DESIGN OF GREEN AGRICULTURE SYSTEM USING IMAGE PROCESSING

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***Abstract*: Irrigation is that the artificial application of water to the land or soil. It is wont to assist within the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and through periods of inadequate downfall the modern challenge of up the expansion of plants and reducing prices justifies that the event of an irrigation system which will minimize the waste of water and cut back employees and monitor overhead is crucial. This system is to assist and supply AN irrigation system which will ease the burden of the users to require care of plants. Soil moistures area unit tough to live and their target levels cannot be maintained expeditiously. That is the rationale an automatic irrigation system would be the simplest answer for this downside. The soil wetness device can check with the extent of soil wetness and also the system can begin mechanically once the extent of wetness is below the adequate level for the plants to grow healthily. The system can mechanically stop once it reached the wetness soil level for such specific time like we have a tendency to set the time throughout morning and evening. The brain for this system is microcontroller. Besides that, it created from reliable elements and comparatively low price**

***Keywords*: Agricultural Land Irrigation System (ALIS), Image Processing, Image Segmentation, Classification, Sensors, Remote Monitoring, Fuzzy Logic Control.**

INTRODUCTION

Irrigation could also be outlined because the science of the synthetic application of water to the land so as to satisfy the water necessities of the crops throughout the crop amount for the full nourishment of the crops. Nutrients to the crops may also be applied through irrigation. The main objective of irrigation systems is to help agricultural crop growth, ensure enough moisture essential for plant growth. It provide crop insurance against short duration drought. Smaller quantity of water applied over a extended amount of your time offer ideal growing conditions. Drip irrigation extends watering times for plants and prevents eating away and nutrient runoff. Also, as a result of the flow is continuous, water penetrates deeply into the soil to get well down into the root zone. Wash out or dilute harmful salt, chemicals of the soil. Reduce hazards of soil piping. Soften the tillage pan. Therefore, most space are often irrigated in less time. The productivity of irrigated land is over the un-irrigated land. Crop yields everyplace within the developing world area unit systematically higher in irrigated areas than in rainfed areas.

LITERATURE SURVEY

Ha Anh Minh Tran et.al., proffered a paper on Design of Green Agriculture System Using Internet of Things and Image Processing Techniques. This paper describes about the design of an automated organic irrigation system in controlling and properly allocating the available water resources for the irrigation system. This paper propose the new solution to plant automatically and monitor remotely. Firstly, the model of plantation is described in depth. Then, CPU plays a central role to handle the irrigation and aftercare the whole system. It is implemented several sensors and actuators to manipulate the environmental farm. The system parameters are updated in cloud frequently.

Furthermore, all of plantations is supervised by digital cameras. The host PC will analyze the image to predict the process of development in agriculture. The automatic planting model using IoT and image processing method is integrated into unified solution. Initially, the mechanical system is set up to sustain the reliability eligibly. The seeds are delivered into land and irrigated in period. There are several environmental sensors that implemented into the tray. Furthermore, an online server is built in the network space. The information from sensors is collected to visualize in host PC. Farmers can supervise in distance the feeding process via mobile network. Furthermore, several cameras are implemented in the smart agriculture system. The Estimated Growth of Tree (EGT) algorithm is developed to evaluate the agricultural evolution. As a result, the crop can be harvested on time.
To validate the superior performance of proposed method, the experimental system is constructed to obtain comparative data. It is considered that wireless communication based on IEEE 802.11.n single-band 2.4 GHz standard is available in the farm. Thus, the sensor monitoring and control method can be implemented via Internet of Things (IoT). The data structure involves three layers such as local controller, message protocol and global controller. In local controller, the peripheral devices are placed in system directly. This section is very important because it contacts to plant and replicates working environment to system. The information is packed into package and transferred through Wemos D1 module. In this research, MQTT (Message Queuing Telemetry Transport) communication protocol is characterized by IoT since this system is a combined structure of existing technology and new method. A major fundamental disadvantage of these systems is the Farmers are not used to these high-end technologies. They

do not understand computer language or the artificial intelligence. For the sensible agriculture, web of Things is important which can need AI and computer-based intelligence. This cannot be balanced here

