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MOISTURE MONITORING SYSTEM FOR DAM CONSTRUCTION USING WSN

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Abstract: The dam construction is tedious process and to construct such a dam need to take care of water and other elements. It consists of moisture sensor and accelerometers which are used to monitor moisture content of soil and tracing of geographical locations. A wireless sensor network is used for structural monitoring of dam. System proposes a solution to deploy wireless sensors at strategic locations to achieve the best estimates of structural health. The system will collect the information of regions and will transfer it to the server. The server analyzes the data and will find out accurate moisture level required for foundation work of dam.

Keywords: *Sensor, Accelerometers.*

I INTRODUCTION

The Three Gorges Dam was built across the Yangtze River. Yangtze river is the largest river in China. Three Gorges Dam is the world's largest hydroelectric dam. The Dam generates 98.8 TWh electricity which is the most generated power by any of the dams in the world.

If the dam construction is failed it is not only waste of efforts but also, it loses future income and security. Events like Earthquake can cause a huge damage to the structural health of dams. Such damage leads to the major effects on the safety of lives and economics .If structural monitoring of dams is done in real time then it can reduce loss of human lives .We can also get warning about hazardous dams because of structural monitoring.

In the initial stages of dam construction system will use soil moisture sensor and accelerometer. Soil moisture sensors are used to measure volumetric water content in soil. Type of soil whether it is sandy, clay, loam and salt present in soil such as iron, manganese, calcium, phosphate, nitrogen etc and temperature of soil are the various factors on which soil moisture is based .There are two types of soil moisture sensor which are based on methods which determines the soil moisture.

1) Soil volumetric water content based soil moisture sensor

2) Soil water tension based soil moisture sensor

A. Soil moisture sensor:

In our daily life water is the main requirement of people. Nowadays we are facing many problems due to water Scarcity. In this paper we are using soil moisture sensor for proper utilization of water.

The soil moisture sensor is used to measure the moisture content of soil. It leads to know the accurate moisturity of soil and we can build the foundation of dam accordingly by adding proper amount of water to it so that foundation will be effective.

B. Pressure sensor :

A pressure sensor is used to measure the pressure of liquid or gases. Variable such as fluid/gas, speed, water level and altitude can be measured indirectly using pressure sensor. Pressure sensor usually act as a transducer

C. Water level sensor :

Water level sensor is used to measure the level of liquids/ fluids. In consumer and industrial application, Water level sensor plays an important role. Water level sensor will be use to identify the amount of water present in the dam and accordingly the gates of dam will be open.

D. ATMega :

ATMega is one of the powerful controllers. ATMega has high performance, fast throughput and it has a

128K huge flash memory. It is 128 bit microcontroller .It is used in the case of complex applications. ATMega is both compact and powerful with high speed operation making it suitable for real world applications such as robotics, remote sensing units and much more. ATMega has one eight channel 10 bit A/D converter so as to make the system ideal for reading real world and analog data.

E. ZigBee:

ZigBee is a high level communication protocol used to create personal area networks with small, low power digital radios based on IEEE 802.15.4 specification. ZigBee is intended to be simpler and less expensive than other wireless personal area network. Due to low power consumption it limits transmission distances to 10-100m of line-of-sight. ZigBee is used in a low data rate application which requires long battery life and secured transmission. By using mesh network ZigBee devices can transmit data over long distances. ZigBee networks are secured as it contains 128 bit symmetric encryption keys. ZigBee devices transfer data securely without any data loss.

