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Automated Humidity System for Proficient Water and Energy Consumption

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Abstract

The paper proposes an intelligent irrigation system with water and energy monitoring with the aim of reducing water and energy consumption in long term. It also eliminates the continuous human intervention in the field. Agriculture plays an important role for the economic development of a country. Utilising the water resources effectively and efficiently for agriculture will in long term preserve the ground water resources. And energy management also is an important feature that is taken into consideration while designing this system. In the conventional irrigation system, the farmer has to continuously monitor the soil and weather conditions for growth of crops. The proposed system measures the various parameters such as soil-moisture, soil temperature, pH value, rainfall, humidity, etc., and the decision is made on the collective values of the parameters. Sensors for each of the above parameters produce the continuous inputs for the system which are compared with the reference values to provide the control outputs of the system. The water quantity and the power consumption are continuously measured for determining the total consumption per month and alerting the user. The field and weather conditions are continuously recorded for the future use of the farmer.

Keywords: *smart irrigation, automated water supply, intelligent irrigation system, weather and soil based irrigation, rainfall detection, humidity based water flow*

INTRODUCTION

Any country without agriculture will suffer economically. Agriculture is the backbone of India. In India agriculture contributes to about sixteen percent of total GDP and ten percent of total exports. Hence the government and the population look out for more economically feasible methods of agriculture and irrigation. Over 60% of India's land is arable producing agricultural products of significant economic value and hence optimising the water and energy resources and increasing the production are the most important concerns researchers are looking for.

Water is a fundamental part of all realized life on Earth. Water can both continue life in right amounts and compromise life when it isn't accessible. Water subsequently is a valuable characteristic asset that must not be squandered. Inadequate rainfall and lack of land reservoirs are the causes of the continuous extraction of water from the earth thus reducing the ground water level. In addition, it is also necessary to gauge the amount of water applied to the ground for maintaining the health of land as well as crops. Applying too much water can cause runoff, erosion, waste of water and deceased plant life. This will also reduce the amount of minerals in the soil thus reducing the fertility of the soil. If too little water is applied other problems such as turf burnout may arise.

The key to optimized irrigation is striking the correct balance in moisturising the soil for good crop yield with optimal use of water. There are many methods used to achieve water saving through different technologies. In this project, the water is supplied to the root zone of the plants whenever it is required rather than the practice of watering the soil at regular intervals which will help to save large quantities of water during humid, winter and rainy seasons.

RELATED WORKS

Yunseop Kim.(2008) proposed remote sensing and control of an irrigation system using a distributed wireless sensor network [1]. This is an easy to use basic leadership program for controlled water system. The framework has in-field detecting stations for detecting diverse parameters of field land and climate station for detecting miniaturized scale metrological data. It utilizes Bluetooth, TCP/IP innovation for sending information remotely with ease. Despite the fact that Bluetooth wipes out utilization cost of the system, as it were, principle constraint of Bluetooth innovation is its scope of activity which is restricted to a couple of meters. So one can remotely screen and control gadgets utilizing this innovation however it is an essential for each controlling gadget configuration to have a committed Bluetooth module. As the single Bluetooth module is shared by a few gadgets so it results in access delay. Obstruction is another enormous issue of Bluetooth innovation.

Sankar.p.(2009) proposed a remote sensor arrange based framework utilized for a smart temperature estimation framework [2]. The framework being used has computerized multipoint thermometers for temperature estimation. Framework utilizes a propelled RISC chip and Wireless Fidelity innovation for information transmission. An extraordinary information stockpiling record framework is practiced for perusing and composing SD card, and additionally for the administration of the information document by the FAT16 document framework. Remote sensor systems are anything but difficult to set up without utilizing links and offer a more prominent adaptability. 8-bit ATmega Series AVR processors with various size of programmable glimmer memory are utilized. It likewise has in fabricated ADC with 516k EEPROM. It underpins ISP mode and I2C BUS.

Mahesh M. Galgalikar.(2010) proposed a Real-Time Automization Of Agricultural Environment for Social Modernization of Indian Agricultural System [5] which centers around persistently observing the dirt dampness, water dimension of the well, temperature, mugginess, dew point, climate conditions and gives the details about the field to user though SMS. It uses an ARM7TDMI Core 32-bit microprocessor, GSM services which operate through SMS as a link between ARM processor and centralized unit. The GSM model is controlled by a standard set of AT (Attention) commands. GSM innovation's prepared accessibility, straightforwardness, less flag disintegration improves it for sending control flags and accepting updates over long separations. For basic applications requiring ongoing checking the field condition can be transmitted utilizing radio connection. The disadvantage of this framework was that GSM has a settled greatest cell site scope of 35km which is forced by specialized confinements. Also, the rancher should be comfortable with the whole mind boggling AT directions, lastly soil Parameters in regards to manures and plant infections are not consolidated in the framework.

