

Automation in Soil Irrigation

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ABSTRACT:-

The development in embedded system has proved to a reliable solution in monitoring and controlling the environment monitoring system. The project aims at building a system which can be used on universally at any scale to monitor the parameters in a given Agricultural land. With the evolution of and camera devices coupled with IoT technologies it is possible to remotely monitor the parameters such as Ph level, Moisture, amount of nutrition contents in Soil. We will be using ATMEGA 328as our main board and through camera collect the real time data (images) from environment and this real time data(images) will be fetched by the web server and display it on the computer. User can access this data from anywhere through Internet. Using image processing the amount of soil content and suitable for crops information will be provide to agricultural field

I. INTRODUCTION

In agricultural application of data acquisition system, Soil pH is a key parameter for crop productivity therefore its spatial variation should be adequately addressed to improve agriculture management system. Soil pH affects the soil's physical, chemical and biological properties and processes and thus plant growth, and durability. When we try to analyse soil parameters, we noticed that pH parameter is very important factor to classify soil.

Soil pH is defined as the negative logarithm (base 10) of the H⁺ concentration (moles per liter) in the soil. As the acidity of the H⁺ in the soil increase the soil pH value decrease. Soil monitoring becomes very important when farmers need advice for crop and farming. For this demand, the development of a microcontroller based embedded system is design for monitoring. Such a system should monitor and provide data for remote examine. The collected data by monitoring system can easily be exported to a PC via a serial port to make subsequent data analysis or graphic and

digital storage thus automatic data collection is possible without giving up PC resources. Additionally, temperature and gas sensors are used to measure temperature, oxygen and carbon dioxide levels in the soil for fermentation. Internet of Things (IoT) is the network of physical things embedded with electronic circuits, sensors, software and network connection which enables these things to exchange data from one another. IoT is the fusion of the digital and physical world. In a world of lot, millions of things or devices will be interconnected and uniquely identified on the Internet. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration between the physical world and computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. In near future, lot is expected to provide many more services like advanced connectivity of physical objects over a wide network and also many applications.

II. EXISTING SYSTEM

Agriculture plays an important role in an Indian economy. It continues to be the stay of life for the majority of the Indian populations. Due to the improper maintenance, the crop becomes damaged which causes a huge loss for a farmer and hence the smart Agriculture concept was introduced. Precision agriculture is used to enhance the crop production by using the advanced technologies. It supplies the information about different environmental aspects and it helps to monitor the system.

Monitoring environmental factors are not enough and complete solution to improve the yield of the crops. There are numbers of other aspects that affect the productivity to the huge level. These factors include an attack of insects and pests and are to be controlled by sprinkling the proper insecticide and pesticides for the crop. Then the birds and other wild animals are stealing the crops

at the harvesting stage. So, the farmers face several problems during the cultivation and harvesting stage. The solutions for all the problems are to take care of all factors and develop an integrated system which contains technologies as given below.

Advantages of Existing System:

Big data analytics types in that, use the predictive analytics to determine the future possibilities of the data modelling. This is used to generate the analytics and focuses on them. They have no. of. Techniques are used to predict and analyze the data. The techniques are classification algorithm, clustering algorithm, Association rule mining. These algorithm examples are SVM, decision tree algorithm, C4.5, RepTree and J48, k-nearest neighbor, Naive Bayes, Neural networks, K-means clustering methods, Apriori algorithm, Fpgrowth algorithm. It has been used for analyzing the soil types and IoT leads to the development of the numerous applications in all domains like medical, manufacturing, industrial, education, governance, transportation etc. This technology is used in the agriculture field to collect the data through the sensors and stored in the cloud farmland with the current soil nutrient information. It is useful in monitoring the field data as well as controlling the field operations which provides the flexibility. Big data technologies like Hadoop, HDFS, MapReduce, Pig, Hive, STORM, Mahout etc. In the agriculture sector consists the huge volume and variety of data [5]. It was focusing on the information and processes the data with the help of e-agriculture. It focuses on agriculture field to involve an innovative way to find out the design, conceptualization, development, evaluation.

