AN IMPLEMENTATION OF AGRICULTURAL SENSORS BASED ARTIFICIAL INTELLIGENT IRRIGATION SYSTEM (AIIS) USING DEDICATED MACHINE LEARNING ALGORITHM

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Abstract

In India, rural agriculture plays an important role in the development of the country. Basically, agriculture depends on the rainy season when there are not enough water sources. To overcome this problem, The Irrigation System works in the field of agriculture. In this system, water is supplied to the agricultural field depending on the soil type. In agriculture, there are two things, namely soil moisture and soil fertility. Currently, there are many different techniques for irrigation to reduce the need for rainfall. This paper discusses an implementation of the smart irrigation system using IoT. This type of technique is powered by an on / off table using electric power. The Hardware and software requirements for this model include the Arduino UNO, Soil Moisture Sensor, Wi-Fi module ESP8266, Arduino CC (IDE), Android Studio and MySQL.

Keywords:

Rural Agriculture, Water Sources, Irrigation System, IoT, Arduino, Soil Moisture Sensor, Wi-Fi Module

1. INTRODUCTION

The term "IoT" refers to the interaction between things and the embedded computer tool that can be individually identified in an accessible Internet infrastructure. 'IoT' connects various devices and traffic with the help of internet and electronic sensors [1]. The Internet of Things finds applications in the fields of electricity, medicine, information technology, global space research and many more. To better understand IoT, we need to know about M2M, which is machine-to-machine, machine-to-man, machine-to-machine, and mobile connections used to connect machines to humans, electrical and electronic devices, and various systems intelligently [2]-[5].

Smart object It can be used for physical interface and computer environment based on interaction with people and other smart objects. RFID embedded electronic tags are used as smart objects in many electrical applications RFID-based visit systems [6]. The smart thermostat is another example of a smart object that can be used for an automatic remote to control air conditioners based on the temperature of the house [7]. A smart device is an electronic device used to connect to other electronic devices or network systems through various protocols available [8]. Examples of smart devices are Android based smartphones and tablets. The smart phase is an advanced power phase that is automatically controlled based on the information gathered about generation and consumption behavior, i.e. performance improvement, system reliability [9]. Different types of sensors, smart objects, smart devices and the Internet of Things are used to design and control smart grid with the use of digital signal processing and communication systems [10].

The use of IoT is going to create a cell phone-like revolution of the last decade. It is going to permeate our daily lives in all fields like health, industry, housing, agriculture, transportation, pollution, disaster, security, electricity, telecommunications, non-conventional energy. The embedded system (hardware + software) is going to play a major role in its development in the future.

The Internet of Things (IoT) shapes human life with greater connectivity and ultimate functionality, all through the global networking of the Internet. For example, previously electricity usage was measured annually using conventional meters. Now, Internet-connected (sensor technology) smart meters measure power usage every 15 minutes and provide feedback to power consumers, sometimes automatically adjusting system parameters. The IoT will make life easier, more convenient, and more efficient with the help of motion and the cloud. The IoT will combine the physical world with the virtual world to create a smart world.

The Internet of Things That Affects Human Life with Outstanding Functionality, all of which is happening through the World Wide Web. Obviously, there is no limit to frequent connections to the Internet [9]. In short, we can summarize that these are a lot of personal things that can build life simply, actively and economically with the help of quality and cloud. IoT can combine the physical and virtual worlds and make it highly customizable.

Smart planetary dream can be realized by using internet of things. By using embedded chips and sensors, smart objects can be enhanced to 'think', 'feel', 'speak' and 'communicate' with each other. These products can be enhanced to communicate with humans through the use of the Internet and mobile or other network facilities [10]. That is, they can control and monitor these objects from anywhere, anytime and use their intelligence services using the Internet of Things.

With the rapid development of protected horticulture, intelligent greenhouses (commonly referred to as multi-span intelligent greenhouses or modern greenhouses) evolved. It is an advanced type of protected agriculture. It has an integrated environmental control system. Using this system, many factors such as indoor temperature, light, water, fertilizer and gas can be adjusted directly, and high yields and stable good vegetables and flowers can be felt throughout the year, with good economic benefits.

