

Automatic Irrigation Control by using wireless sensor

AMIT MEWARA

M.TECH DWCE, SGVU

Abstract: Agriculture faces many challenges, such as climate change, water shortages, and labour shortages. In agriculture field is important to use proper method of irrigation. Drip irrigation method is economical and efficient. In agriculture field is important to get the information about the fertility of soil and moisture content of soil. After measuring these two factors a farmer can start sowing of seeds. We are using Automatic drip irrigation through microprocessor to measure the moisture of soil. A WSN is a system consisting of radio frequency (RF) transceivers, sensors, microcontrollers and power sources. The purpose of this paper is to provide more facility in agriculture field by Using ZigBee. Paper describes an application of a wireless sensor network for low-cost Wireless controlled and monitored irrigation solution.

Keywords: Fertility, surface, irrigation, Drip irrigation, wireless sensor, ZigBee,

I. INTRODUCTION

In India the economy is mainly base on agriculture and the climatic conditions. So agriculture, need to modernize the conventional agricultural for the better productivity. The main reason is the lack of rains and scarcity of land reservoir water. Unplanned use of water the ground water level is decreasing day by day. Lack of rains and scarcity of land water also results in decrement water on earth. Drip irrigation system water is provided to root zone of plants drop by drop which results in saving of huge amount of water. A general WSN protocol consists of Application layer, Transport layer, Network layer, Data link layer & Physical layer. Currently WSN Using two Technologies: ZigBee & Bluetooth. Both operate on Industrial Scientific and Medical (ISM) band of 2.4 GHz, which provides license free operations, huge spectrum allocation and worldwide compatibility.

2. Objective of Drip Irrigation System:-

- (a) Conservation of energy & water resources.
- (b) Improve crop productivity.
- (c) Saves labour works.
- (d) Removes the need for workmanship for flooding irrigation.
- (e) Handle the system manually as well as automatically.
- (f) Detect water level.
- (g) To design, build and test the system which will be economical and efficient.

3. Irrigation Methods:

1. Surface irrigation:-

Surface irrigation is defined as the group of application techniques where water is applied and distributed over the soil surface by gravity. Surface irrigation is flood irrigation in which water distribution is uncontrolled and so it is inherently inefficient.

Types are following

- (a) Level basin
- (b) Furrow basin

(c) Border strip

(a) Level basin Irrigation

Level basin Irrigation has historically been used in small areas having level surfaces. Water is applied rapidly to the entire basin and is allowed to infiltrate. In this technique the top end of the field is applied with water where it will flow over the whole field. After the water reaches the end of field it starts run off to pond. It is used in our country at large basis.



Level

basin Irrigation

(b) Furrow basin Irrigation

Furrow irrigation is conducted by creating small parallel channels along the field length in the direction of predominant slope. Water may be supplied using gated pipe, siphon etc. It is suited to the growing of tree crops and used in the production of vegetables. It has several advantages that whole field is not filled with water rather than water is applied in furrows.



Furrow basin

Irrigation

(b) Border strip irrigation

Border strip known as border check or bay irrigation .it is hybrid of level basin and furrow irrigation .The field is divided into no. of bays or strips. The bays are typically longer, Narrow & sloping is done in long dimensions. In this water is poured at upper end of the border strip & advanced down the strip. It is most complicated irrigation method. It is used for growing crops like wheat, barley, fodder etc.



network of valves, pipes, tubing & emitters. It is done with the help of narrow tubes which delivers water directly to the base of the plant. Drip irrigation may also use devices called micro-spray heads, which spray water in a small area, instead of dripping emitters. These are generally used on tree and vine crops with wider root zones. It removes water logging problem because water is provide as per requirement of drop therefore no problem of overwatering. To resolve the problem of surface irrigation, drip irrigation method using in agriculture. it saves huge amount of water & improve crop productivity. all the relevant factors like land topography, soil, water, crop and agro-climatic conditions are needed to determine the most suitable drip irrigation system.

Disadvantages

- (a)Huge amount of water is used.
- (b)Not Efficient.
- (c) Production of crops is less.
- (d)More water waste.
- (e)Soil erosion is major problem.
- (f)Consume a large amount of water & area between crop rows remains dry.
- (g) Water logging in fields.

2. Drip irrigation

It is also known as trickle irrigation or localized irrigation or Micro irrigation. This method saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly the root zone, through

Advantages of Drip Irrigation:-

- (a)Save huge amount of water.
- (b)Efficient & welfare..
- (c)Installation is easy & flexibility in operation.
- (d)Improve crop productivity.
- (e) Less weed growth.
- (f) Saves labour works.
- (g) Reduce soil erosion.