Disadvantages of Existing System:

This paper aims at making agriculture smart using automation and IoT technologies based on real time field data. Smart warehouse management are temperature maintenance, humidity maintenance and theft detection in the warehouse. Controlling of all these operations will be through any remote smart device or computer connected to Internet and the operations will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with micro-controller and raspberry pi. Then it will be stored in the cloud and big data analytics concepts are used to analyze the data. Finally, the report will be sent to the farmer through mobile computing technologies.

III. PROPOSED SYSTEM

Our life is turning into more smart and simple because of the IoT technologies and applications gradually. From the literature it is clear that in the agriculture field the IoT, cloud and big data concepts are used separately to predict the crop yields. As a novelty, a smart agricultural model is proposed by integrating the above concepts to deliver the prediction attributes to the farmers through the mobile computing technology.

Hardware Requirements:

- Atmega328
- Power supply
- Lcd Display
- Water level sensor
- ESP 8266 Wi-Fi Module
- Relay Driver

Arduino ATMEGA 328

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.

Revision 3 of the board has the following new features:

►1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

►Stronger RESET circuit.

►Atmega 16U2 replace the 8U2. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB

Arduino boards, and the reference model for the Arduino platform; .

Power supply

The microcontroller and other devices get power supply from AC to Dc adapter through voltage regulator. The adapter output voltage will be 12V DC non regulated. The 7805 voltage regulators are used to convert 12 V to 5VDC. Figure 5 shows how the input AC power is converted into output DC power. The adapter output voltage will be 12V DC non regulated. The 7805/7812 voltage regulators are used to convert 12 V to 5V/12V DC. . Further, LM317 is used to provide variable power e.g. 3.3V to LPC2148

RAIN SENSORS

A rain sensor is one kind of switching device which is used to detect the rainfall. It works like a switch and the working principle of this sensor is, whenever there is rain, the switch will be normally closed.

The rain sensor module/board is shown below. Basically, this board includes nickel coated lines and it works on the resistance principle. This sensor module permits to gauge moisture through analog output pins & it gives a digital output while moisture threshold surpasses.



Rain-sensor-module

This module is similar to the LM393 IC because it includes the electronic module as well as a PCB. Here PCB is used to collect the raindrops. When the rain falls on the board, then it creates a parallel resistance path to calculate through the operational amplifier. This sensor is a resistive dipole, and based on the moisture only it shows the resistance. For example, it shows more resistance when it is dry and shows less resistance when it is wet.

Float Level Transmitters

are ideal for continuous Level monitoring in Water, Diesel, Chemical and Oils for accurate level Measurement. The Output is not affected by liquid type, temperature, Pressure and other

physical parameters. The Transmitter is factory calibrated and is ready to use.

Construction

Float Level Transmitter consists of non magnetic sealed stem containing series of reed switches and resistor, Float carrying magnet, Mounting adaptor (or flange) and enclosure containing electronics. Consider our Float Level Transmitters for all your continuous liquid level monitoring needs like Water, Diesel, Lube oils, Fuels, Chemicals and Petrochemical liquids.

Software Requirements

- Embedded Program
- ARDUINO IDE
- Express PCB
- Thing speaks

Embedded C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C, e.g., main () function, variable definition, data type declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, can do so easily from the dropdown menu. Modifying their selection also automatically updates the PORT infos with the data they need in relation to the new board.

Straightforward Sketching

With Arduino IDE, users can create programs called sketches that are built with a text editor. The process is a straightforward one though it has several bells and whistles that make the experience more interactive.

Project Documentation

Arduino IDE offers programmers the option to document their projects. This function allows them to keep track of their advancements and any changes they make every time. Apart from

that, documentations allow other people to easily employ the sketches to their own boards.

Simple Sketch Sharing

Aside from saving and archiving sketches and uploading them to the board, Arduino IDE is also capable of sharing sketches (available only on the cloud version). Each sketch is given its own unique URL that users can share with their colleagues and fellow Arduino hobbyists. The recipient then has access to the code; they can save it in the cloud sketchbook or download it for their own use.