2. LITERATURE REVIEW

The brilliant greenhouse, also known as the automatic greenhouse, refers to a high-tech "intelligent" greenhouse based on the agricultural greenhouse environment, equipped with computer-controlled automation facilities such as movable skylight, shading system, thermal insulation, and wet screen / fan

cooling. System, spray drip irrigation system or drip irrigation system, mobile seeds and so on. The control of the intelligent greenhouse usually consists of a signal acquisition system, a central computer and a control system [8].

The "central system" of the intelligent greenhouse is the intelligent greenhouse monitoring system. It has sensors, automatic control system, communication, computer technology and expert system. It creates an intelligent soft and hard base for the greenhouse to realize automatic monitoring and control of temperature, humidity, light, carbon dioxide, nutrient solution and other factors by pre-loading the appropriate environmental parameters required for the growth of various crops [7].

The computer operator enters the data and control parameters needed to plant the crops on the computer, and the computer can sense unmanned automation operation. The data collected by the computer can be accurately displayed and counted so that the expert can provide a reliable basis for decision making. The control cabinet is fitted with a manual / automatic transition-switch, which can be operated manually if required [4].

The system collects various environmental parameters through sensors, makes decisions and advises with the knowledge of the agronomist system and provides automatic, computer network (wired, wireless) and other methods of irrigation system, temperature regulation system, humidity regulation system, indoor and outdoor shade and manual. So as to achieve high quality and efficient production objectives of high yield by creating favorable environmental conditions for crop growth and development [2].

The system can be widely used in the production management of modern greenhouses, warehouses and warehouses, breeding and storage houses and other agricultural facilities in various regions so that users can realize the convenience that science and technology brought to serve agriculture" has brought. By using the greenhouse monitoring system, farmers feel that "the greenhouse will always be in good weather, even when it is windy and rainy [3].

In fact, the Internet of Things technology is an integrated and integrated application of various concept technologies, modern network technologies, artificial intelligence and automation technologies [9].

In a greenhouse environment, a greenhouse Internet of Technology can be used to become part of the measurement control of a wireless sensor network. Various sensor terminals and nozzles with fans, low voltage motors, valves and low actuators are used to create a wireless network to measure the matrix humidity, composition, pH value, temperature, air humidity, and air. Pressure light intensity, carbon dioxide concentration, etc., then by sample analysis, automatically regulate the greenhouse environment, regulate watering and fertilization so as to obtain optimal conditions for plant growth.

3. PROPOSED SYSTEM

The Arduino Uno is one of the most widely used microcontrollers in the industry. It is very easy to handle, convenient and easy to use. The encoding of this microcontroller is very simple. This microcontroller program is considered unstable due to flash memory technology. The applications of this microcontroller include a wide variety of applications such as security, home appliances, remote sensors and industrial automation. This microcontroller can connect to the Internet and act as a server.

Soil moisture sensor A type of sensor used to detect soil moisture. This sensor has two outputs, analog output and digital output. Digital o / p are permanent and can change the analog o / p threshold. The operating principle of soil moisture sensor is the open & short circuit concept. Here the LED gives a hint when the output is high or low. When the soil level dries out, the flow of electricity does not flow through it. So it works like an open circuit. So o / p will be increased. As, the soil level rises, the flow of current from one terminal to another. So it works like a closed circuit. So o / p will be zero. The sensor here is coated with platinum, to create higher performance and longer life. The sensitivity limit is also high, which pays the farmer the minimum cost. WiFi module ESP8266 is a low cost module used to interface microprocessors. It has 96 KB of data RAM and 64 KB of Instruction RAM.