Drip irrigation using wireless sensor:

ZigBee technology:-

Zigbee is a high level communication protocols used to create personal area networks built from small, low power digital radios. It can transmit data over long distances by passing data through a mesh network. It is used in low data rate applications that require long battery life & secure network. Parameters such as motor ON/OFF, water level etc. by using Zigbee module we can transmit and receive over long distance. Microcontroller used for motor control. The major types of wireless communication are radio frequency (RF) communication personal area networks (PAN), local area networks (LAN), cellular networks, and satellite networks are used. Irrigation control with the Zigbee in agricultural areas has a crucial importance. Zigbee system is efficient for water management in the agricultural cropping systems. It used to measure soil moisture. It is used for communication purpose. Its objective is more crop per drop.

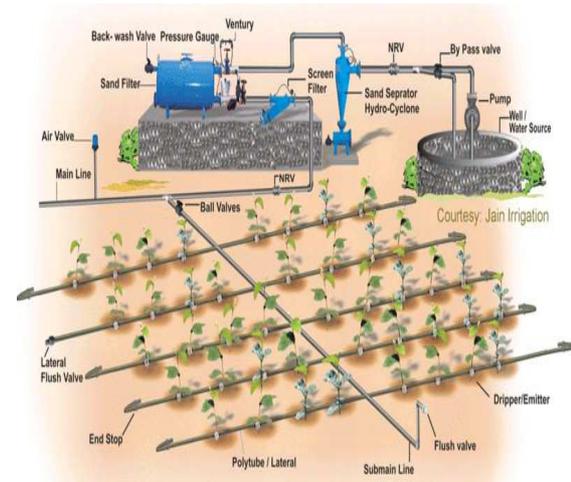
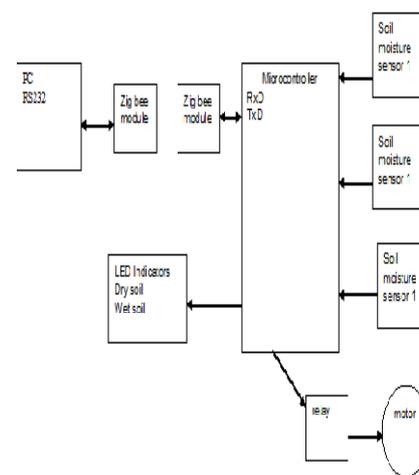


Fig. layout drip irrigation



Block diagram of agricultural irrigation system

Working:-

This system is based on soil identification which consists of Zigbee module for communications purpose. Soil moisture sensor sense the moisture of soil. The output of the sensors is recorded by microcontroller and output is generated by microcontroller. Soil moisture sensing network is used to monitor the moisture contained in soil. Three different sensors are used to monitor three layers of soil. Output of network is given to the Micro controller. Indicator indicates whether the soil is dry or wet. Microcontroller is the heart of

the system. It controls the overall irrigation system. It takes the input from moisture sensor 1, 2, 3 etc. & according to the written program it turns ON or OFF the motor pump. It also indicates the condition of soil. It provides the data to the PC through Zigbee module. When soil is dry motor is on and when soil is wet motor is off. Thus microcontroller controls the operation of motor. It just like a Bluetooth but different that it is a full duplex communication. It is used here to have wireless link between PC & the main irrigation system. So that data can be logged into PC. AC or DC motor can be used for whole system. On the basis of soil moisture detection, motor ON/OFF working will be done. Provision of water and considering the need of water to the crop is done by controlling motor. LCD is also used at field .It indicates message from the microcontroller soil state, motor state.

ZIGBEE:-

ZigBee is a low-cost, low-power, wireless mesh network standard. The low cost Allows the technology to be widely deployed in wireless control and monitoring applications. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive range. It operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide. Data transmission rates vary from 20 to 900 kilobits/second. It supports both star and tree typical networks, and generic mesh networks. ZigBee builds upon the physical layer and medium access control defined in IEEE standard 802.15.4(2003 version) for low-rate WPANs. The specification goes on to complete the standard by adding four main components: network layer, application layer, Zigbee device objects (ZDOs) and manufacturer-defined application objects which allow for customization and favour total integration.

Advantage of Zigbee:-

- (a)Moisture level is measured in soil. So water as per requirement of the soil & prevents water clogging of soil.
- (b)Valves are controlled in system. So labour is not required for valve controlling;
- (c)It provides water directly at the root of the plant as per need.
- (d)It improves crop Productivity & quality.
- (e)It reduces the amount of total runoff & saving water resource.

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