Vast Library

Arduino IDE has more than 700 libraries integrated. These were written and shared by members of the Arduino community that other users can utilize for their own projects without having to install anything. This enables programmers to add a different dimension to their sketches.

Third-Party Hardware Support

While Arduino IDE is designed specifically for Arduino boards, it also supports connections with third-party hardware. This makes the use of the application more extensive rather than limited to proprietary boards.

ADVANTAGES OF PROPOSED SYSTEM

- ▶ Cloud database is used to store and share the crop information's, prices of the fertilizers and crop prices.
- ▶ In an agriculture sector, the cloud computing gives the smartness with flexibility, predictability, scalability, and optimization.
- ▶ It gives the information for farmer in an economical and reasonable cost.
- ▶ In an agriculture field, IoT plays a very important role to collect the data.

Description

The proposed system works as follow, when powered on, Microcontroller unit activates the peripherals for controlling detecting and establishing communication from the various connected devices. Microcontroller unit initiates tests from sensors one by one and also do verification of device to ensure their connectivity. If connection is established, it started to exchange the information to mobile devices. The data from the field is captured by the sensors on the board and transmitted to a Microcontroller. The data is then processed and an analysis is carried out with the

already stored data of the area monitored in ideal condition. If a deviation is found more than the acceptable threshold value, required action is carried out by the system that includes warning to the farmer and switching on the water pump if required

For a comparison with previous versions, see the index of Arduino boards.

- Summary Microcontroller ATmega328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA
- Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader
- SRAM 2 KB (ATmega328) EEPROM 1 KB (ATmega328)
- Clock Speed 16 MHz

LCD (Liquid Crystal Display)

The LCD and LED are the most widely used display in embedded systems. Embedded indicates a combination of hardware and software. LCD is a 16 pin connector. LCD can operate in two modes:

- Four bit mode
- Eight bit mode

LCD is finding widespread use replacing LED's. This is due to the following reasons,

- 1) The declining prices of LCD
- 2) The ability to display numbers, characters, and graphics. This is in contrast to the LED's which are limited to numbers and few characters.
- 3) Incorporation of refreshing the CPU into the LCD. In contrast to LED that has to be refreshed by the CPU.
- 4) Ease of programming for characters and graphics.

Characteristics of LCD

- Display content :-16*2 characters
- LCD type :- STN BLUE,GRAY
- Led backlight:-y/g, white blue green
- Controller:-ks0066 or equal
- Operating temperature:-(-0-5c')
- Power supply:-5.0v
- Viewing angle:-6h;12

Pin Configuration

The pin configuration of this sensor is shown below. This sensor includes four pins which include the following.

- Pin1 (VCC): It is a 5V DC pin
- Pin2 (GND): it is a GND (ground) pin
- Pin3 (DO): It is a low/ high output pin
- Pin4 (AO): It is an analog output pin

Specifications

The specifications of the rain sensor include the following.\



rain-sensor

- This sensor module uses good quality of double-sided material.
- Anti-conductivity & oxidation with long time use
- The area of this sensor includes 5cm x 4cm and can be built with a nickel plate on the side
- The sensitivity can be adjusted by a potentiometer
- The required voltage is 5V
- The size of the small PCB is 3.2cm x 1.4cm
- For easy installation, it uses bolt holes
- It uses an LM393 comparator with wide voltage • The output of the comparator is a clean waveform and driving capacity is above 15mA structures and union, bit operations, macros, etc.

Advantages

- It is simple to learn, understand, program and debug.
- Compared to assembly language, C code written is more reliable and scalable, more portable between different platforms.
- C compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
- Unlike assembly, C has advantage of microcontroller-independence and is not specific to any particular microcontroller/microprocessor or any system. This makes it convenient for a user to

develop programs that can run on most of the systems. As C combines functionality of assembly language and features of high level

- languages, C is treated as a 'middle-level computer language' or 'high level assembly language'.
- It is fairly efficient.
- It provides access to I/O and ease of management for large embedded projects.
- Java is also used in many embedded systems but Java programs require the Java Virtual Machine (JVM), which consumes a lot of resources. Hence it is not used for smaller embedded devices.

