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# Embedded System Design for Irrigating Field with Different Crops Using Soil Moisture Sensor

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**ABSTRACT:** Irrigation is a major problem faced by farmers today. So automated irrigation system must be employed to overcome this. Although there are many automated irrigation system, it cannot be implemented for fields having different crops .This proposed system implements the farmers need by incorporating soil moisture sensor and embedded controller. This system can be implemented for fields having different crops that can be cultivated in a region. Farmers can monitor and control the field from remote locations using GSM technology.

**KEYWORDS**: Soil moisture sensor; PIC microcontroller; GSM; Zigbee

## I. INTRODUCTION

Agriculture is the back bone for our economic growth. Now-a-days there are many potential hazards faced by farmers .Water shortage is one such kind and there are many reforms to overcome the same. An efficient method can be provided by implementing the smart irrigation scheme, in which the farmer can monitor the status of the field from remote location .The proposed system provides an efficient implantation of smart crop based irrigation system. A farmer can cultivate any crop in a field at different seasons and not all crops are irrigated at the same water level .Certain crops are maintained with high level of water content and certain with moderate level. So farmer cannot employ a single system to monitor all crops. The proposed system provides solution for this by providing a database within the microcontroller to select a particular module at a time. This makes irrigation more easy and controllable.

## II. RELATED WORK

### I. GSM

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM [3] uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM [4] digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. GSM is used to send status about the goods in the truck to the user only when the weight changes .GSM is interfaced to the microcontroller through RS 232 to USART terminals.

## II. SOIL MOISTURE SENSOR

Soil moisture sensor measures the volumetric content of water in the soil. The dielectric permittivity of the surrounding medium is measured by using capacitance of the sensor. In soil, dielectric permittivity is a function of the

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water content. The sensor creates a voltage proportional to the dielectric permittivity, which is proportional to the water content of the soil.The sensor averages the water content over the entire length of the sensor. There is a 2 cm zone of influence with respect to the flat surface of the sensor, but it has little or no sensitivity at the extreme edges.

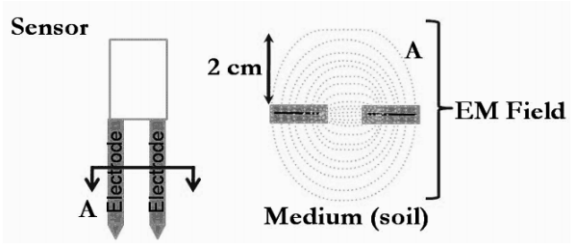


*Fig.1.Soil moisture sensor sensing range*

## III. PIC MICROCOTROLLER

PIC is a High-Performance RISC CPU with only 35 single-word instructions .All instructions execute in single-cycle except for program branches, which are two-cycle. Operating speed for DC is 20 MHz clock inputPIC has 100,000 erase/write cycle Enhanced Flash program memory typical and 1,000,000 erase/write cycle Data EEPROM memory typical .It is self-reprogrammable under software control and supports In-Circuit Serial Programming (ICSP) and In-Circuit Debug (ICD) via two pins, Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation. It supports selectable oscillator options with power saving Sleep mode and programmable code protection.

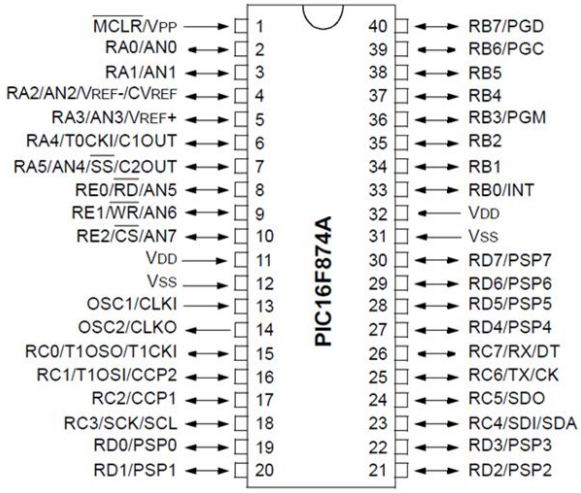


*Fig.2.Pin diagram of PIC 16F874A*

## IV. ZIGBEE

ZigBee, a specification for communication in a wireless personal area network (WPAN).ZigBee is based on an IEEE 802.15 standard. It consumes low power with transmission distance of 10 to 100 meters line of sight. It can transmit data over long distance through intermediate devices such as by forming mesh network.ZigBee has a defined rate of 250 Kbit/s, best suited for intermittent data transmissions from a sensor or input device. It is simple and much less expensive than other WPANs such as Bluetooth and Wi-Fi.

