The Study of Irrigation System Through The SMS Controlled Agriculture Field

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Abstract - The main aim of the project is to develop the irrigation system using GSM technology. Appropriate environmental conditions are necessary for optimum plant growth, improved crop yields and efficient use of water and other resources. Automating the data acquisition process of the soil conditions and various climatic parameters that govern plant growth allows information to be collected at high frequency with less labor requirement. The goal of the project is to develop irrigation system by continuously monitoring the soil moisture level on the field. Whenever the soil condition is dry then controller automatically sends massages to the authorized person by using GSM module. After the person receivers a massages the he can on/off the water pump according to his requirement by passing a simple massage. The objective of this project is to provide a combination of manual supervision and partial automation and is similar to manual set-up in most respects but it reduces the labor involved in terms of irrigation design is simple, easy to install, microcontroller based circuit to monitor and record the values of soil moisture (transistor circuit) environmental that are continuously modified and controlled in order optimize them to achieve maximum plant growth and yield.

Key words: - Irrigation, Crops, Programming, SMS, Water pump and Nozzles.

I. INTRODUCTION

Fast growing technology of wireless sensor networks (WSN) is an advantage to the agriculture sector. Modern advances in the development of WSN offer new trends like Precision Agriculture (PA). This paper presents Fuzzy Logic Based Intelligent Irrigation Control System by employing WSN for PA. In the proposed system the irrigation controller normalizes the desired moisture level in the agricultural soil by controlling the water flow of the irrigation pump based on the sensor readings, by switching the pump between ON and OFF states. For the efficient utilization of water in the agricultural irrigation, the proposed methodology offers a system equipped with soil moisture sensors, temperature sensors, precise irrigation equipments, computer-controlled devices, and an intelligent controller using fuzzy logic approach for irrigation of agricultural fields, which simulates or emulates the human being's intelligence. Automation in irrigation system makes farmer's work much easier. Sensor based automated irrigation system provides promising solution to farmers where presence of farmer in field is not mandatory to perform irrigation process. Automated irrigation systems are developed to operate the water pump remotely (Kamrul, Hassan *et. al.,* 2013 and Mandeep, Singh *et. al.,* 2010). The advancement has even taken place to switch on or off the water pumping motor automatically depending upon the soil moisture level in the respective agricultural fields (Abhinav, Rajpal *et. al.,* 2011; Sanyam, Agarwal *et. al.,* 2012 and V. H. Atodaria *et. al.,* 2013). The need of electromechanically programmed system, for controlling mechanical devices like water pumping motor, water pipe valves, etc remotely based on the feedback of sensor node placed in irrigation field has arrived. Many existing systems use computers along with data base technologies for monitoring and controlling irrigation activity (Manish, Giri *et. al.,* 2013; R. Suresh *et. al.,* 2014; Sikhjit, Singh and Neha, Sharma. 2012; Tahar, Boutra *et. al.,* 2011; Rashid, Hussain *et. al.,* 2013; Deepti, Bansal and S. R. N Reddy. 2013 and Laxmi, Shabadi *et. al.,* 2014).

But in real time, farmers need cheap and simple feedback assisted user interface for controlling automated irrigation system. Nowadays, mobile phone is the most common device used by famers. Therefore mobile phone is used in sensor based automated irrigation system (R. Suresh et. al., 2014; Sikhjit, Singh and Neha, Sharma. 2012; Sumeetha, S. and Sharmila, D. 2012; Rashid, Hussain et. al., 2013; Pavithra, D. S. and M. S. Srinath. 2014; Deepti, Bansal and S. R. N Reddy. 2013; Chandrika, Chanda et. al., 2013 and Laxmi, Shabadi et. al., 2014).This helps farmers to control irrigation process remotely. The modern rain-gun irrigation a system, water is supplied half of the land zone of the plants by rain-gun due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land at the regular intervals. The global

irrigation scenario, however, is characterized by poor performance, increased demand for higher agricultural productivity, decreased availability of water for agriculture, increasing soil salinity and possible effects of global warming and climate change. This process sometimes consumes more water or sometimes the water reaches late due to which the crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic microcontroller based rain-gun irrigation system in which the irrigation will take place only when there will be intense requirement of water.

