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AUTOMATED IRRIGATION SYSTEM BASED ON MACHINE LEARNING CONCEPT

EBIN P.M[1], KAVITHA NAIR R[2], JIMSHA K MATHEW[3]
[1]APJAKTU, India, pmebin74@gmail.com
[2]APJAKTU, India, kavitharnair88@gmail.com
[3]APJAKTU, India, jimshakmathew@gmail.com

ABSTRACT

An automated irrigation system was developed to optimize water use for agricultural crops .This system has a wireless network of soil moisture and temperature sensors placed in the root zone of the plant .A machine learning algorithm was developed with threshold values of temperature, light intensity and soil moisture that was programmed into a microcontroller based gateway to control water quantity. We are train the system by analyzing past weather conditions and current weather conditions. Whenever there is a change in temperature and soil moisture level of the surroundings these sensors sense the change in temperature and soil moisture level and gives an interrupt signal to the microcontroller and thus sprinkler is activated. Water level in the overhead tank is also monitored at a specific time and fill the tank by making the water pump ON. Before making the pump ON, the main power is checked and if no power is available, wait till the mains power become available.

Key words: Decision tree, Machine learning, Temperature sensor, Soil moisture sensor, Light intensity sensor.

1. INTRODUCTION

Agriculture is the main source of livelihood in our country. The proper irrigation is needed to assist in the growing of agricultural crops, maintenance of landscapes and re vegetation of distributed soils in different areas. In the agricultural industry that uses a lot of water, most of the time this resource is not used efficiently and huge amount of water are wasted. In the future, these wastes will lead to large sum of money. The one who manage this resource efficiently will successful in time and money.

In this paper, we develop an automated irrigation system which automatically[1,2] irrigate the agriculture land on sensing the moisture content of the soil and also analyze past weather condition as shown in figure 1. In the field of agriculture, use of proper method of irrigation is important. The advantage of using this method is to reduce human intervention and still ensure proper irrigation. The project uses machine learning concept for irrigating the land. We are developing a software which is able to make a decision on analyzing the past weather conditions and current weather conditions.

This model of controlling irrigation facilities to help farmers. Irrigation has always done by ancient methodology such as manual irrigation using buckets and watering cans, flood irrigation, drip irrigation, sprinkler irrigation and are still being used today. The existing system has several limitations, loss of water from plant surfaces through evaporation, erosion due to flooding , loss of nutrients.

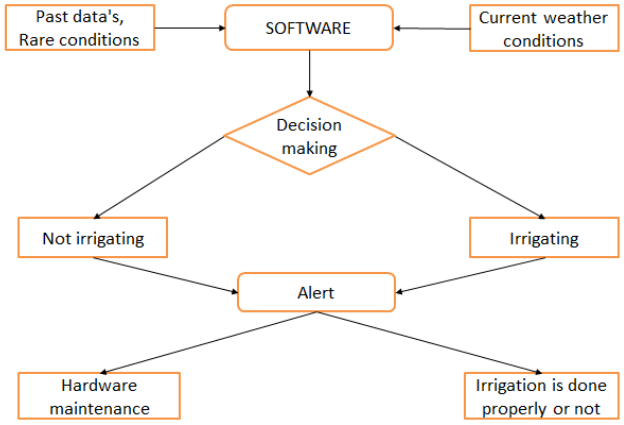

Figure 1: Workflow diagram

2. LEARNING UNDER SUPERVISION

The entire system is divided into three submodules: Sensor reading, Machine learning training,and Working of the system.

2.1 Sensor Reading

Mainly three sensors are used: Temperature sensor, Soil moisture sensor, and Light intensity sensor.

2.1.1 Temperature Sensor

Temperature sensor here used is LM35, which is a precision IC temperature sensor with its output proportional to the temperature in degree Celsius. The working base of the sensor is the voltage read[3] across the diode. If the voltage increases, then the temperature rises and there is a voltage drop between the transistor terminals of base and

emitter,they are recorded by sensors. If the difference in voltage is amplified, the analog signal is generated by the device and it is directly proportional to the temperature.

2.1.2 Soil Moisture Sensor

This is an electrical resistance sensor which reads the moisture content of the soil. A current is passed across the electrodes through the soil and the resistance to the current in the determines the soil moisture. The soil was examined under three conditions: dry condition, optimum condition and excess wet condition.

2.1.3 Light Intensity Sensor

An LDR (Light Dependent Resistance) is a component that has a resistance that changes with the light intensity that falls upon it. To works on the principle of photo conductivity.

The readings from these three sensors are compared with the past weather conditions and obtain a final pattern of readings. Based on pattern of readings, machine decides irrigation is needed or not. Figure 2 shows Diagram of sensor reading

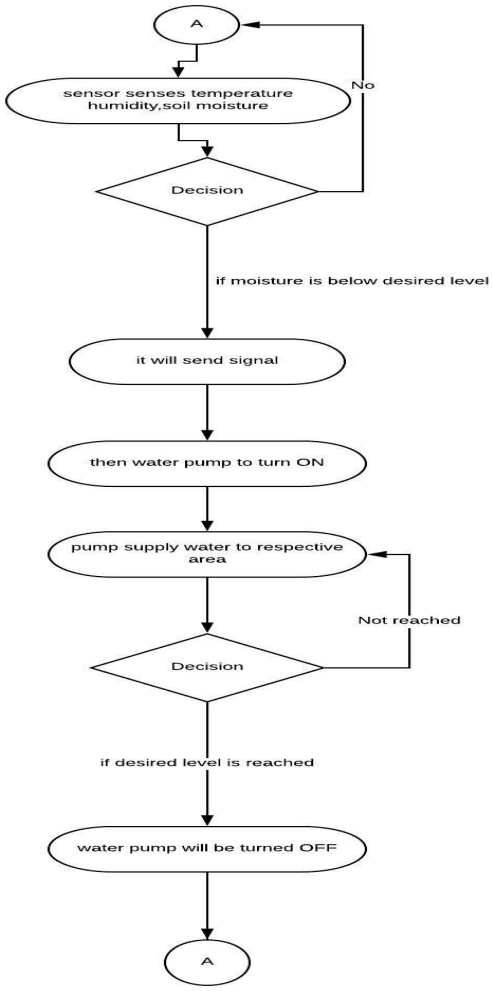

Figure 2: Diagram of sensor reading

2.2 Machine Learning Training

Machine learning is the study of algorithms and mathematical modelsthat computer systems use to progressively improve their performance on a specific task. Machine learning algorithms build a mathematical model of sample data known as training data, in order to make decisions to perform specific task.