Vasif Ahmed, Siddharth A. Ladhake (2010) proposed a plan of Ultra Low Cost

Cell Phone Based Embedded System for Irrigation which utilizes AVR ATMega32 microcontroller and incorporates insurance against single staging, over current, over voltage, dry running and plausible bearing flaws and alarms the client through missed calls/bells on consummation of errands. RTC DS1307 and DS18S20 are utilized for time and temperature estimation. The framework offers appealing highlights like mechanized control dependent on parameters indicated however console, SMS, number of missed brings in determined span from client portable however sequential link and dependent on the directions got and the present sensor conditions microcontroller framework sends flag to the turn on-off the engine however starter utilizing transfer. Interfacing is done using RS232, AT commands is used. [6]

The framework portrayed in [6] gives ideal water dispersion in fields dependent on manual settings, various missed brings in determined time term, SMS from mobile phones. It guarantees assurance of engine against over-burdens and overheating and faces lopsided characteristics and furthermore gives robotized restarting. It utilizes bells, missed calls for ready reason. It's an ultra-minimal effort because of use of old mobile phone models. It has a devoted voice based call approach for talked directions to encourage the uneducated ranchers. The main disadvantage it has is that it utilizes a similar system administrator for control framework and client phones to guarantee more noteworthy likelihood of effective association; and it requires additional capacity memory for including different sensors.

Gao Guohong and Liu Yi. (2011) introduced an application based on single chip computer (AT89S52) in agriculture and landscape irrigation system is described in [7]. The framework has numerous useful units like clock unit, alert unit and the presentation module. This methodology decreases the staff remaining task at hand, enhances successful asset usage, and builds trim efficiency subsequently lessening the expense of agrarian items. AT89S52 processor is utilized. This processor is of 8 bit with 256 byte RAM, 8K ROM and no EEPROM, ISP PWM, I2C and ADC. In this paper, irrigation field is monitored and controlled automatically using Wireless technology.[7]

The above research explains about various controllers and technologies which describes about the paper. The previous techniques were implemented with various controllers like AVR Atmega 16 microcontroller; Arduino controller, 8051 and PIC Microcontroller were used to acquire data from different types of sensor which are expensive. The existing wireless technologies like Bluetooth and Zigbee protocol are used only for short distance communication. In this paper, PIC microcontroller is used which runs multiple processes at a time by controlling the motor. GSM modem is used for efficient communication.

PROPOSED SYSTEM

The system is a sustainable solution to maintain water usage efficiently in the agricultural fields. It gives water to plants as indicated by the yield and works as per the dirt dampness state of the root zone of plants. Therefore it decreases intemperate weight on ranchers to pay extra water duty on water. Moreover siphon water system likewise spares extra expense for water siphoning. Further, mechanized water system framework enables ranchers to apply the perfect measure of water at the ideal time. Human attention is reduced on irrigation significantly. Moreover, energy consumption on water pumps could be reduced by efficient water allocation based on the requirement.

The ebb and flow look into spotlights on accuracy farming, soil preservation and harvest water system booking and water amount control for expanding water use proficiency. The framework displays the plan and advancement of Irrigation controller framework worked around PIC16F877A microcontroller. The PIC controller gets the data from the sensors which provide the exact condition about the field and irrigate the water based upon the field condition. The framework comprises of microcontroller, peripherals including LCD and driver circuit hand-off to switch on/off an engine.

The system measures various parameters such as soil-moisture, soil-temperature, pH value, rainfall, humidity etc., The soil moisture sensor is to be placed in the root zone of the plant for sensing the moisture content of the soil. A minimal effort, superior exactness IC temperature sensor is utilized with its yield relative to the temperature in ^{o}C. The sensor senses the field temperature and is interfaced with microcontroller. Humidity sensor senses the field humidity which is changeable according to the climate and the type of soil. The tipping bucket rain gauge is used to measure rain fall.

In addition, the system uses GSM (Global System for Mobile Communication) to inform the user about the exact field condition. The information is passed onto the user on request in the form of SMS whenever is needed. An algorithm is developed with threshold values of corresponding sensor that is programmed into a microcontroller (PIC) to control water quantity. By using android application, the farmer can view the report of field condition for a week at any time they want.

