

Sensor Based Automatic Fertigation System

S. MuthuKumar M. Naveenraja V. NaveenKumar Associate Prof. Dr. S. RajaRanganathan

Dept. of CSE
SNS College of Technology
Coimbatore, Tamil Nadu, India
muthukumarsl27@gmail.com, naveenraja104@gmail.com

Abstract- In sensor based automatic system, the irrigation and the fertilizer supplying system can be automated. Our project comprises of two modules irrigation system and the fertilizer supplier system. In irrigation system, the moisture of the soil can be found using the moisture sensor which can be fixed at the different parts of the farm land. For the crops planted, the required water content can be varied with types. Based on the sensor values obtained from the land, the controller will regulate the required amount of water quantity to the crops. This will terminate the motor when the required level reached. In the fertilizer supply system, the fertilizer content present in the soil can be found using the PH sensor fixed at the farm lands. This will find the nutrient content found in the soil. This will supply the fertilizer to the soil based on the sensor values which can be fixed at the farm lands. This will reduce the over watering and over fertilizer supplying to the crops. As the required quantity of water and fertilizer will be supplied to the crops, this will increase the productivity of the crops and improve the texture of the soil.

Keywords- Fertigation system, automatic irrigation, Fertigation methodology.

I. INTRODUCTION

The aim of this paper is to develop a sensor based fertigation system for any agriculture crops. Manual irrigation technique at the present time in which requires the farmer to visit the field at regular intervals. This will leads to loss of water and excess of water in the field. This can make crops dried & also results into slow growth of crop and less production. In the manual fertilizer supply system, the farmer will supply under or excess of minerals to the crops which lead to the reduction in the crop production. This issue can be resolve if farmers will use automatic and remote drip irrigation technique.

The crop production will mainly based on the proper supply of the nutrients and water supply to the crops. Here automatic fertigation system provides solution for the farmers where presence of farmer in his field is not mandatory to do fertilizer and water supply process. This system is also programmed to control mechanical devices like water pumping motor and sensors for the fertigation in the agriculture field.

The farmer will be communicated through SMS. This GSM with the sim card inserted will be used to send the details to the farmer. This will send the farmer every process to be carried out in the system and if necessary the farmer can control it manually. The GSM sends this data to Arduino which is receiving the data from the ph sensor in the form of salt percentage present in the soil. After processing the received data, this data is displayed on the LCD. So whenever the system

receives the command from the sensors attached to the agriculture field, then it checks with the required amount to the received amount. The Arduino regulates the necessary actions programmed to it. The motor is controlled by the Arduino. The sensors check periodically the moisture and nutrient level of the field. If the soil salinity reaches to the low level, the motor is automatically turned on & a message is send to farmer that the motor is turned off. In any up normal conditions the motor can be manually controlled by the farmers.

II. LITERATURE REVIEW

The wireless network technology is increasing rapidly which has a success rate in remote monitoring over many years. A system has been designed to regulate the irrigation in the field with the help of canopy temperature. With the use of the embedded sensors thermal imaging and thermal imaging, microcontroller irrigation is scheduled automatically [1]. The other system focuses on zone specific irrigation which increases the crop production and also optimizes the water usage. A precision irrigation is used to provide an effective usage of water based on closed loop zone specific data. Soil, crop and climate are the major factors which can be monitored to provide a decision support system in the agricultural field. The necessary actions can be regulated according to the monitored data [2]. The distributed field sensor based irrigation saves water as well as increases the productivity of the crops. This paper explains the detailed design of

variable rate irrigation with software and wireless sensor network for real time field sensing and also control of site specific precision linear move irrigation system. The Bluetooth wireless technology can be implemented in the module which saves the time as well as inexpensive [3]. The uniform environmental conditions all over the green house can be implemented using GSM based drip irrigation methodology gives the facilities of maintaining. The lower range of agriculture land can be covered using this system. The cost involved in implementing this system is very high to cover such low area. Hence it's not economically benefit [4].

The climatic parameter monitoring with the help of WSN is the energy efficient inexpensive technology. These networks are deployed to provide a data about the environment in situation of long distance or impossible transport to check the actual environment conditions. WSN can be used to convert physical parameter to electrical signal and the multihop network would transfer the data to the destination [5]. Sumeetha et al. [6] provided a remote control application to control the irrigation motor in the field using mobile phone. The system is developed using PIC16F877A microcontroller which integrates GSM, sensors and motor. Based on the feedback of sensors, the microcontroller controls the operation of motor.

When there is no flow of water in the pipe due to insufficient water level in the well or when the temperature decreases beyond normal or when voltage level is low or the motor gets off automatically and the problem is intimated to farmers through SMS. The mobile phone is used to control the operation of the motor using missed calls. Jothipriya and Saravanabava [7] presented embedded system for the automation of drip irrigation based on GSM. The system ensures that water is distributed to field by automatic switching on/off of main gate valves whenever a normal voltage condition exists. Information is exchanged in form of SMS.