The Temperature, humidity, light intensity, soil temperature and water content in the greenhouse play an important role in the growth of crops in the greenhouse. The Greenhouse Automated Control System adopts a computer-distributed network control system centered on PLC that automatically adjusts for air temperature, soil temperature, humidity, CO2 concentration, soil moisture, light intensity, water flow, pH value, and EC value. And other parameters in the greenhouse in real time, to create the best environment for plant growth and close to the ideal value of the indoor environment artificially imagined, to meet the needs of greenhouse crop growth and development. It is suitable for seed and seedling breeding, high yield planting, rare and precious floriculture and other sites, thus increasing the output of greenhouse products and improving labor productivity. It is a successful example of high-tech achievements that serve modern agriculture with large-scale production.

3.1 SYSTEM DESIGN

In agriculture, sensors such as soil moisture are used. The information received from the sensors is sent to the database folder by the Android device. In the Control section, the system is activated using the application, which is completed using the on/off buttons in the application. Also, this system is activated automatically when the soil moisture is low and the pump is operated based on the humidity shown in Fig.1.

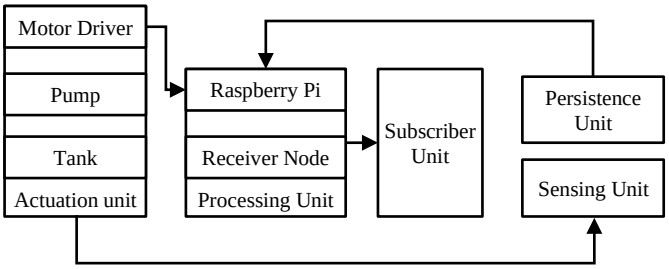

Fig.1. System design

Anyone can perform the installation without the need for knowledge of irrigation systems or electricity, especially if you already have a driver installed. The front cover is easily removed

for its magnetic connection, exposing the entire Nitro Sprite connection system. Take a photo of how the cables are placed on your old controller and place them the same way on this new Nitro Sprite. You do not even need a screwdriver for this as the cables are inserted by pressing the top button. Once installed it can be fixed to the wall using the plugs and screws included in the box. It is a light device (230 g) so it can be placed anywhere as long as it is protected from direct sunlight and rain. If this is not possible, you can always place it inside the outer box to protect it from environmental encroachments. It works with a power adapter (24VAC, 50 / 60Hz, 800mA) that you can purchase separately, regardless of the connection, as the cables go directly to the controller.

It has the feature of taking some time away from the user from the application and watering the field when the time comes. In this system, there is a switch to turn off the water supply in case of system failure. Other parameters such as humidity sensor indicate threshold price and soil water content. Also, the project can be improved by designing this system for large acres of soil. Furthermore, this scheme can be linked to ensure soil value and harvest expansion in each soil. The microcontroller and sensors are successfully connected to each other and wireless communication between different terminals is achieved.

4. RESULTS AND DISCUSSION

According to data collected by temperature and humidity, soil moisture, soil temperature and other sensors in the greenhouse, the greenhouse automatic control system transmits sensor information to the 485 to 232 converters using the RS485 bus, which is connected to the upper system for display, alarm and query. The monitoring center will display and store the sample data obtained in tabular form and then compare it with the set alarm value. If the measured value exceeds the specified limit, the alarm or voice alarm will be displayed on the screen and the record will be printed.

At the same time, the monitoring center can send control instructions to the field controller and control the monitor fan, water pump and other equipment to cool and humidify as instructed, thus ensuring a crop growth environment in the greenhouse. The monitoring center can start by asking the detection center and visual alarm device by warning command to take appropriate action by the greenhouse management staff to ensure that the environment in the salvage room is normal.

Table.1. Temperature Management in (%)

Executions	**RIS**	**AIS**	**ASIS**	**MISI**	**AIIS**
100	60.09	65.31	72.63	68.50	94.44
200	59.76	63.81	72.04	66.63	93.43
300	58.42	62.70	71.06	65.80	93.27
400	57.28	62.32	69.85	64.89	92.31
500	56.23	61.31	68.71	63.97	92.74
600	55.52	60.38	67.60	62.64	91.54
700	54.22	59.38	66.90	61.56	91.38

For agricultural parks with greenhouses, the Internet can automatically detect and control information. Equipped with wireless sensor nodes, each wireless sensor node can monitor various environmental parameters. By retrieving data transmitted by the wireless sensor sync for storage, display and data management, information on all basic test points can be obtained, managed, analyzed and processed and displayed in the form of intuitive charts and curves to each greenhouse user.