Zohaib Mushtaq et.al., proposed a paper on Automatic Agricultural Land Irrigation System By Fuzzy Logic. This paper deals with design and simulate a fuzzy controller using MATLAB for automatic land irrigation. This controller is mathematically designed and simulated in MATLAB. Fuzzy logic has been used in many sectors like industrial control systems, artificial intelligence, medical, and agriculture. Fuzzy logic gives opportunity and chance to utilize real world attributes/linguistics in computing. As a result, precision, optimization and efficiency of design increase and implementation time decreases.
In control system, selection of control model is critical stage of designing. But in fuzzy logic this is done by controller precisely and accurately. It consist of inputs/outputs values with membership functions.
Input involve agricultural land water level categorization and time.
Output of designed controller contains driven well operation and power supply.
Software and calculated evaluation have been done on input controlling outputs.
We calculate outputs to induce minimum proportion error distinction between calculated and simulated results.
We got 1.9% error in driven well operation and one.15% error in power supply.
The use age of such automatic land irrigation system will not only increase crops production and also decrease expenses and solve frequent disconnection problem of tube well from grid due to load shedding. The main disadvantage of fuzzy logic is inability to straightforwardly advance optimal number of fuzzy rules and determine the membership function parameters

Janani P et.al., trotted out a paper on Automatic Field Irrigation Setup Using MATLAB.
The idea behind this project is to optimize the utilization of water effectively and also the motor are wired on and off based mostly upon the feel of the leaf. The healthy leaf image will be already stored in the PIC16f877a microcontroller in the SD card.
The captured leaf image from the camera is shipped via Zigbee through signal acquisition processor to the microcontroller.
When scrutiny each the pictures, if the captured image mismatches with the stored image in the microcontroller, automatically command will be sent from the controller to turn on the motor and thus irrigates the field.
Also, the project aids in giving info regarding the appropriate soil for cultivating the Plants like Banana, Paddy, Wheat etc.

The objective of this project is to provide automatized irrigation system to reduce the human intervention in the field and to irrigate the field based on the information obtained from the camera fastened within the field to understand the condition of the leaf additionally to the detector values obtained from the microcontroller. And also, the camera captures the image of the soil and method victimisation MATLAB and deliver the knowledge regarding the kind of soil. Eg. Red soil which is suitable for Cultivating Banana Plant. A major fundamental disadvantage of these systems is Low transmission, further as low network stability, also are a number of its disadvantages that takes it a step back as compared to others Replacement with Zigbee compliant appliances is pricey. Zigbee is not secure like WiFi based secured system. It does not have end devices available yet.

Anitha K proposed a paper on Automatic Irrigation System. The project is intended to develop Associate in Nursing automatic irrigation system that switches the pump motor ON/OFF on sensing the wetness content of the soil. In the field of agriculture, use of correct methodology of irrigation is vital. The advantage of victimization this methodology is to cut back human intervention and still guarantee correct irrigation. The project uses Associate in Nursing 8051 series microcontroller that is programmed to receive the signalling of varied wetness condition of the soil through the sensing arrangement. This is achieved by victimization Associate in Nursing op-amp as comparator that acts as interface between the sensing arrangement and also the microcontroller. Once the controller receives this signal, it generates Associate in Nursing output that drives a relay for operational the pump. An show LCD digital show alphanumeric display} display is additionally interfaced to the microcontroller to display standing of the soil and pump. The sensing arrangement is created by victimization 2 stiff golden rods inserted into the sphere at a distance. Connections from the golden rods area unit interfaced to the management unit.

This project on "Automatic Irrigation System" is meant to make an automatic irrigation mechanism that turns the pumping motor ON and OFF on police work the damspness content of the planet. In the domain of farming, utilization of appropriate means of irrigation is significant.
The continuous extraction of water from earth is reducing the water level because of that heap of land is returning slowly within the zones of un-irrigated land. The advantage of using this system is to decrease human interference and still certify applicable irrigation. The circuit comprises of sensing arrangement parts built using op-amp IC LM358. Op-amp's are configured here as a comparator. Two stiff copper wires area unit inserted within the soil to sense whether or not the soil is wet or dry. The Microcontroller is employed to manage the total system by observance the sensing arrangement and once sensing arrangement senses the dry condition then the microcontroller can send command to relay driver IC the contacts of that area unit accustomed start the motor and it'll switch the motor, if the sensing arrangement senses the soil to be wet. The microcontroller will the on top of job because it receives the signal from the sensing arrangement through the output of the comparator, and these signals operate beneath the management of software that is keep in memory of the Microcontroller. The condition of the pump i.e., ON/OFF is displayed on a 16X2 LCD. The power supply consists of a step down transformer, which steps down the voltage to 12V AC. This is reborn to DC employing a Bridge rectifier. The ripples area unit removed employing a electrical phenomenon filter and it's then regulated to +5V employing a transformer that is needed for the operation of the microcontroller and alternative elements. The major drawback of this method is, It only performed limited number of executions simultaneously. It is generally used in micro equipment

