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IOT BASED SMART AGRICULTURE

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ABSTRACT

Agriculture plays a vital role in the development of an agricultural country. Around 70% of people depend on farming in our country, and one-third of the nation's income comes from agriculture. Issues concerning agriculture have been continually impeding the improvement of the nation. The main answer for this issue is smart agriculture by modernizing the current customary strategies for farming. Henceforth the undertaking targets making agribusiness smart using computerization and IoT advances. The featuring highlights of this project incorporate smart GPS-based remote-controlled robots to perform errands like weeding, sensing moisture, animal and bird scaring, spraying, and so on. Also, it contains smart irrigation with savvy control and canny dynamic dependent on precise ongoing field information. Thirdly, smart warehouse management includes temperature support, humidity maintenance, and burglary discovery in the stockroom. Controlling of every one of these tasks will be through any far-off shrewd gadget or PC associated with the Web, and the tasks will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with miniature regulator and raspberry pi

Keywords: *IoT, Sensors, GPS, Microcontroller and Wi-Fi*

1. Introduction

Farming is considered the premise of life for the human species as it is the primary wellspring of food grains and other crude materials. It assumes a fundamental part in the development of a nation's economy. It additionally gives enormous plentiful work occasions to the individuals. Development of monetary state of the nation. Sadly, numerous farmers utilize the conventional strategies for cultivating, which brings about low yielding of harvest & natural products. Be that as it may, any place mechanization had been executed, the yield has been improved.

Consequently, there is a need to actualize current science and innovation in the farming area to expand yield. Several different factors influence profitability to a greater extent. These elements include assault of bugs and irritations, which can be constrained by spraying the proper insecticide and pesticides. Besides, assault of wild creatures and fowls at the point when the harvest grows up. There is likewise a probability of thefts at the moment when the yield is at the phase of reaping. Even after harvesting, the farmer faces a challenge to store the harvested crops. To provide solutions for all such issues, it is essential to create an integrated system that will deal with all elements influencing the efficiency in each stage like cultivation, harvesting, and post-harvesting storage. This paper helps in observing the field information as well as controlling the field tasks, which gives adaptability. Then paper targets making agriculture smart utilizing automation and IoT technologies.

The fresher situation of diminishing water tables, evaporating of streams and tanks, capricious climate presents a critical need for legitimate water usage. To adapt to this utilization of temperature and moisture sensors at reasonable areas for checking harvests is executed in [1]. A calculation created with limit estimations of temperature and soil moisture can be customized into a micro-controller-based gateway to control the water quantity. The system can be powered by photovoltaic boards and can have a duplex correspondence connect dependent on a cell web interface that permits information examination and water system planning to be modified through a page [2, 3]. The mechanical advancement in Remote Sensor Organizations made it conceivable to observe and control nursery boundaries in precision agriculture [4, 5]. The use of innovation in the field of agriculture assumes a significant function in expanding the creation just as in diminishing the additional labour endeavours. A portion of the research attempt is accomplished to improve farmers, which gives the system that utilization

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advancements supportive for expanding the agricultural yield [6, 7]

In the studies related to remote sensors, sensors were put beneath the soil, which speaks with hand-off hubs by utilising variable correspondence convention giving exceptionally low obligation cycle and thus expanding the existence season of a soil monitoring system. The system was created using a microcontroller, a universal asynchronous receiver transmitter (UART) interface, and sensors. At the same time, the transmission was finished by hourly testing and buffering the information, sending it, and checking the status messages. The disadvantages of the system were its expense and shipping of the sensor under the soil, which causes the weakening of radio frequency (RF) signals [8].

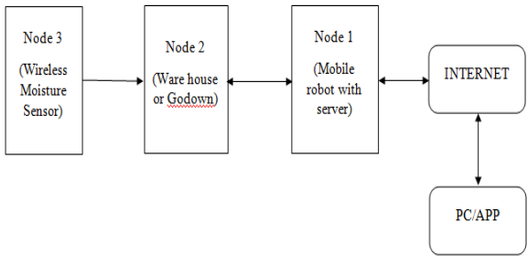

Fig. 1 System Overview

The paper comprises four segments: node 1, node 2, node 3, and mobile app or PC to control system. There are two methods of activity of the system: auto mode and manual mode. In auto mode, the system takes its own choices. It controls the introduced gadgets, though, in manual mode, the client can control the system's activities utilizing the android application or PC orders.

Node – 1: Node – 1 is GPS based on a versatile robot that can be controlled distantly utilizing PC just as it very well may be modified to explore self-governing inside the limit of field using the coordinates given by the GPS module.

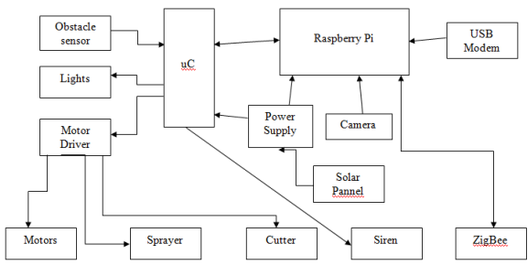

Fig. 2 Node – 1

The remote-controlled system has different sensors, and gadgets like a camera, deterrent sensor, alarm, cutter, sprayer; furthermore, utilizing them will perform undertakings like: keeping watchfulness, winged creature and creature scaring, weeding, and spraying.