A. Need of Automatic Irrigation

- Simple and easy to install and configure.
- Saving energy and water resources
- Farmers would be able to deliver the right amount of water at the right time by automating farm or nursery irrigation.
- Avoiding irrigation at the wrong time of day, reducing runoff from overwatering saturated soils which will improve crop performance.
- Less human intervention. Automated irrigation system uses valves to turn motor ON and OFF. Motors can be automated easily by using controllers and no need of labour to turn motor ON and OFF.
- It is precise method for irrigation and a valuable tool for accurate soil moisture control in highly specialized greenhouse vegetable production. It is time saving.
- Eliminates the possibility of the human error in adjusting available soil moisture levels.

HARDWARE DESIGN

PIC microcontroller is used to regulate the operation of the motor and water pump. Meteorological parameters and electrical parameters are taken as contributions for the microcontroller. Soil moisture levels and other field conditions are considered as the meteorological inputs which are detected by different sensors.

The sensor network consists of the following sensors. They are,

1. Soil moisture sensor
2. Temperature sensor
3. PH indicator
4. Rainfall detector
5. Humidity sensor

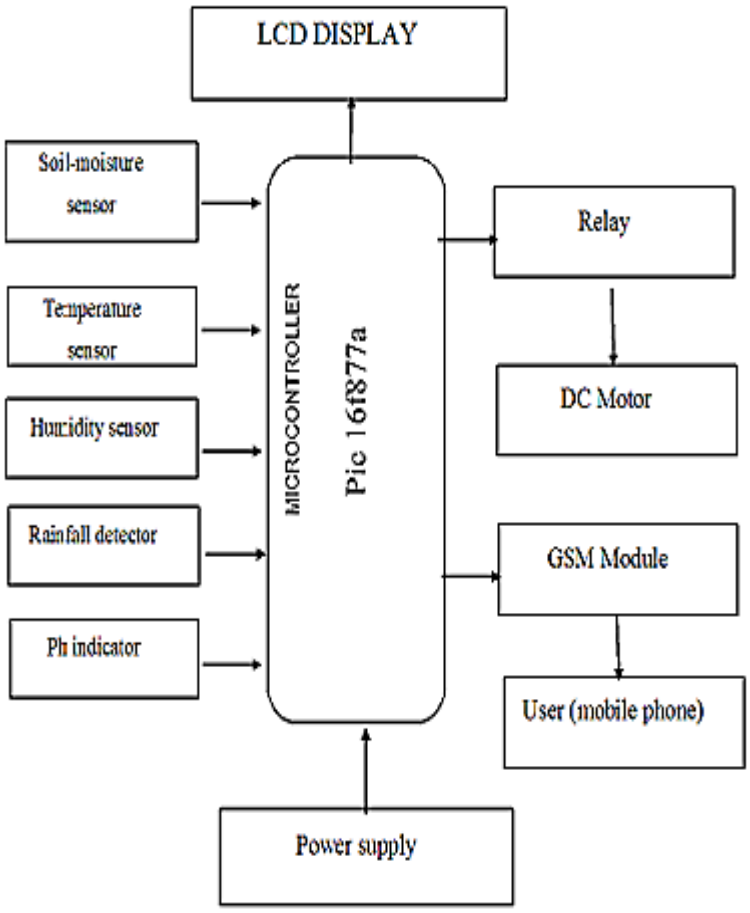

Fig: 1. *block diagram of overall system*

The hardware components are as follows,

1. PIC (16f877a) microcontroller
2. GSM module
3. Power supply
4. DC motor
5. Interface circuits

WORKING PRINCIPLE

The project is designed to develop an intelligent irrigation system which switches the motor ON/OFF on sensing the conditions of the field and it sends a message to the user about the condition of the field through GSM. The system consists of Soil Moisture Sensor, temperature sensor, pH indicator, humidity sensor, and rain detection sensor, a PIC Microcontroller, GSM and a Relay interface board. The microcontroller PIC16f877A receives the input signal of varying moisture, weather, and water condition of the soil through the sensing arrangement.

Once the controller receives this signal, it generates an output that drives a relay for operating the water pump. A LCD display is also interfaced to the microcontroller to display the status of the soil and weather.

Soil moisture sensor determines soil moisture particles in the energetic area in advance respectively arranged irrigation event and this discontinues the motor when the moisture level is exceeding 30. When the level reduces below 30 the motor switches ON automatically and the user receives a message through the GSM about the condition of moisture.