ARDUINO IDE

Arduino IDE works on the three most popular operating systems: Windows, Mac OS, and Linux. Aside from that, the application is also accessible from the cloud. These options provide programmers with the choice of creating and saving their sketches on the cloud or building their programs locally and upload it directly to the board

Board Management

Arduino IDE comes with a board management module, where users can select the board they want to work with at the moment. If they wish to change it, they

IV. CONCLUSION

This study provides an exploration into various development technologies like smart phone applications and precision agriculture. It enables the farmer to have an effective and smart solution to improve the crop yield with less cost. The proposed smart model for the agriculture field is to predict the crop yield and decide the better crop sequence based on the previous crop sequence in the same farmland with the soil nutrient current information. Through real time sampling of soil, farmer will be able to get current fertilizer requirements for the agriculture crop. This is an essential requirement towards agriculture sector in India to get improved crop production with a reduction in the cost of fertilizer requirements keeping soil with health intact.

REFERENCES :

- [1]. Manpreet Kaur, Heena Gulati, Harish Kundra, "Data Mining in Agriculture on Crop Price Prediction: Techniques and Applications", International Journal of Computer Applications, Volume 99-No.12, August 2014.

- [2]. SajjadHussain Shah, FazleKabeer Khan, Wajid Ali, Jamshed Khan, "A New Framework toIntegrate Wireless Sensor Networks with Cloud Computing". IEEE Aerospace Conference, BigSky, MT, USA, 2-9 March 2013.
- [3]. V.C. Patil, K.A. A1-Gaadi, D.P.Biradar, M.Rangaswamy, "Internet Of Things (IoT) and CloudComputing for Agriculture: An Overview", Proceedings of Aipa 2012, India
- [4]. F. Diebold, "Big Data", Pier working paper archive, Penn Institute for Economic Research,2012
- [5]. D. Laney, "3-D Data Management Controlling Data Volume, Velocity and Variety". METAGroup Research Note, 2001.
- [6]. Khandakar Entenam Unayes Ahmed, Mark A Gregory, "Integrating Wireless Sensor Networks with Cloud Computing", 7th International Conference on Mobile Ad-hoc and SensorNetworks (MSN), Beijing, 16-18 December 2011.
- [7]. Sanjay D. Sawaitul, Prof. K.P. Wagh, Dr. P.N. Chatur, "Classification and Prediction of Future Weather by using Back Propagation Algorithm An Approach", International Journal of Emerging Technology and Advanced Engineering, Vol. 2, Issue 1, January 2012, pp. 110-113.
- [8]. I. Jagielska, C. Mattehews, T. Whitfort, "An investigation into the application of neural networks, fuzzy logic, genetic algorithms, and rough sets to automated knowledge acquisitionfor classification problems". Neuro computing. Vol. 24, 2012
- [9]. D Ramesh, B Vishnu Vardhan, "Analysis of Crop Yield Prediction Using Data MiningTechniques", International Journal of Research in Engineering and Technology, 2015,
- [10]. S. Veenadhari, Dr. Bharat Misra, Dr. CD Singh, "Data Mining Techniques for Predicting Crop Productivity - A Review Article", International Journal of Computer Science and Technology IJCST, Vol. 2, Issue 1, March 2011.
- [11]. Wen-Yaw Chung, Pei-Shan Yu, Chao-Jen Huang, "Cloud Computing System based on Wireless Sensor Network", Pre-processing Categorization using MapReduce Attribute Selection using MapReduce Pattern Prediction Evaluation IoT Devices C5.0 algorithm using MapReduce Association algorithm using MapReduce Cloud Database 2017 International Conference on Intelligent Computing and Control (12C2) Federated Conference on Computer Science and Information Systems, 8-11 Sept 2013, pp 877-880,