II. MATERIALS AND METHODS

Power Supply:

The 230V input voltage is brought down to 5V DC via a 12V step-down transfer, the bridge rectifier circuit and the voltage regulator IC LM358. The voltage obtained is fed to the microcontroller.

GSM Module and MAX32 Cable:

As mentioned before, the controlling singles are the message from the operator. These massages are received by the GSM module, which is interfaced by the PIC microcontroller via MAX232 cable. The module used is SIM300 which function on 900MHz cable. The GSM used is SIM300, which function on 900MHz frequency band.

LCD Display:

We have used a 16x2 LCD panel which is interfaced with the microcontroller via series registers and capacitors. We have also used a soil moisture detecting unit the function of which is to notify the microcontroller and ultimately the user that the water level has fallen below threshold and alert the user to turn the motor ‘on’.

Relay:

As soon as the GSM module receives the ‘turn on’ request, it inform the microcontroller and as a response the microcontroller and as a response the microcontroller send a 5V signal to the relay which charge the coil and turns the relay on.

Water Pump:

A regular 230V water pump is used for the irrigation purpose.

Software Components:

Software components include embedded software written to the controller memory. It is specialized in the form of programming for the particular hardware which has time and memory constraints. There are varieties of programming languages that can be used to instruct the controller viz Assembly Language, Embedded C, Java, Python etc. Embedded C is most commonly used programming language and hence it is used for this particular prototype (Pratik A. *et. al.,* 2015).

Hardware Components:

Hardware components includes interconnected electronic and electrical elements which perform analog or logic operations on received and already stored data to produce desired output. It includes various kinds of integrated circuits, relays, memory devices like microcontroller/microprocessors, amplifying devices, communication and interfacing devices etc. The hardware components that used for this prototype are listed below along with their functions.

Water Sensor:

YL 69 water sensor along with bridge device YL 38 is used to detect the presence of water in the irrigation pipes. The bridge device YL 38 can also be called as middle man circuit. This sensor has two plastic probes which has metal strips attached on it. This sensor is fitted in the pipes such that when water flows through the pipe, probes of the sensor will get inserted into water. When both the probes come in direct contact with water at a time, current passes through them which trigger the output to middle bridge YL 38. The bridge device there after gives output to microcontroller in the required form.

III. RESULT AND DISCUSSIONS

In this research, we have discussed four parts of SMS based irrigation system deployed in an agriculture field for crop irrigation. The nozzle is attached with water sensor component. The water sensor is mounted to the inlet of the water pipe. The motor is controlled by SMS that can be used to remotely turn Motor ON. The four nozzles are N_1, N_2, N_3 and N_4 and the water sensor attached are WS_1, WS_2, WS_3 and WS_4 respectively.

