

Automatic Water Management in Drip Irrigation

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Abstract— The main aim of the project is to minimize the man power and to restrict the wastage of water. It also aims to reduce the energy of man. It increases the yield of crops. The automatic water management in drip irrigation is used to provide required water to crops. There are main three units in the project i.e. sensor unit, valve unit and main base station unit. Microcontroller is used to communicate between three units. Water that is to be provided to crops is first saved in a tank from lakes, rivers etc. So we had used one more unit motor unit .the soil moisture sensors senses the volumetric water content in soil and provides the data to base station unit using microcontroller The Zigbee is used to compare the values, and compare the values with threshold and provides the corresponding data to base station unit. Base station unit gives the information to valve unit. Valve unit will open the valve of particular lane to which the water is to be provided. After the conditions are fulfilled again the information is send to base station unit which sends the data to valve unit and valve unit changes the direction of the valve .as we have used motor unit it will first check if it is dry run it will power off the motor, and again it checks whether pressure of water is low or high, if it is low motor again will be turned off showing that water tank is going to be empty.

Key words: Automatic Water Management, Zigbee

I. INTRODUCTION

Traditionally the drip irrigation is operated by human and it is very time consuming. The previous practice used for irrigation is based on remote monitoring as well as controlling. The farmers have to keep watch on their lands for proper growth of their crops. sometimes the farmers fail to understand the need of the crop, and so the crops get damaged because of which the whole world has to suffer .and also to increase their cultivation they use different types of methods which are harms everyone's life.so we should we concern about this, because of this various alternative methods are used for drip irrigation among them one famous is automation. In traditional system discrete and wired solutions are used, which creates many difficulty in measuring as well as controlling the system, especially when it is concerned with large geographical area. In traditional method the farmer has to do a lot of hard work, as well as proper use of resources is not done many resources gets wasted. The automation system decreases their load as well their use of energy, as well we can use less number of resources, decreases the time consumed .by adopting this system farmers enhance their skills ,trailer cropping pattern to lower the water demand and usage. The main & full purpose of this paper is to design automated water management in drip irrigation .Another purpose is also to help companies planning to switch from traditional way of irrigation into a more productive and automated system in the wireless sensor network using Zigbee.

This research is useful as the controls of the sensors for a specific job, or a task are processed by the

microcontroller and Zigbee. It can also be useful for the future related researches in conducting advance research on industrial automation using microcontroller or the artificial intelligence methods.

This paper is focused on automation of drip irrigation. Zigbee, microcontroller and various sensors have been used for this purpose

II. METHODOLOGY

A standard Zigbee module is used. There are main three units in this project i.e. sensor unit, valve unit and base station unit. The entire process revolve around these three units. We had used soil moisture sensor which used to sense the volumetric water content and sends the values to ADC 0808 which then gives digital values which is passed to microcontroller and the result is displayed on LED. The microcontroller also sends the value to Zigbee transmits the value to microcontroller of base station unit .After comparing the values with each other and checking the result with respect to threshold value again Zigbee receives value from base station unit and sends the value to microcontroller which further transmits the value to valve unit. The valve unit opens the valve of particular lane in which we need to supply water. After fulfilling the requirement the microcontroller sends the information to valve unit and it again changes the direction of valve. And so on the process repeats.

As we have saved water from lakes and rivers. Thus used another unit called motor unit. The water to be provided is first saved in tank. Microcontroller checks weather the motor is dry run or not if it is dry run then it automatically switch off the motor.

In order to achieve the best performance and accurate detection, three different units are designed and implemented.

- 1) Interfacing LCD with microcontroller.
- 2) Interfacing microcontroller with Zigbee.
- 3) Interfacing microcontroller with ADC 0808.
- 4) Interfacing microcontroller with Relay.
- 5) Interfacing microcontroller with water level indicator in base station unit.

These three main components are explained below briefly.