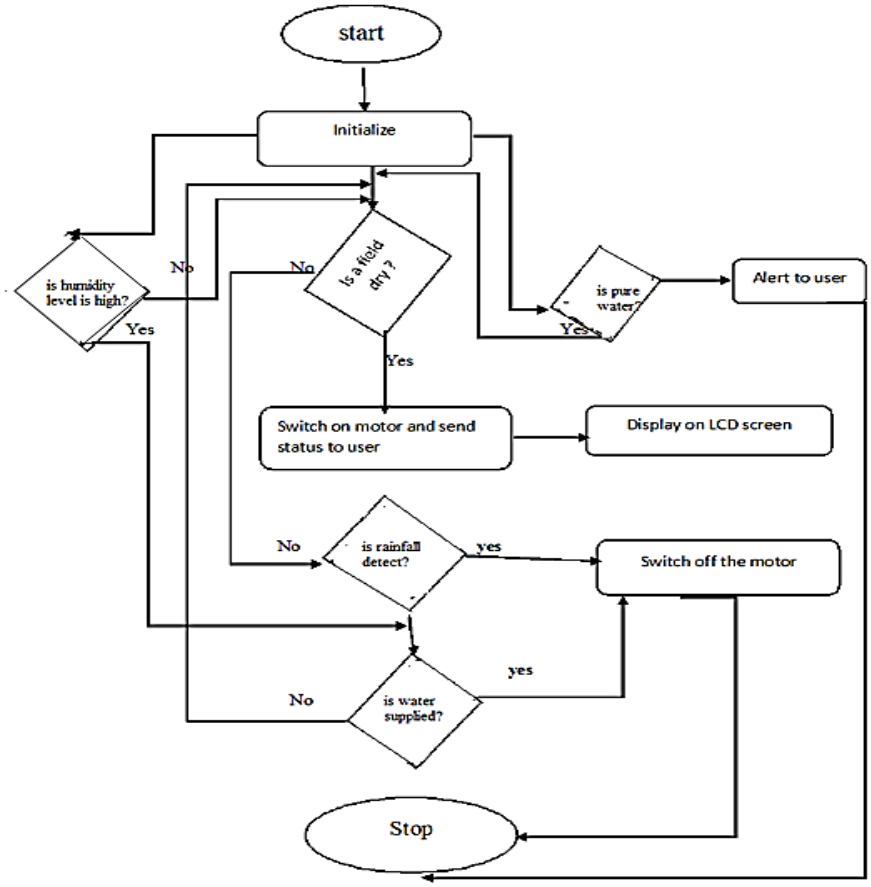

Fig: 2. *Flow chart for working principle of the system*

Rain sensors are considered as rain shut off devices. When there is rain, the user receives a message through GSM and the motor switches OFF automatically. The humidity sensor is used to sense the humidity level in air to make a confirmation of the rainfall, when the humidity level is above 130 the user receives a message through GSM about the condition and it can be an assurance for the rainfall.

The temperature sensor is used to measure the temperature in the field, when the temperature is above 37 the user receives a message through the GSM and it will be taken as an abnormal level. The PH level indicator is used to test the quality of the water in the field, the PH of the water should be 0.7 to 0.8.when there is a change in the pH level the user receives a message through GSM and the motor switches off automatically even when there is a necessity of water to the field.

The dirt dampness sensor is to be put in the root zone of the plant for detecting the dampness substance of the dirt. (LM35) is an ease elite accuracy IC temperature sensor for little temperature ranges with its yield corresponding to the temperature (in °C). It senses the field temperature and is interfaced with microcontroller. The operating temperature range is -55°C to 150°C.The tipping bucket rain gauge is used to measure rain fall.
The GSM is used in the system to update the exact the condition of the field to the user. Additionally the farmer can view the record for a week at any time they want by using android application and the record consists of weather condition and consumed power which is displayed in the form of graph.

RESULTS

sno	date	soil-moisture	temperature	humidity	Power consume(unit)
1	20/3/16	33	30	88	3
2	21/3/16	14	31	96	2
3	25/3/16	28	28	56	4
4	28/3/16	30	31	39	9
5	29/3/16	25	32	67	5
6	1/4/16	38	28	54	6
7	2/4/16	67	29	89	3
8	3/4/16	31	39	96	2
9	5/4/16	17	38	88	3
10	7/4/16	36	29	70	4

Fig: 3. *Table of manual data calculated from the field*

This table shows the output value of the moisture, temperature, humidity and current consumption. This sample data is taken manually and helps to increase the system performance.

