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Intelligent IoT Based Automated Irrigation System- A Review

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Abstract

This paper contains the survey of various irrigation techniques to using machine learning. Now a day's IOT technique is becoming a key technique for of intelligence in irrigating The diseases can affect any part or area of the crop. This paper mainly focuses on automating the irrigation system by employing wireless sensor and mobile computing. Also research been done in applying machine learning in agricultural system too Recently "Machine to machine (M2M)" communication is an emerging technology which allows devices, objects etc to communicate among each other and send data to Server or Cloud through the Core Network. There are techniques for irrigation system such as Wireless Sensor and Actuators Networks (WSANs) and Artificial Neural Network. Selecting a method is always a difficult task because the quality of result can vary for different input data. This paper provides an overview of different classification techniques used for irrigation system.

Keywods- Artificial Neural Network, Automated hardware, Irrigation

Introduction

Irrigation is the application of controlled amounts of water to plants at needed intervals it helps grow agricultural crops, maintain landscapes
,and revegetate disturbed soils in dry areas and during rainfall. Irrigation has other uses in crop production, including frost protection, suppressing weed growth in grain field and preventing soil consolidation.

Indian agriculture is one of the main sources of living and it mostly depends on the rain, it has a major effect on Indian economy. A large quantity of water is used for agricultural field and therefore 85% of available fresh water resources are used for yielding agricultural crops. This is due to the major growth in population due to this tremendous growth in population there is large demand of food. Agriculture is the main source for food production. Advancement in technology such as artificial intelligence, robotics, machine language etc. we need to implement a technique by which there can be restricted consumption of water in agriculture uses.

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Types of irrigation

There are several methods of irrigation. They vary in how the water is supplied to the plants. The goal is to apply the water to the plants as uniformly as possible, so that each plant has the amount of water it needs.

Surface irrigation

Basin flood irrigation of wheat Surface irrigation is the oldest form of irrigation and has been in use for thousands of years. In surface (furrow, flood, or level basin) irrigation systems, water moves across the surface of an agricultural lands, in an order to wet it and infiltrate into the soil. Surface irrigation can be subdivided into furrow, border strip or basin irrigation. It is often called flood irrigation when the irrigation results in flooding or near flooding of the cultivated land. Historically, this has been the most common method of irrigating agricultural land and still used in most parts of the world.

Micro-irrigation

Micro-irrigation, sometimes called localized irrigation, low volume irrigation, or trickle irrigation is a system where water is distributed under low pressure through a piped network, in a pre-determined pattern, and applied as a small discharge to each plant or adjacent to it. Traditional drip irrigation using individual emitters, subsurface drip irrigation (SDI), micro-spray or micro-sprinkler irrigation, and mini-bubbler irrigation all belong to this category of irrigation methods.

Drip irrigation

Drip (or micro) irrigation, also known as trickle irrigation, functions as its name suggests. In this system water falls drop by drop just at the position of roots. Water is delivered at or near the root zone of plants, drop by drop. This method can be the most water-efficient method of irrigation, if managed properly, evaporation and runoff are minimized. The field water efficiency of drip irrigation is typically in the range of 80 to 90 percent when managed correctly.

In modern agriculture, drip irrigation is often combined with plastic mulch, further reducing evaporation, and is also the means of delivery of fertilizer. The process is known as fertigation.

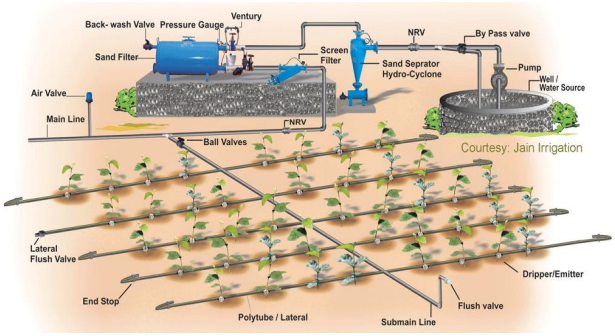

Fig :1 Drip irrigation

Sprinkler irrigation

In *sprinkler* or overhead irrigation, water is piped to one or more central locations within the field and distributed by overhead high-pressure sprinklers or guns. A system utilizing sprinklers, sprays, or guns mounted overhead on permanently installed risers is often referred to as a *solid-set* irrigation

system. Higher pressure sprinklers that rotate are called *rotors* and are driven by a ball drive, gear drive, or impact mechanism. Rotors can be designed to rotate in a full or partial circle. Guns are similar to rotors, except that they generally operate at very high pressures of 40 to 130 lbf/in² (275 to 900 kPa) and flows of 50 to 1200 US gal/min (3 to 76 L/s), usually with nozzle diameters in the range of 0.5 to 1.9 inches (10 to 50 mm). Guns are used not only for irrigation, but also for industrial applications such as dust suppression and logging.

