LABVIEW BASED SMART IRRIGATION SYSTEM WITH WSN AND FUZZY CHOICE MAKING CONTROL

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***Abstract*— The continuous extraction of water from earth is reducing the water level, due to that plenty of land is coming back slowly within the zones of un-watered area. In agriculture field, utilization of legitimate watering system is vital because the main reason is the lack of rainfall & scarcity of land reservoir water. The Fuzzy controlled automotive irrigation method is proposed for agriculture cropping system, which allows producers to maximize the productivity with effective water saving method. The accurate irrigation amount was difficult to obtain in the field and the impact factor was high because it's all depends on environmental conditions. so as to unravel this problem, a fuzzy decision-making methodology of irrigation is intended. In this proposed approach, the Solar energy supported self powered automotive irrigation system is designed using wireless sensor network. The network collects soil moisture and water level information, and then transmits the data to a remote monitoring control system using ZIGBEE wireless sensors and critical field updates are informed to the end user by the GSM network. The administrator can monitor soil parameters and control the irrigation on the remote computer according to the specific needs of plants if needed. Ultrasonic repelling device has been deployed to control rodents from damaging the drip laterals. The remote monitoring framework is developed using LABVIEW to monitor and control the irrigation and fertigation. The test results shows that the method and system has many advantages such as it is economic, high communication reliability and high control accuracy.**

Keywords- irrigation; fuzzy control technology; wireless sensor network; ZigBee

I. INTRODUCTION

The continuously increasing demand of the food necessitates the rapid improvement in food production technology. In most of the developing countries such as India, national economy mainly depends on the Agriculture and India ranks second worldwide in farm output. But these countries do not able to make proper use of agricultural resources due to the high dependency on rain . The climatic conditions are isotropic and are not able to make full use of agricultural resources. The main reason is that the lack of rains and scarify of land reservoir water. The continual extraction of water from earth is reducing the water level as a result of that heap of land is coming back slowly within the zones of unirrigated land. Nowadays different irrigation systems are used to reduce the dependency of rain and mostly the existing irrigation systems are driven by electrical power and manually ON/OFF scheduling controlled.

In this paper, a wireless water-saving irrigation system will be presented based on solar energy and Zigbee wireless sensor networks. Using solar energy solves the inconvenient problem of laying wires through the farmland, and the self powered devices can measure the soil moisture continued. The applications of this system in farmland is energy and economics. Many people have issues with rodents. Rats eat our crop, contaminate our stored food, damage drip laterals, spread dangerous diseases to people and . In this project, the ultrasonic repelling device has been developed to unravel the problem in controlling the population of rats and scared them away from entering field. It is pretty difficult to set up accurate mathematical model because of its large inertia, nonlinear and delay characteristics. Besides, applying traditional controlled method will fail to satisfy water-saving requirement. Fuzzy control does not need to establish the mathematical model of the controlled objects.

II. DESIGN OF SYSTEM STRUCTURE

Intelligent water-saving irrigation system includes two primary functions. The first one is to finish collection of soil moisture information. The second one is to control intelligent water-saving irrigation. There are four parts in the system. They are sensor node cluster, coordinator node and irrigation controller and irrigation pipe network. Wireless sensor network consists of sensor node cluster, coordinator node and controller node. Irrigation pipe network is laid over the irrigated areas and electric control valves are installed on

pipelines. Deployment of soil moisture sensor node and level sensor node is to form a sensor node cluster according to the plant conditions and watering status of crop. Each node is responsible for monitoring a small area of soil moisture conditions or air temperature conditions, real-time obtains soil moisture and air temperature, sends the information to coordinator node with a certain time interval. When coordinator node receives the information, carries out fuzzy inference and fuzzy decision to soil moisture and air temperature information in order to decide whether or not to conduct water and how long irrigation time is. Coordinator node then sends the irrigation information to irrigation controller node. Irrigation controller controls pump valve at corresponding region to open or turn off. Thus a closed-loop irrigation network control system is formed and it can implement water-saving irrigation to crops. The Structure of intelligent irrigation sensor network is shown in figure.1.

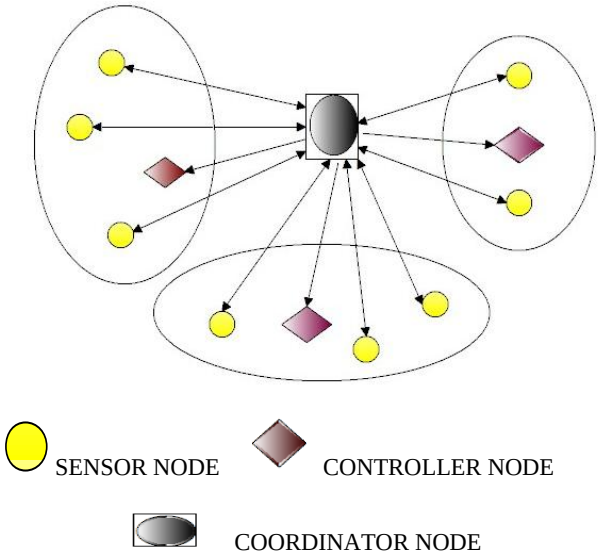

Figure 1. Overall Architecture

III. HARDWARE DESIGN

A basic block diagram shown in the Figure 2. It gives a concise thought regarding this paper. This venture might be partitioned into three primary modules such as front end, management module and monitoring and control module (User). In the front end various actions, such as sensing the real time temperature, soil moisture, water level, and PIR motion detection humidity the farm is been carried out.The management module is responsible to control the irrigation control station by gathering the real time data from the sensor network .