Aniket H propounded a paper on Automatic Control of Drip Irrigation System and Monitoring Soil by Wireless. It deals with the review of remote monitoring and control system based on existing technologies. ZigBee or Hotspot primarily based device and watching system with automatic irrigation management is planned during this project. The prime objective is to pick out the acceptable wireless network to gather the information from wet sensors, water soluble fertilizer sensor placed in the field, temperature sensors of various areas of the sector, pressure sensors within the irrigation system to observe the right drip of water in conjunction with the plant food that area unit unbroken in a very separate tank. Another addition of the planned automation system is to put in the digital cameras to observe the plant growth and overall condition of the sector. In addition, the developed irrigation technique partially removes the surplus employment of the farmers. To identify the acceptable pump with facility for maintaining bound suggested pressure within the narghile. To identify proper sensors and monitoring device required for the farming data like soil moisture, soil temperature, soil fertilizer & chemical constituents. To keep the environmental balance of assorted sources of this planet and maintaining the alkane generation throughout harvest home in check, this contemporary approach can facilitate to succeed in a target with more modern gadgets. The main detriment of this project is To keep the environmental balance of various sources of this planet and maintaining the methane generation during harvesting under control is difficult

Dr. Ali Hamouda1 et.al., ., put forward Wireless Fuzzy Controller for Drip Irrigation The paper converges on design of fuzzy irrigation system based on AVR microcontroller Atmega 32 to design and develop a coffee price feature that relies on embedded platform for water irrigation system. The project designed using MATLAB 10, fuzzy logic and Simulink tools books the temperature and soil moisture sensors are used for detect the water quantity present in agriculture and water level sensor used for detecting water level in tank the level gauge interfaced by electronic circuit worked as signal conditioner circuit the water from tanks controlled by solenoid valve which actuated by relay circuit open and close as the microcontroller output then the water transmitted to roots zone using pipes line for irrigation process .
The data acquisition system required to monitoring over all field in each Green house and then sending the data to control room the data may transferred by wire or wireless network for wireless networks sensor the ZigBee protocols are used. The control system development to using one sensor for both temperature and soil moisture that can be placed on roots zone for monitoring the temperature and moisture of soil, by mistreatment feedback management mechanism with a centralized management unit that regulates the flow of water on to the sphere within the real time supported the fast temperature and moisture values [7]. The proposed Fuzzy logic controller based controller was prototyped using MATLAB. The input parameters like air temperature, soil moisture are tabulated as in figure and the result of different reading used in the design of fuzzy logic controller for drip irrigation system. The project was developed to implementing irrigation control the key parameters involved in fuzzy logic controller, Mamdani and Sugeno algorithms, a photo cell water pumping system the irrigation of the field through tanks by using control valves. Parameters of interest were irrigation control, fuzzy logic controller design, Simulink Control, solar radiation, photovoltaic electrical output, and water flow output. The major drawback of this paper is to solve classification and regression problems whereas GA stochastic optimization technique to solve optimization problem

John R. Dela Cruz presented a topic on Water Usage Optimization of Smart Farm Automated Irrigation System Using Artificial Neural Network. It deals with the limited water resources had become the main constraint to be considered in farming. Optimizing this has become one of the interests in researches relating to precision agriculture. In this paper, the researchers use Neural Network in optimizing the water usage in the smart farm by incorporating it to the proposed Smart Farm Automated Irrigation System (SFAIS) by implementing an expert system. Simulations were done using the MATLAB Neural Network toolbox and results show that neural network is a useful tool.
The Smart Farm Automatic Irrigation System is the control system to be utilized in order to optimize the amount of water resources to be used in the smart farm. The priority level of the WTMCS that provides the were predicted using a feed-forward back propagation ANN model with 2 nodes in the input layer, 20 nodes in the hidden layer, and 1 node in the output layer. Based on the results, it can be seen that the network provided a good response where though an almost linear relationship between the expected or target data and the output that was achieved from the network. The drawback of this paper is automated irrigation systems are not new. But the problem of efficiently allocating water resources to irrigate plants with just the right amount of water necessary for it still exists.