Node – 2: Node – 2 will be the storage place or warehouse. It comprises the motion detector, light sensor, moistness sensor, temperature sensor, room warmer, cooling fan through and through interfaced with an AVR microcontroller. The motion detector will identify the movement in the room. When the security mode is ON, it will impart the alarm sign to the client through Raspberry pi and along these lines giving theft detection.

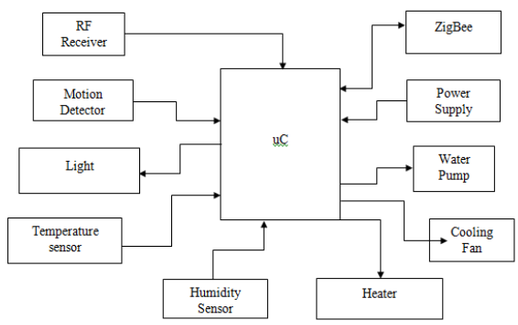

Fig. 3 Node – 2

The temperature sensor and moisture sensor detects the temperature and moisture individually. If the worth passes the boundary at the point room radiator or cooling fan will be turned ON/OFF, giving moisture and temperature maintenance. Node 2 will likewise control water depending on the information sent by node – 3.

Node – 3: Node – 3 will be a smart irrigation water system with highlights like keen control of water pump based on continuous field information, for example, naturally turning ON/OFF the pump after achieving the required soil moisture level in auto mode. Exchanging water pump ON/OFF distantly utilizing versatile or PC is manual mode and consistent checking of soil moisture.

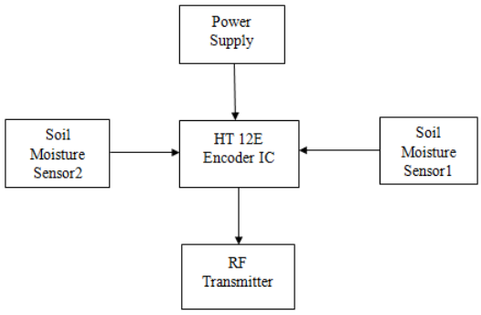

Fig. 4 Node – 3

In node – 3, the moisture sensor sends the information utilizing HT12E Encoder IC and an RF transmitter. The sent information is got by node – 2, and there it is handled by the microcontroller to control the activity of the water pump.

2. Hardwares

2.1 Moisture Sensor

Soil moisture sensor gauges the water content in the soil. It utilizes the property of the electrical resistance of the soil. The relationship between the deliberate property and soil moisture is adjusted, and it might change contingent upon natural factors, for example, temperature, soil type, or electric conductivity. Here, it is utilized to detect the moisture in the field and move it to the microcontroller all together to make a controlling move of exchanging water pump ON/OFF.

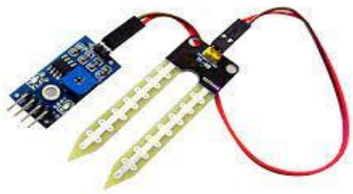

Fig. 5 Moisture Sensor

2.2 Temperature Sensor

The LM35 is an accurate IC temperature sensor. The output voltage of LM35 is straightforwardly relative to the centigrade temperature. The LM35 doesn't need external adjustment or managing to give an exact temperature range. The cost of the LM35 sensor is too low. It has low yield impedance and direct output. The operating temperature range for LM35 is -55˚C to +150˚C. With temperature rise, the yield voltage of the sensor increments straight, and the estimation of voltage is given to the microcontroller, which is increased by the transformation factor to provide the measure of the actual temperature.

Fig. 6 Temperature Sensor

2.3 Humidity Sensor (DHT11)

The DHT11 is an essential, minimal effort computerized temperature and humidity sensor. It gives out computerized esteem, and thus, there is no compelling reason to utilize change calculation at the ADC of the microcontroller. Consequently, we can give its yield straightforwardly to information pin rather than ADC. It has a capacitive sensor for estimating humidity. The main genuine weakness of this sensor is that one can get new information from it simply after regular intervals.

Fig. 7 Humidity Sensor (DHT11)

2.4 AVR Microcontroller (Atmega 16/32)

The microcontroller utilized is, Low-power AVR 8-bit microcontroller, having 8k bytes of In-Framework self-programmable Blaze program memory, Programmable sequential USART, 8-channel, 10-digit ADC, 23 programmable I/O lines.