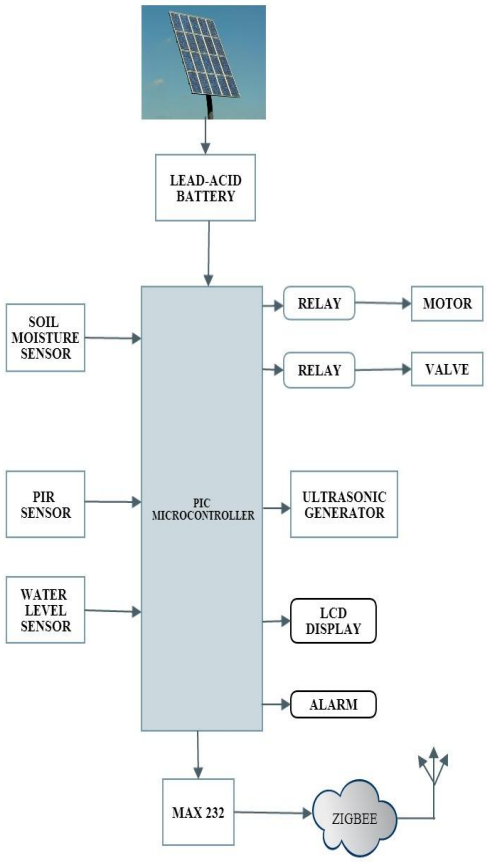

Figure 2.Block Diagram of Smart Irrigation

In figure 3.Monitoring and control module is the user interfaced module. The owner of the farm views the real time status of his farm and also makes some additional control over his farm which is optional depending upon the current climatic changes at the farm.

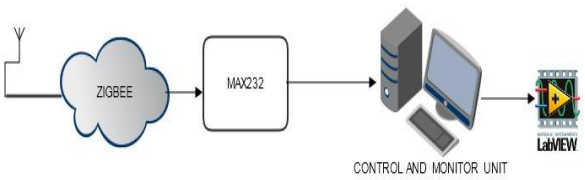

Figure 3. Block Diagram of control and monitoring unit.

IV. FUZZY LOGIC IN SMART IRRIGATION

As is shown in figure 4**,** The soil moisture(X) and air temperature (Y) were the input variables, irrigation duration (T) was the output variable. The membership functions used trim type which has high computational efficiency. Input and output variables of fuzzy sets which divided into three different ways.

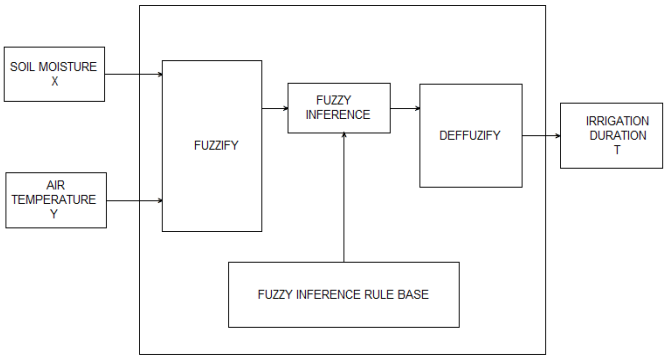

Figure 4. Structural Principle of Fuzzy Controller

Fuzzy reasoning was the process that the fuzzy input value calculated by fuzzy output value through certain reasoning mechanism based on knowledge base. The reasoning rules mainly according to experience and summaries. Then the rule which could obtain would be described by the sentence of "if then". For example, according to experience, when the soil moisture is below the lower limit, the water of soil is shortages extremely. At this time whatever the level of field temperature, crops require a lot of irrigation .In Fuzzy inference rule to say is that "if X is VD then Y is VC" than irrigation time is long period. The Fuzzy inference rule shown in Table 1.

X	Y						
	VC	C	RC	ZO	RH	H	VH
VD	L	PL	PL	PL	PL	PL	PL
D	L	L	L	PL	PL	PL	PL
RD	M	M	L	L	L	PL	PL
ZO	S	M	M	M	L	L	L
RW	ZO	ZO	M	M	M	L	L
VW	ZO	ZO	ZO	ZO	ZO	ZO	ZO

Table.3.3.1 Inference Rule Of Crop Water Requirement

Defuzzification means the process of obtaining the accurate output values which control signal system required according to the fuzzy reasoning results multiplied by scaling factor. This system uses quality center method to defuzzification, to get the time of control valve open the spray irrigation.