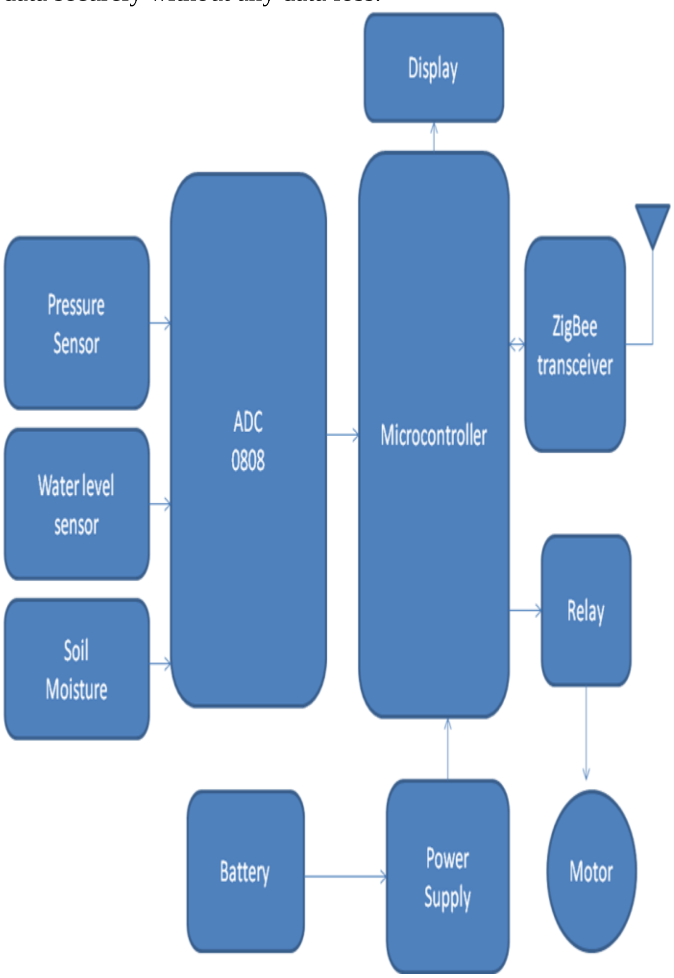

Figure 1 Proposed System Architecture

II LITERATURE SURVEY

Lazarescu M.T. [1]showed functional design and implementation of WSN which can be used for long term environmental monitoring of IOT applications. WSN can be used for an application which requires flexibility, reusability, optimization of sensor and gateway nodes, optimization of communication protocols for both in -field and long range, error recovery from communication and node operation.

Nomusa Dlodlo and Josephat Kalezhi [2]explained the use of IOT and ICT for remotely accessing the data and how it can be used by developers to build country specific technology and uplifting the standards of people.

Xinying Miao[3] expressed the Wireless Dam Sensor Network (WDSN) that is employed with the smart nodes and sink nodes which are able to transmit and detect data with the capability of maximal transmission distance. By making the use of techniques like optimization of data sampling and data transmission and using ZigBee standards we can decrease the power consumption of sensors.

Wen-Yaw Chung [4] shows the use of wireless sensor network system for soil moisture monitoring. It also gives accuracy of sensors in determining the soil moisture content.

Shi-Feng QI and Yan-Hua LI [5] provides the solution for safety of dams by replacing the existing wired monitoring system by wireless monitoring system. It mainly solves the problem like automatic monitoring of water level, seepage, seepage pressure and deformation of dam.

III SYSTEM DEVELOPMENT

The In this paper, system can read the ADC values and also receives the sensor data. We can apply linear programming on the data values collected from the sensors in order to generate optimum watering plan.

On the basis of values that we have read from ADC and sensor can be utilized by linear programming in order to generate optimum watering plan through which we can generate respective control commands and will transfer them to respective hardware devices. Hardware device is totally operated on wireless network i.e. computer can communicate with hardware through WSN.

Linear programming is mathematical method for determining a way to achieve the best outcome in given mathematical model for some list of requirements represented as linear relationship. It is used to evaluate control parameters like how much total water we have and what will be the exact pressure of the incoming flow. Also we can calculate water moisture level with the help of parameters.