III. METHODOLOGY

Fertigation is the combination of irrigation and fertilizer application to the soil in order to improve crop production and plant growths. Irrigation systems assisted in the growing of agricultural crop, maintenance of landscapes and re-vegetation of disturbed soil in the dry area and during the periods of inadequate rainfall. Of course, the channeling of water sprain over the farm lands plays an important role in the crop productions and plant nourishing. This was attributed to the diseases, insufficient conventional methods of applying large amounts of water and decline of irrigation water. Fertigation will only supply the

required amount of water and nutrient to the soil. This process reduces minimizes the risk of the roots contracting soil-borne diseases, soil erosion, reduces the amount of fertilizer used, reduces water consumption, controls the precise time and increases the nutrients absorbed by the plants, and rate of fertilizers being released. In the Sensor based fertigation system, the irrigation and the fertilizer feeding of the plants will be combined. The required quantity of the water and the fertilizers only supplied to the crops as of the required proportion.

The soil will be subjected to find the amount of the moisture and the nutrients content with the help of sensors. The system will The quantity of water and nutrients will vary based on the duration of the crops and the type of crops. The system will be predefined with the required amount of water and the nutrient content to the crops which has been planted.

The sensors attached to the soil periodically checks the available quantity of moisture and the nutrient level of the soil. If the available amount will below the required amount fixed, the system will initiate the necessary actions. In this system only the required quantity of the water and the nutrients will be supplied to plants as the result of the sensor values. This process will be automated by the controller.

IV. CONFIGURATION BLOCKS OF SENSORS BASED FERTIGATION SYSTEM

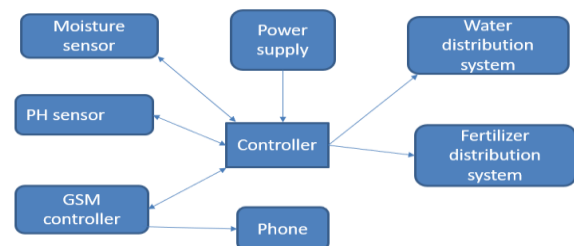


Fig.1 Blocks of Sensor Based Fertigation System.

1. GSM Module

GSM (Global System for Mobile) is SIM900 Quad-band GSM / GPRS device, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is easy to use as plug in GSM Modem and very compact in size. Then Modem is designed with 3V3 and 5V DC TTL interfacing circuitry, which allows User to directly interface with Arduino as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc.). The baud rate can be from 9600-115200 bps through Attention commands. This GSM/GPRS TTL Modem has internal TCP/IP

stack to enable User to connect with internet through GPRS feature. It is suitable for DATA transfer application as well as SMS in mobile phone to mobile phone interface. The modem can be interfaced with a Arduino using USART (Universal Synchronous Asynchronous Receiver and Transmitter) features a serial communication. GSM has built in Network status LED which shows that the module is in network range or not.

If the LED in the GSM module is glowing Green without any blink then it is in network and if the LED is blinking after two-three seconds it means that the module is not placed in the network. GSM has been mainly used to send every actions taking place in the system to the farmer.

2. Arduino Controller- Arduino acts as a controller unit for the whole system. It consists of physical programmable circuit board and software that runs on computer. It can be used to write and upload computer code to the physical board. Every action taking place in the system has been regulated by the arduino controller. The sensors and motor has been interlinked through the arduino. When the sensor sends the data, it then compares with the programmed data and it initiates the actions accordingly.

3. LCD Display-LCD is an electronic optical device used to display the output information of the input data base given by the sensors and the command to On/Off the motor by the SMS commands for the GSM mobile and direction sent from the Arduino controller. It consists of 16 pins with inbuilt back light. It is very compact, easy to use and light. It have no flicker consumes very less power as it depends upon the backlight technology. The geometrical distortion is not needed for the LCD display. Here it is used to display the reading of salinity form the sensor and also the state of On/Off of the system.

4. Future Scope of the project- Sensor Based fertigation system can also be used with the wireless sensor networks which can sense environmental conditions. Use of wireless sensors will open easier way for the action required in fertigation. For this we need to install wireless sensor network in the whole field where irrigation is required. It can also be used in another field also. It be used in the Robotics which can be interfaced with the GSM system with the help of wireless sensor network. It can be implemented with the RFID system through which it can also used to track monaylaundring. It can be attached with the internet of things that can provide information on online source. This can be used to track all the movement and output value of any field throughout the year.

5. Software- The programme is written in assembly language and arduino is used to assemble. The programme is written such a way they it is easy to understand. By using this controller, new entry can be created and deleted. Software uses serial port to share the data. If necessary software can be used to test the module. The software can be used to regulate the actions based on the programmed controller.

V.CONCLUSION

The objective of the project was to design and implement a Sensor based Automatic Fertigation system. The GSM system setup receives the message from the mobile through GSM module and responds according to the task allocated. When message is regarding Stop the operation and start of the operation System successfully responded. Also the reading of the soil salinity done by the microcontroller got displayed on the LCD. If the salinity exceed than the set limited, operation gets stalled. The control of the system can be done in both ways by GSM. By using this system sustainable crop production has been developed which will lead to sufficient use of water and fertilizers. By this crop production can be increased. This system helps the farmers to save time and it can be used in another farm as well.

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