The decision making algorithm here used is ID3 algorithm.

2.2.1 Decision Tree

Decision tree learning uses a decision tree as a predictive model to go from observations about an item. In this tree structures leaves represent class labels and branches represent conjunction of features that lead to those class labels. Then decision tree used to make a particular decision.

2.2.2 ID3 Algorithm

In decision tree learning, ID3 (Iterative Dichotomise 3) is used to generate a decision tree from a dataset. ID3 algorithm starts with the original set as the root node. On each iteration of the algorithm[4] it iterates through every unused attribute of the set and calculates the entropy of that attribute. It then selects the attribute which has the smallest entropy value. The set is then split by the selected attribute to produce subset of the data. Throughout the algorithm decision tree is constructed with each non terminal node representing the selected attribute on which the data was split and terminal[5] nodes representing the class label of final subset. Figure 3 shows Diagram of machine learning process

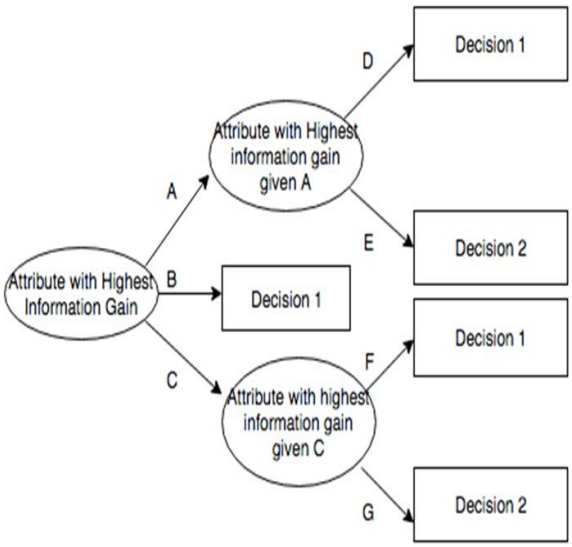

Figure 3: Diagram of machine learning process

2.3 Working

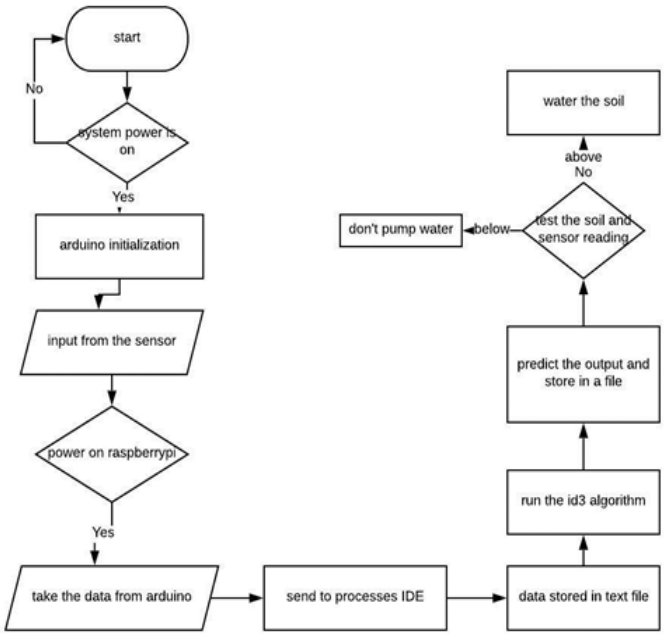

Figure 4: Diagram of working

Temperature and moisture sensor will sense the soil condition at regular intervals and send the data to the microcontroller of the Arduino. Arduino has an inbuilt analog to digital converters which will convert analog data to digital one. In this system a raspberrypi is connected and converted signal send to it as shown in figure 4.

Machine learning based ID3 algorithm is employed in the hardware. This algorithm is simple and efficient. The sensed temperature and moisture values are then engulfed in the machine learning algorithm. The raspberrypi sends the signal to Arduino to start the pump for irrigation process.

3. CONCLUSION

This paper provide a fully automated system for overhead tank filling and watering of agricultural land based on the mains power status, current soil moisture level, atmospheric temperature and sun light intensity.

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REFERENCES

1. **"Microcontroller-based automatic irrigation system with moisture sensor"**AbhinavRajpal et.al, International Conference of Scientific and Engineering, 2011.
2. **"Water-Saving Irrigation System Based on Automatic Control by Using GSM Technology"** K S S Prasad et.al, middle-east journal of Scientific Research,2012.
3. **"Microcontroller based Controlled Irrigation System for Plantation"** S R Kumbhar et.al, IMECS, Vol II, 2013.
4. **"GSM based Automatic Irrigation System for Efficient Use of Resources and Crop Planning bu using an Android Mobile",**Pavithra D S et.al, IOSR-JMCE,Vol II,2014.
5. **"Automatic Plant Irrigation System"**by Amit Yadav,RahulDev,RavinderKumar,Shwetank Singh.