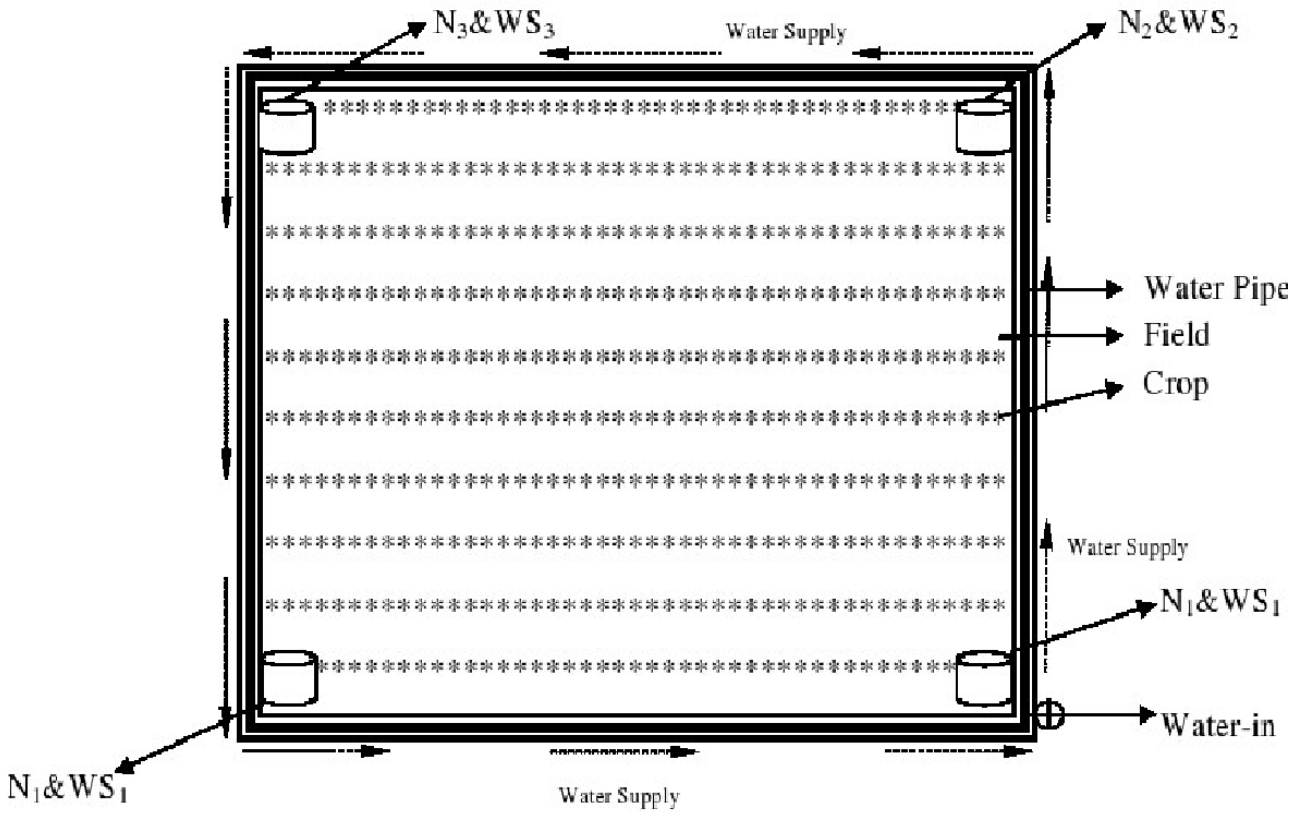

Fig 1.0 SMS Controlled Base Agriculture Field for Irrigation System

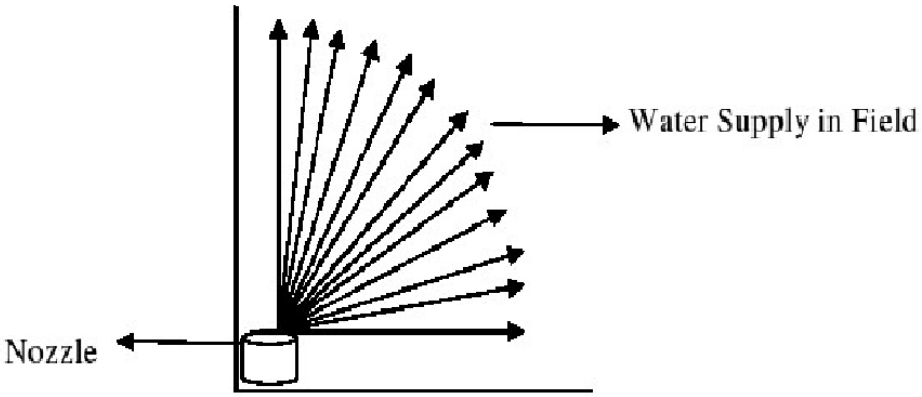

Fig 1.1 Water supply nozzle work at 90 degree angle in field

Depending upon the field/fields to be irrigated, a particular set of instructions is sent from a registered mobile number to the GSM module in the form of SMS. GSM module there after decodes the set of instructions and sends the signal to a microcontroller through communicating device. Microcontroller is programmed with Embedded C to operate the DC motor and valves as per the instruction set. The nozzles are deployed at a 90 degree angle. The purpose is to constrain water within the field. To start irrigation an SMS is sent to the GSM module via a registered mobile number. This results in opening of the nozzle. Water is regulated such that, N_1 &WS_1 supply 100 % water it receives, N_2 &WS_2 80 % of water, N_3 &WS_3 75 % of water and N_4 &WS_4 65 % of the supply water it receives. N_1&WS_1 is attached nearest to water pump and all nozzles are at a similar distance but we can see that N_4&WS_4 supply water which is very low as compared to all the nozzles. We can see that fig 1.1 all nozzles in the field are at 90 degree angle so that the right and left side corner of the nozzle water is not supplied to the field. Finally we observe that crops on the sides of the nozzle

are damaged because no water is supplied in this side corner of the nozzles.