Intelligent IoT Based Irrigation System

In terms of machine learning, lot of research been carried out towards crop yield and crop disease prediction only. There has been no research reported which employs machine learning algorithm towards analysing the soil condition based on trained data set for irrigating the field automatically without any human intervention. Also there exists no M2M system which interacts between the system towards making analysis and predicting intelligently. Most of the system just captures the data from the field and accordingly controls the sprinkler valve for watering the field. So taking all the above mentioned drawbacks in the existing system, we here have developed an intelligent IoT based automated irrigation system where the temperature and moisture sensors deployed in field communicate to Arduino microcontroller.

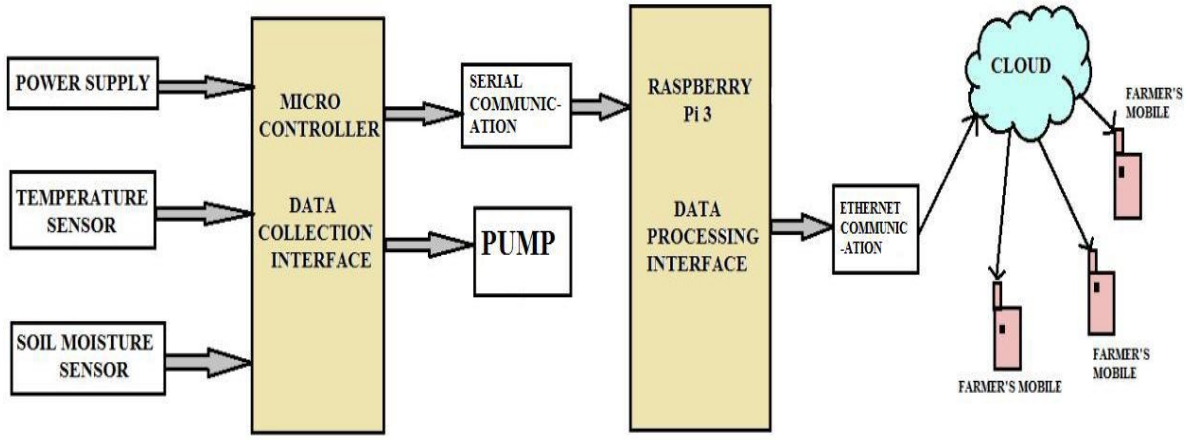

Fig.2 IoT Based Automated Irrigation System [5]

Advantage	Disadvantage
soil moisture can be predicted accurately and accordingly decision support can be developed for irrigation scheduling.	Compatibility: As of now, there is no standard for tagging and monitoring with sensors. A uniform concept like the USB or Bluetooth is required which should not be that difficult to do.
Data**:** The more the information, the easier it is to make the right decision. Knowing what to get from the grocery while you are out, without having to check on your own, not only saves time but is convenient as well.	There are several opportunities for failure with complex systems. For example, both you and your spouse may receive messages that the milk is over and both of you may end up buying the same. That leaves you with double the quantity required. Or there is a software bug causing the printer to order ink multiple times when it requires a single cartridge.
Tracking**:** The computers keep a track both on the quality and the viability of things at home. Knowing the expiration date of products before one consumes them improves safety and quality of life. Also, you will never run out of anything when you need it at the last moment.	Privacy is a big issue with IoT. All the data must be encrypted so that data about your financial status or how much milk you consume isn't common knowledge at the work place or with your friends.
Time: The amount of time saved in monitoring and the number of trips done otherwise would be tremendous.	There is a chance that the software can be hacked and your personal information misused. The possibilities are endless. Your prescription being changed or your account details being hacked could put you at risk. Hence, all the safety risks become the consumer's responsibility.

LITERATURE SURVEY

Various papers are suggesting to identify the irrigation system using various approach suggesting the various implementation ways as illustrated and discussed below.