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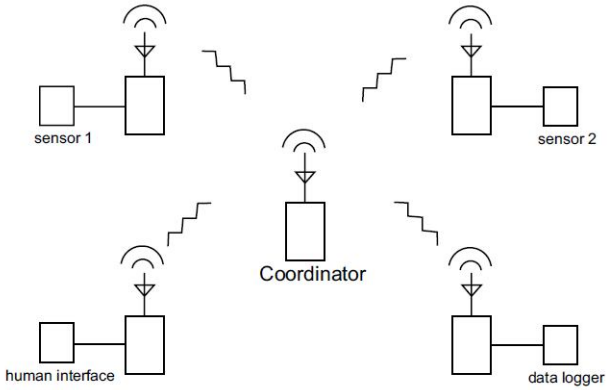


*Fig.3.Zig-bee network with five nodes*

## V. PROPOSED SYSTEM

The system uses a microcontroller to control and co-ordinate the functions of the entire module. Soil moisture sensors placed at different locations in the field transmit the voltage which is proportional to the moisture content using zigbee. The microcontroller can be selected to a particular module by the farmer based on the crop cultivated in the field. Based on the selected module microcontroller sets a threshold value. If the moisture content is reduced below the threshold level then the solenoid valve and motor is activated by using a relay. The soil moisture sensor continuously monitors the field, hence the moisture content is transmitted continuously in the form of voltage to the controller. The controller in turn continuously checks for the value and if the value received exceeds beyond the threshold the motor is turned off and the solenoid valve is shutdown. The message can be sent to the user through GSM when any abnormal conditions such as prolonged water storage in the field occur.

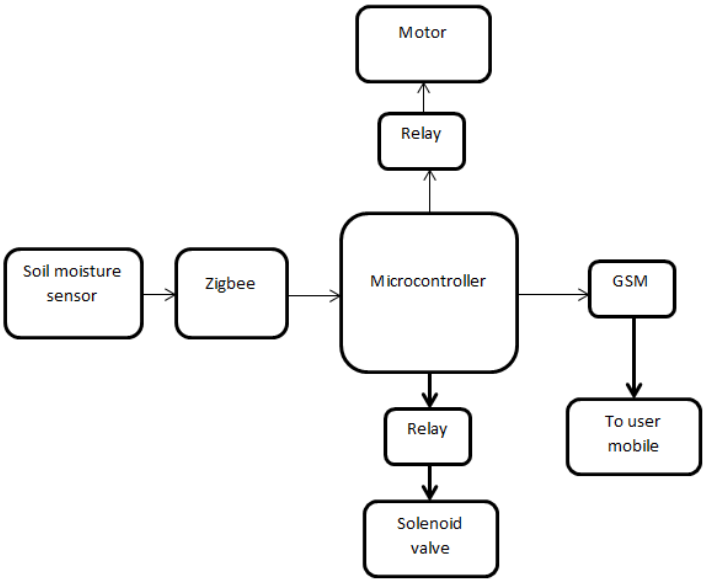


*Fig.4. Block diagram*

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## VI. SIMULATION RESULTS

Simulation is carried out in proteus software with the .hex file generated using MPlab IDE .Here LCD module is used to display the status of the field. Three modules sugarcane, paddy and banana are implemented in this system. The simulation result shows the status when sugarcane module is selected.

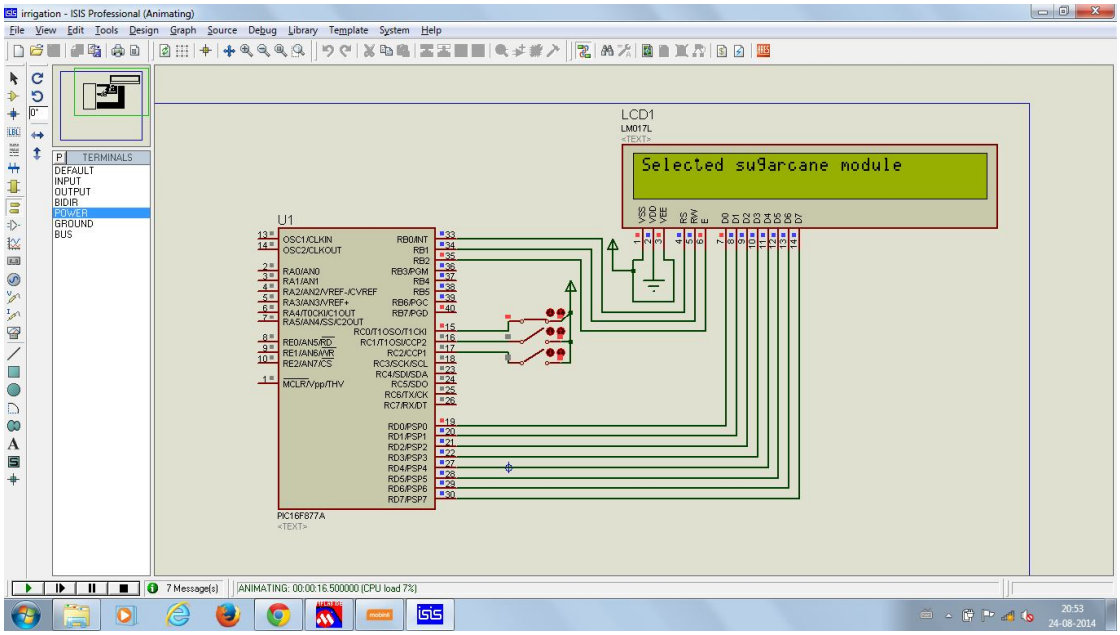


*Fig.5.Simulted Output*

## VII. CONCLUSION

Thus the proposed system can be used to implement efficient irrigation scheme for the field having different crops. The system can be further enhanced by using fuzzy logic controller. The fuzzy logic scheme is used to increase the accuracy of the measured value and assists in decision making.

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