CONCLUSION

The dirt dampness and watering framework actualized was observed to be plausible and financially savvy for streamlining water assets for agrarian creation. This system uses various parameters as input that provides the necessary data to increase the effectiveness of irrigation system and to save water and energy. This also reduces the human interruption. Cultivation in places with water scarcity can be efficiently implemented using this system thereby improving sustainability. Moreover, the Internet interface permits the supervision through portable media transmission gadgets, for example, an advanced mobile phone.

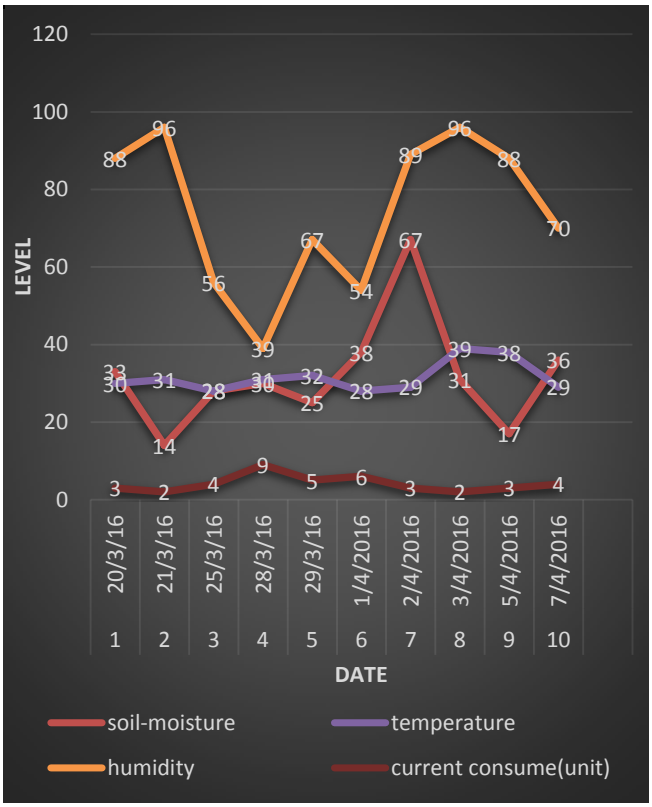

Fig: 4. *over all analysis graphs for the data recorded*

REFERENCES

1. Yunseop Kim, Robert G. Evans and William M. Iversen, (2007) "Remote sensing and control of irrigation system using a distributed wireless sensor network" IEEE transactions on instrumentation and measurement vol.57, pp-96-97
2. Sankar, P., Norman, S. R, (2009) "Embedded System for Monitoring Atmosphere is Weather Conditions Using Weather Balloon", International Conference on Control, Automation, Communication and Energy Conservation 2009, pp 1-4
3. Md. Wasi-ur-Rahman, Mohammad Tanvir Rahman, Tareq Hasan Khan and S. M. Lutful Kabir, (2009) "Design of an Intelligent SMS based Remote Metering System", Proceedings of the IEEE International Conference on Information and Automation pp. 1040-1043
4. Yan Xijun, Lu limei, Xu Lizhong, (2009) "The Application of wireless sensor network in the Irrigation Area Automatic System", International Conference on Networks Security, Wireless Communications and Trusted Computing.vol.23, pp.21-24
5. Mahesh M. Galgalikar, (2010) "Real-Time Automization Of Agricultural Environment for Social Modernization of Indian Agricultural System", on IEEE Proceedings, pp 20-23
6. Vasif Ahmed, Siddharth A. Ladhake, (2010) "Design of Ultra Low Cost Cell Phone Based Embedded System for Irrigation", on International Conference on Machine Vision and Human Machine Interface ,vol.20, pp 40-45
7. Gao Guohong, Liu Y, Fu Junhui and Wang Yingjun, (2010) "Design of time control irrigation system based on single-chip computer" second international conference on communication systems, networks and applications.
8. L. L. Pfitscher, (2011) "An automated irrigation system for rise cropping with remote supervision"- proceeding of international conference on power engineering, energy and electrical devices, vol. 50, pp 90.
9. Joaquin Gutierrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garraway, and Miguel Ángel Porta-Gándara "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module"
10. R. Yan, H. Sun, and Y. Qian (2013) "Energy-aware sensor node design with its application in wireless sensor networks," IEEE Trans. Instrum. Meas., vol. 62, no. 5, pp. 1183–1191.

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