Fig. 8 AVRMicrocontroller (Atmega 16/32)

2.5 Obstacle Sensor (Ultra-Sonic):

The Ultra-Sonic sensor works on the rule of sound waves and their appearance property. It has two sections: Ultra-Sonic transmitter and Supersonic collector. The transmitter communicates the 40 kHz sound wave, and the collector gets the reflected 40 kHz wave, and on its gathering, it sends the electrical sign to the microcontroller. The speed of sound in the air is now known. Thus, the separation of obstruction is determined from the time needed to get back the communicated sound wave. Here, it is utilized for obstruction identification if there should be an occurrence of a versatile robot and as a movement indicator in product house for forestalling robberies. The Ultra-Sonic sensor empowers the robot to identify and dodge deterrents and quantify the deterrent's good ways. The scope of activity of the supersonic sensor is 10cm to 30cm.

Fig. 9 Obstacle Sensor (Ultra-Sonic)

2.6 ZigBee Module

ZigBee is utilized for accomplishing remote correspondence somewhere in the range of Node – 1 and Node – 2. The reach for Zigbee is approximately 50 meters, and it very well may be expended utilizing high power modules or by using the organization of modules. It works on 2.4 GHz recurrence. Its capacity utilization is extremely low, and it is more affordable when contrasted with other remote modules like Wi-Fi or Bluetooth. It is, as a rule, used to set up a remote neighbourhood.

Fig. 10 ZigBee Module

2.7 Raspberry Pi

The raspberry pi is a little pocket-size PC used to do little processing and systems administration tasks. It is the principal component in the field of the web of things. It gives access to the web, and subsequently, the association of computerization system with far off area controlling gadget becomes conceivable. Raspberry pi is accessible in different variants. Here, model Pi 2 model B is utilized, and it has a quad-centre ARM cortex-A5 3 central processor of 900 MHz and a slam of 1 GB. It likewise has 40 GPIO pins, a Full HDMT port, 4 USB ports, an ethernet port, a 3.5 mm sound jack, a camcorder interface (CSI), the showcase interface (DSI), and a miniature SD card opening.

Fig. 11 Raspberry Pi

3. Software Used

3.1 AVR Studio Adaptation 4

It is utilized to compose, fabricate, arrange and investigate the installed c program codes that should have been scorched in the microcontroller to perform wanted tasks. This product straightforwardly gives a .hex record which can be effectively consumed into the microcontroller.

3.2 Plunge Follow

Plunge race is EDA/computer-aided design programming for making schematic outlines and printed circuit sheets. The designers give a multi-lingual interface and instructional exercises (as of now accessible in English and 21 other dialects). Dip Trace has four modules: Schematic Catch Editorial manager, PCB Format Proofreader with the worked fit as a fiddle-based auto switch, 3D See and Fare, Part Supervisor, and Example Supervisor.

3.3 SinaProg

SinaProg is a Hex downloader application with AVR Man and Breaker Spot Mini-computer. This is utilized to download code/program and to set circuit pieces of all AVR-based microcontrollers.

3.4 Proteus 8 Test system

Proteus 8 is a standout amongst other reproduction programming for different circuit plans of the microcontroller. It has practically all microcontrollers and electronic parts promptly accessible, and consequently, it is a generally utilized test system. It tends to be used for test programs and implanted plans for gadgets before real equipment testing. The reproduction of programming of microcontrollers should likewise be possible in Proteus. Reenactment evades the danger of harming equipment because of the wrong plan.

3.5 Raspbian Working Framework

Raspbian working framework is the free and open-source operational framework which Debian based and improved for Raspberry Pi. It gives the essential arrangement of projects and utilities for working Raspberry Pi. It accompanies around 35,000 bundles of pre-aggregated programming projects packaged in a pleasant organization for hustle-free establishment on Raspberry Pi. It has a great network of designers that runs the conversation frames and answers some practical issues. In any case, the Raspbian operating system is still under reliable improvement with a primary spotlight on improving the presentation and the strength of the same number of Debian bundles as could be expected under the circumstances.

4. Outcomes of proposed methodology

In contrast with customary types of gear, current supplies are more dependable and easy to use. It likewise devours less time and requests less work. Present-day farming uses cutting-edge innovation, it is less work concentrated than customary agribusiness, and the yield amount is more significant because there is an emphasis on boosting creation and keeping a reliable quality. Current agribusiness utilizes trend-setting innovation, for example, plant reproducing strategies and pesticides. The fundamental distinction between natural and ordinary cultivating is that customary cultivating depends on compound intercession to battle bugs and weeds and give plant nourishment. Natural cultivating depends on common standards like biodiversity and soil fertilisation instead of creating solid, bountiful food.

5. Conclusion

The sensors and microcontrollers of every three Hubs are effectively interfaced with a raspberry pi, and remote correspondence is accomplished between different Hubs. All perceptions and exploratory tests demonstrate that venture is a finished answer for field exercises, water system issues, and capacity issues utilizing far off controlled robot, savvy water system framework, and a keen distribution centre the executive's framework separately. Usage of such a framework in the field can improve the yield of the harvests and generally creation. IoT modernization makes a difference in gathering data on circumstances like climate, moistness, temperature, and soil productivity. Trim web-based examination engages disclosure of wild plant, level of water, bug area, animal intrusion into the field, trim advancement, cultivation

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