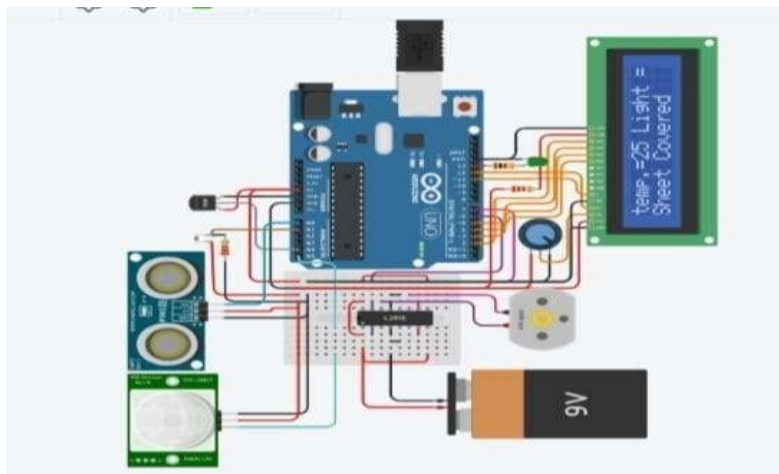


Fig. 2 : Digital circuitry



CONCLUSION

This IoT based crop protection system which we proposed has been cost effective and all the sensors have been checked and the output have been checked and the expected output has been obtained. This system as we intended is cost effective to the farmers to use for protection of the yields which they harvested.

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