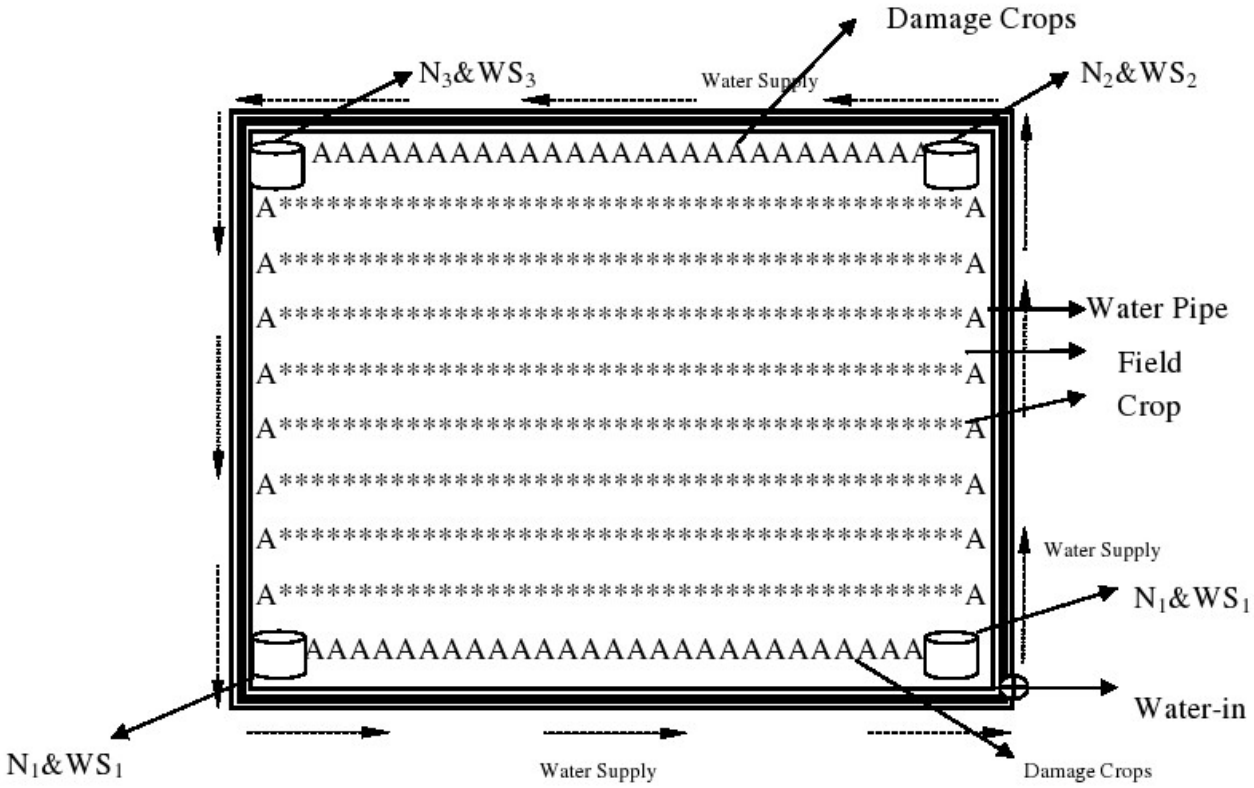

Fig 1.2 Show the damage crop (A) corner side of nozzles

IV. CONCLUSIONS

In this research, we can see that four nozzles are attached in four corners of the field for the irrigation system. All nozzles supplies water at an angle of 90 degrees but water is not supplied in the corners of the nozzle. Microcontroller is programmed using C programming language and when a particular set of instructions is sent from a registered mobile number to the GSM module through SMS, water motor starts. The result is measurement of the water supply unit in the field for crop irrigation, N_1 &WS_1 100 % supply water, N_2 &WS_2 80 % supply water, N_3 &WS_3 75 % supply water in the agriculture field.

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