Shetty Sagar et.al., put forward an idea of Enhanced Agriculture using Image Processing and Sensors. This paper is an Irrigation systems which are currently in use are mostly manually operated. Those systems can be replaced with an automated concept of irrigation to use water efficiently and effectively. Moisture sensor based Automatic Irrigation System is based on soil moisture sensor that will measure the level of moisture in the soil and send the signal to Raspberry pi system and accordingly it will irrigate the crops through smart sprinkling solution. The Raspberry pi plays the role of microcontroller here. It will compare the values received from moisture sensor with the predefined moisture levels already stored in the system. Based on the values received from the sensors, the Raspberry pi will turn the irrigation system on or off. Rain is considered as one of the major factors that can effect crops .Here, we provide image processing based rainfall detection, which would help farmers to determine type of rainfall the could face and store it. The Raspberry pi uses camera for capturing the images of the soil and after calculating the pH values the particular crops that can grow in the field are suggested to the farmer.

The main objective of this project is to maximize overall savings in terms of time, cost and labor of farmers. This project targets at reducing the overall water wastage using more judicious approach by using moisture sensors and smart sprinkling technology. This project also includes rain detection and rain harvesting parameters, which would reduce burden on groundwater as well as pipeline water. Crop suggestion using pH reduce chances of crop failure by suggesting suitable crop using the pH level of soil.

Systems currently in use don't determine the type of crop suitable for their respective field. This results in, they grow the same crop again and again. This reduces the possibility of a good yield. We have used pH property of soil to determine the degree of acidity or basicity which affect nutrient availability and plant growth. For capturing the images, Pi camera is used and after processing the captured image the pH value of the soil is determined and accordingly crops or plants are suggested that can be grown in that field. Rain plays a pivotal role in determining the growth of the crop. Existing systems can't determine when the rain can possibly arrive and what would be its intensity. Implementing Wavelet and K-means Clustering based rainfall detection or an Image Processing Based Rain Drop Parameter Estimation (IPRDPE) based rain detection system (according to the location of the field) can detect both rainfalls as well as the intensity of the same. We are also rooftop rainfall harvesting which would act as an alternate source of water supply whenever needed.

CONCLUSION

This paper discuss about many different techniques and tools are used for soil irrigation and control. We cannot doubt about the advantages of all the approaches developed by different researchers, however the main issue elaborated from the above discussion is the identification of the end user for a particular approach. For example, if we say that remote sensing schedule model has to be implemented by the water managers in the region, the solution becomes easy. We can use the simulation models based upon soil indicators or water balance approaches and we can also use the remote sensing techniques depending upon the complexity of the situation. However, we concluded that for a single farmer, there is still not an easy tool which farmers can adopt.

SUMMARY

Sl. no	TECHNOLOGY/ ALGORITHM/ CONTROLLER	SENSORS/ INPUTS	PERFORMANCE METRICS		
			GERMINATION RATE	RATE OF HIGHT PLANTATION	TEMPERATURE
1	Fuzzy logic	Real time clock Temperature sensor	-	-	20 ℃ to 25℃
2	IOT and Image processing/ MQTT protocol	Camera image	97,41	81,31	-
3	Wireless sensor network/ Zigbee	Temperature sensor Soil moisture Humidity pH of soil	-	-	22,2℃ to 28,9℃
4	PIC Microcontroller/ Zigbee	Camera image	96,25	80,76	-
5	Support Vector Machine Classifier	Camera image	-	-	-
6	IoT/ Arduino	Temperature sensor Soil moisture Ultrasonic	-	-	20,2℃ to 27,5℃
7	IoT	Soil moisture Sensor Soil pH detection	-	-	-

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Irrigation schedule be formulated by the farmer, it is not possible. For remote sensing, need an infrastructure and trained manpower from acquiring the image to interpretimage. Same is true for the simulation irrigation schedule models. But if the irrigation