Table.2. Humidity Management in (%)

Executions	**RIS**	**AIS**	**ASIS**	**MISI**	**AIIS**
100	62.39	67.61	69.23	65.76	95.35
200	62.06	66.11	68.64	63.89	94.31
300	60.72	65.00	67.66	63.06	94.18
400	59.58	64.62	66.45	62.15	93.22
500	58.53	63.61	65.31	61.23	93.65
600	57.82	62.68	64.20	59.90	92.41
700	56.52	61.68	63.50	59.03	92.30

At the same time, to realize the intensity of greenhouse network remote management, various ear and visual alarm information and SMS alarm information are provided according to the needs of the plant. In addition, the Internet of Things technology can be applied to different stages of greenhouse production. When the greenhouse is ready for production, by arranging various sensors in the greenhouse, the indoor environmental information of the greenhouse can be analyzed in real time so that the varieties suitable for planting can be better selected; During the production phase, employees can feel better management using the Internet of Technology to collect a wide variety of information such as temperature and humidity in the greenhouse.

Table.3. Cloud Management in (%)

Executions	**RIS**	**AIS**	**ASIS**	**MISI**	**AIIS**
100	61.13	75.35	76.79	74.20	94.61
200	59.50	73.61	75.21	72.78	93.32
300	59.02	71.27	73.01	71.52	92.31
400	57.73	70.46	71.38	69.53	91.42
500	55.62	68.17	70.24	67.06	91.05
600	54.13	66.24	68.04	65.62	90.01
700	52.32	64.51	66.89	63.90	89.24

Table.4. Sensor Security Management in (%)

Executions	RIS	AIS	ASIS	MISI	AIIS
100	62.51	74.88	79.14	77.39	94.45
200	62.62	74.86	79.31	77.66	94.95
300	62.64	73.98	78.58	77.36	94.83
400	59.54	71.15	75.24	73.85	91.60
500	58.34	69.83	74.51	72.53	91.22
600	57.73	69.00	73.62	71.99	90.65
700	57.32	68.60	73.54	71.69	90.95

For example, the opening and closing times of the shading network can be sensed and controlled according to the

temperature, light and other information in the greenhouse, and the start time of the heating system can be adjusted and controlled according to the collected temperature information; Once the product has been harvested, the information collected through the Internet can be used to analyze plant performance and environmental factors in a variety of ways, to re-feed the next stage of production, and to obtain accurate management and high quality.

The use of Internet of Things technology in the greenhouse can improve product quality, adjust the growth cycle and improve economic benefits, especially the efficiency and accuracy of greenhouse management. For large-scale greenhouse facilities, if the environmental conditions in the greenhouse are manually controlled, it requires a lot of manpower and time, and there are inevitable manual errors.

If the Internet of Things technology is used, the mouse must be clicked to complete the manual operation in the shortest amount of time, and this is very rigorous, which is an important factor in keeping the industry confident about the use of the Internet of Things in modern agriculture.

5. CONCLUSION

Furthermore, this proposed method can be improved by incorporating machine learning methods that are capable of reading and recognizing the needs of the crop, which will help transform the agricultural sector into an automated system. Studies and results tell us that this decision can be implemented to reduce water loss and reduce the manpower required for a field. From the above information, we can finally conclude that the hardware components of this system interface with all the sensors. The system is powered by a power source and has been tested to irrigate an agricultural field.

With the popularization and use of the Internet of Things technology, ordinary users will be able to access various accurate sensor data collected at any time through computers or mobile phones, and remotely control the video sensor to monitor the overall environment of the greenhouse. After the product leaves the nursery, its rotation process can be retrieved from the corresponding bar code at any time. The industry generally believes that the agricultural intelligence monitoring system will be widely used in convenience agriculture.

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