A. Microcontroller:

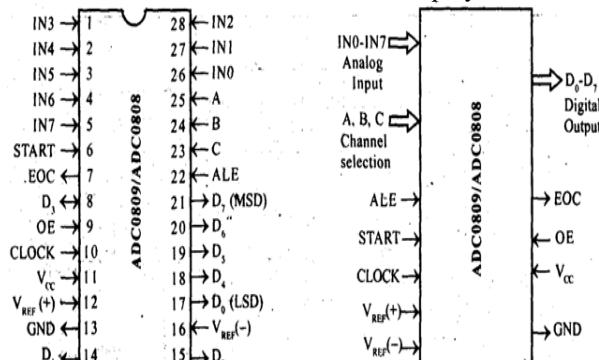
The Microcontroller AT89S52 is a primary controller. The primary controller collects information from soil moisture sensor as well as from the Zigbee. One microcontroller is present in sensor and valve unit and one in base station unit. Here in sensor and valve unit the microcontroller first receives the data from sensor and display the data on LCD. Also transmits the data to Zigbee. Then Zigbee communicate with microcontroller of base station receives the data and sends the required information back to sensor and valve unit. Which is further passed to relay and solenoid valve.



Fig. 1: Microcontroller

B. Adc 0808:

It is 8 bit Analog to Digital converter. It receives the analog value from soil moisture sensor and transmits the digital value 8 bit value to microcontroller which is displayed on LCD.



LSD = Least Significant Digit, MSD = Most Significant Digit

Fig. 2: ADC 0808

C. Lcd Display:

Liquid Crystal Display is an electronic display module. Generally used in all systems is 16*2 which means 16 characters per line by 2lines. . It is used to display the value received from sensor. This has no limitation in displaying special & even custome character. The instructions are given to LCD to perform predefined task initializing, clearing screen, and controlling display.



Fig. 3: LCD Display

D. Zigbee:

This is used as coordinator as well as router. Here we have used 2 zigbee.one in sensor and valve unit and the other in base station unit. It transmits the value from sensor unit via microcontroller to base station unit, there compares the values from sensor with threshold and gives the result.



Fig. 4: Zigbee

III. FIGURES AND FLOWGRAPHS

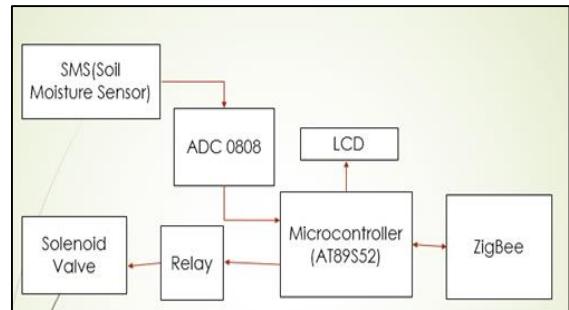


Fig. 5: Block Diagram of Sensor & Valve Unit

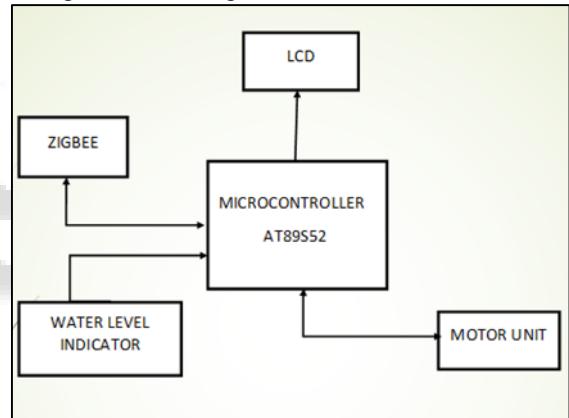


Fig. 6: Block Diagram of Base Station Unit

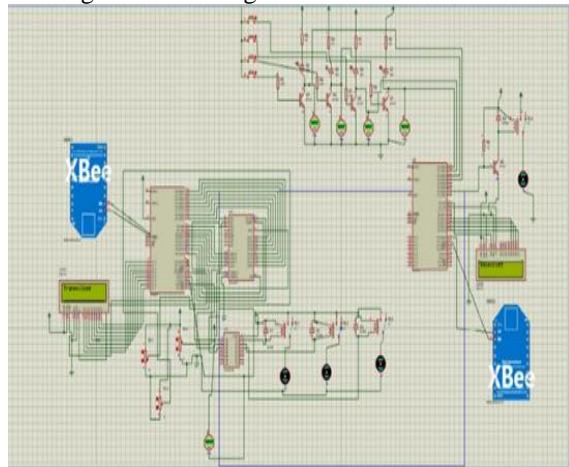


Fig. 7: Circuit Diagram

IV. WORKING

89S52 and Zigbee acts a main control unit for the proposed system. Following are the blocks used for the system working:

- 1) Zigbee used to compare the values from soil moisture sensor with threshold value. If the value is greater than threshold then display the value on LCD and information related to the value is passed to valve unit.
- 2) ADC 0808 is used to convert analog value from sensor to digital value and display the result on LCD
- 3) 16X2 LCD is used to display the values from sensors. It is connected in 8bit mode with microcontroller.
- 4) Relay is used to operate as a switch. The coils of the relay produces magnetic fields which changes the switch contacts.
- 5) 7805 is voltage regulator used to convert higher voltage to +5V DC for microcontroller to other logic IC's.
- 6) Diode 1n4007 is a rectifier diode. It is used for voltage protection. It is rated up to 1A/1000V.



Fig. 8: Hardware part

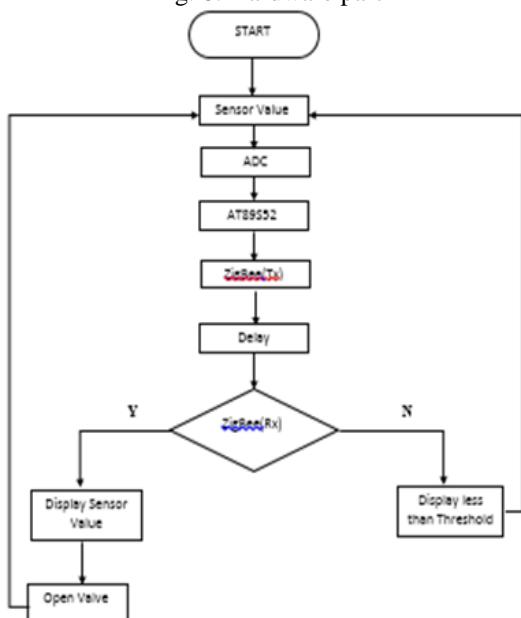


Fig. 9: Flow Chart of sensor and valve unit

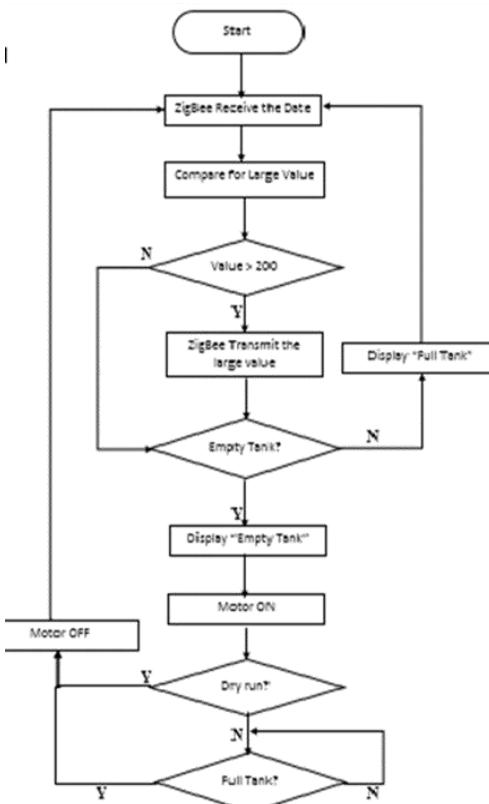


Fig. 10: Flow Chart of base station unit

V. CONCLUSION

The implementation of this project is to reduce man power. And also to make irrigation automatic using basic technologies. This will increase the yield of the project. The sensors are used to sense the volumetric water content and accordingly the water is supplied to crops as much required, with this there will not be any wastage of water as well no damage of crops and the farmers need not use other artificial methods to increase the yield of the crops. Zigbee used in this project which is interfaced with microcontroller. It act as transmitter as well as receiver.

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