V. RESULTS

Labview 2012 could be a absolutely featured programming language made by National Instruments. It is a graphical language quite unique in the method by which code is constructed and saved. There is no text based codes in Labview but diagrammatic view of how the data flows through the program can be viewed. Using Labveiw the modules such as motor control, temperature control, water level control and soil moisture control and motion detection are simulated. If there is a fire in the field, the alarming light will be turned on . The user interface of the system is showed in figure 5.

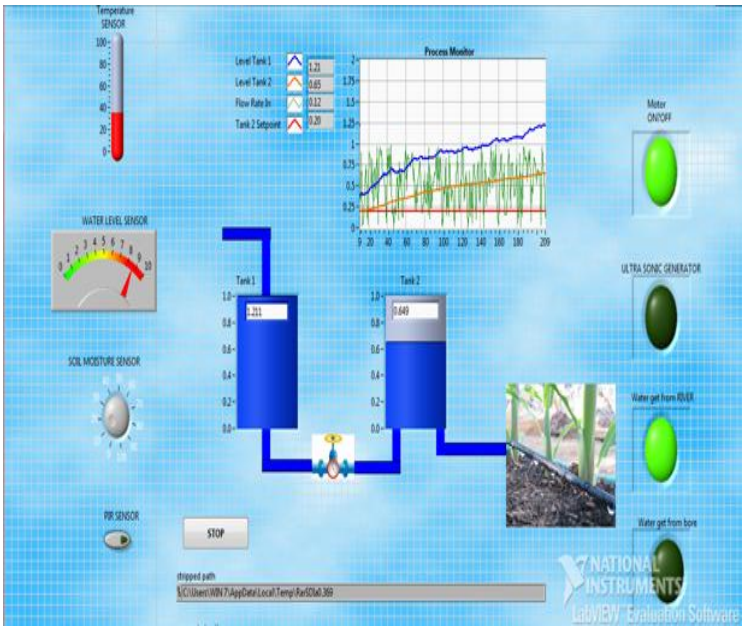

Figure 5. The user interface of the system

VI. CONCLUSION

To irrigate precisely according to the needs is to control water amount according to the characteristics of water requirement, what's more, it can make the water content of the soil just meet the needs of crops. The goal is not only for saving water, but also for promoting crops to develop stronger and produce better. In this approach, wireless sensor networks and fuzzy control technology are introduced to design a water-saving irrigation system. The fuzzy control technology is used to intelligent water-saving irrigation, which can meet the requirement and development of intellectualized and network-

based agriculture. Automated irrigation system can be very profitable labor saving investment in many cases. However, the magnitudes of the benefits are very sensitive to the amount and value of the labor saved. It is also cost efficient.

VII.FUTURE WORK

User can screen the whole information using portable mobile technology that is Lab VIEW data dashboard. Data Dashboard permits you to create custom, transportable views of National Instruments LabVIEW applications. utilizing this application, you can make dashboards to display the values of network-published shared variables and deployed LabVIEW Web services on indicators, such as charts, gauges, textboxes, and LEDs. Desktop sharing, likewise called remote desktop is a software that helps you locally view or control a remote system's running desktop. This has been done from computer to computer, but more recently mobile apps have become available for doing this with a Smartphone or tablet. This applications available for ipad,iphone, Android phones and tablets version 2.3 or higher, windows 8.

REFERENCES

[1] Gao Feng, Yu Li, Zhang Wen'an, et al. 2009. Research and design of crop water status monitoring system based on wireless sensor networks. Transactions of the CASE 25(2):107-112.

[2] Chen Zhaobo. 2007. Research advance and development trends of water use efficiency in plant biology. Scientia Agriculture Sinica 40(7):1456-1462.

[3] Zhao Yandong, Zhang Junfu, Yin Weilun. 2009. Study on precision irrigation control system in accordance with plants physiological water requirement. Jieshui Guangai (1):11-14

[4] Zhang Wei, He Yong, Qiu Zhengjun, et al. The design of precision irrigation system based on wireless sensor network and fuzzy control [J]. Transactions of the CSAE, 2009, 25(Supp.2):7-12.

[5] Fang Xujie, Zhou yiming, Cheng Wenliang, et al. 2009. The design of wireless intelligent irrigation system based on ZigBee technology. Journal of Agricultural Mechanization Research (1):114-118

[6] Liu Hui, Wang Maohua, Wang Yuexuan, et al. 2008. Development of farmland soil moisture and temperature monitoring system based on wireless sensor network. Journal of Jilin University 38(3):604-608.

[8] Zhang J., Li W., Xia Z., et al. The implementation of communication for CC2430-based wireless sensor network nodes[C]. Beijing, China: IEEE Computer Society, 2009.

[9] NATIONAL INSTRUMENTATION "GETTING STARTED WITH THE DATA DASHBOARD FOR LABVIEW".