Yuthika Shekhar et al [1] studied that Agriculture has a major impact on economy of the country. Lot of Research been carried out in automating the irrigation system by employing wireless sensor and mobile computing. Also research been done in applying machine learning in agricultural system too Recently "Machine to machine (M2M)" communication is an emerging technology which allows devices, objects etc to communicate among each other and send data to Server or Cloud through the Core Network. So accordingly developed an Intelligent IoT based Automated Irrigation system where sensor data pertaining to soil moisture and temperature captured and accordingly KNN (K- Nearest Neighbor) classification machine learning algorithm deployed for analyzing the sensor data for prediction towards irrigating the soil with

water. This is a fully automated where devices communicate among themselves and apply the intelligence in irrigating. This has been developed using low cost embedded devices like Arduino Uno, Raspberry Pi3.

S.Muhammad Umair et al examined Irrigation systems are as old as man itself since agriculture is the foremost occupation of civilized humanity. To irrigate large areas of plants is an onerous job. In order to overcome this problem many irrigation scheduling techniques have been developed which are mainly based on monitoring the soil, crop and weather conditions. Irrigation scheduling engrosses when to irrigate and how much water to be applied. Currently most of the irrigation scheduling systems and their corresponding automated hardware are fixed rate. Variable rate irrigation is very essential not only for the improvement of irrigation system but also to reduce the irrigation cost and to increase crop yield. The heart of automatic irrigation system (fixed rate or variable rate) is its control unit: as it controls irrigation time and water flow. Intelligent control based irrigation is necessitated to maximize the efficiency and production. Existing technologies varies from water balance or check book method to sophisticated sensor-based systems .Most of the irrigation systems use ON/OFF controllers. These controllers can not give optimal results for varying time delays and varying system parameters. Artificial Neural Network (ANN) based intelligent control system for effective irrigation scheduling. The proposed Artificial Neural Network (ANN) based controller is prototyped using MATLAB. The input parameters like air temperature, soil moisture, radiations and humidity are modeled. Then using appropriate method, ecological conditions, evapotranspiration and type of crop, the amount of water needed for irrigation is estimated and then associated results are simulated.

Raja sekhar reddy.G et al, concluded that sensors, wireless networks and ANN controllers are introduced to design automatic power and water saving irrigation System. This proposed System compared Existing System; it's shown that fixed rate hardware devices are failing because of its limitations. Proposed System is implemented better and more efficient than Existing System, Proposed System changes their decision and output according to the ecological condition, By using ANN concept we are getting accurate results while calculating Required soil moisture from the input parameters. Using This ANN Based controller control the large area of irrigation lands By saving lot of Energy and Water Resourses. And showing those results in simulation graph, by comparing Existing and proposed System Consuming resources

Rani Pagariya, Mahip Bartere studied the survey of various image processing techniques to detect various plant diseases using machine learning. Now a day's image processing technique is becoming a key technique for diagnosing the various features of the crop. The diseases can affect any part or area of the crop. Detection of various cotton crop diseases and to classify

them. There are so many classification techniques such as k-Nearest Neighbor classifier , k-means Classifier, Probabilistic Neural Network, Genetic Algorithm, Support Vector Machine, and Principal Component Analysis, Artificial neural network, Fuzzy logic. Selecting a classification method is always a difficult task because the quality of result can vary for different input data. This paper provides an overview of different classification techniques used for plant leaf disease classification

Karandeep Kaur studied agriculture is the mainstay of a developing economy like India. Majority of its population depends on agriculture for their income. With depleting resources, reducing land sizes and increase in input and labor costs, combined with the uncertainty of various factors like weather, market prices etc, agriculture in India has become a profession which is full of risks. The advancements in technology must be worked upon across various disciplines and it has already shown dramatic improvements in many fields. However, agriculture has not benefitted much from such advancements. Smart farming is the need of the hour of the Indian economy. Machine learning is an imminent field of computer science which can be applied to the farming sector quite effectively. It can facilitate the up-gradation of conventional farming techniques in the most cost-friendly approach. The purpose of this paper is to broaden the farming horizon by listing and evaluating the different applications of machine learning in Indian agriculture and to help the farmers advance their work up by many notches

Irrigation systems are as old as man itself since agriculture is the foremost occupation of civilized humanity. To irrigate large areas of plants is an onerous job. machine learning in agricultural system too Recently "Machine to machine (M2M)" communication is an emerging technology which allows devices, objects etc to communicate among each other and send data to Server or Cloud through the Core Network. For that Intelligent IoT based Automated Irrigation system used in irrigation techniques, which gives the better result as compare to other irregation technique.

Conclusion

This paper provides the survey of different techniques for irrigation system. preservation of water sources and minimizing wastage of it done by this effective system which will helps for better productivity of corps. an Intelligent IoT based Automated Irrigation system can be extended for irrigating the field with water.

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