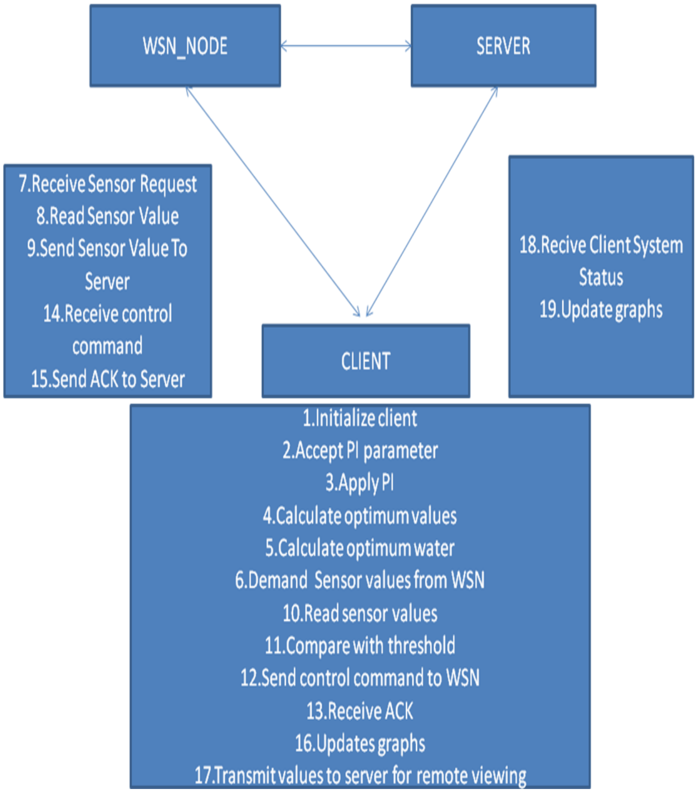

Figure 2 Working of System

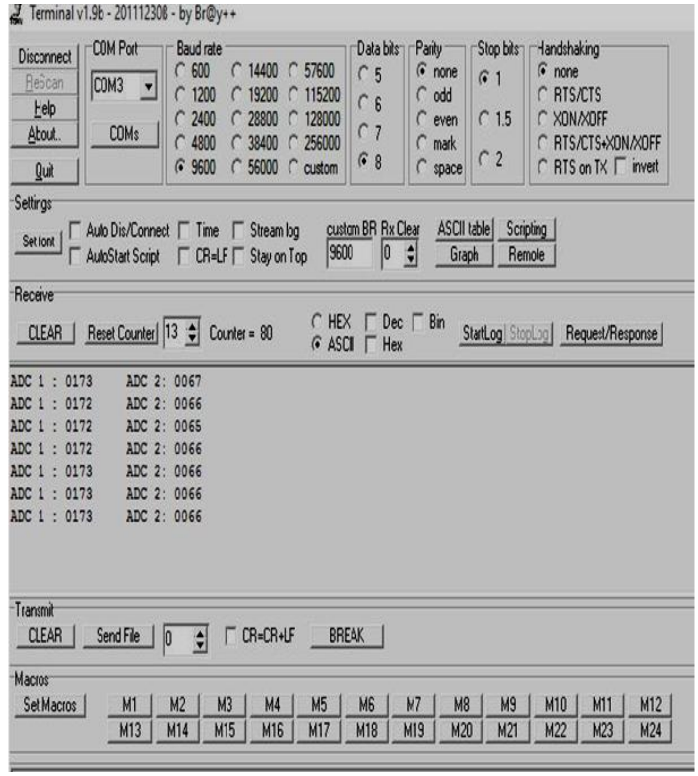

Figure 3 Intermediate Outcome

IV INTERMEDIATE OUTCOME

In this paper the system is been controlled by moisture sensor, water level sensor and pressure sensor. By the help of moisture sensors, pressure sensors, water level sensors reading operations, if soil moisture is below pre settled threshold value in this case water pump machine will be automatically ON and also the respective water requirement will be displayed.

Once the moisture level reaches to its pre settled level then the water pump will be OFF automatically. Apart from this we can find the pressure exerted by the incoming flow of water with the help of pressure sensor. For getting the exact water requirement for construction of dam we can use the following formula

VWC=1.17*10-9*ADC 3 - 3.95*10-6*ADC 2 + 4.90*10-3*ADC 1-1.92

This will help to calculate accurate water requirement for construction of dam. Also the level of water present in the dam will be finalized to some exact value with the help of water level detection sensor. These are the intermediate results which we got from the system. In this case the paper has only 2 ADC values which are shown with the help of hyper terminal and micro C.

V CONCLUSION

This is automated wireless dam monitoring system that provides real time feedback of the collected data and controls all the activities of dam monitoring system efficiently. This system accurately measures moisture content of the soil that is required for construction process of foundation work of dam. By using this system we can save almost 55% of water and 45% of power. This system also reduces the man power. This improves productivity and ultimately the profit.

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