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DEVELOPMENT OF NOVEL ALGORITHMS FOR AGRICULTURAL PRACTICES

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Abstract— Irrigation is the process of artificially supplying water to land where crops are cultivated. Water being an invaluable limited resource, should be used judiciously. Hand pumps, canal water and rainfall were a major source of water supply traditionally for irrigation. This method has led to drawbacks like under irrigation and over-irrigation. This drawback has caused leaching and loss of nutrient content of soil. During the course of its growth different crops need different nutrients in different amounts. It is paramount that these nutrition needs of the crops are met. We propose here an algorithm that would provide the farmer a way to effectively utilize water resources and meet the nutrition needs of crops.

Keywords— Automation, irrigation, unmanned robot, wheel encoder, sensors, GSM.

I. INTRODUCTION

We live in a world where everything is being automated. There are still few fields in our country where automation hasn't quite really caught up. Agriculture is one such filed where human intervention is inevitable. Agriculture being the primary occupation in India, it is imperative that we bring about automation in this field as well. Automation means introduction of automatic equipment to perform tasks that previously needed a person to do it.Automation in agriculture envisages monitoring and controlling the factors that directly or indirectly affect the growth of crops. What we propose here is a system that will automate the irrigation aspect of agriculture. The major environmental factors that affect the growth of crops are light, temperature, humidity and soil moisture. We introduce a technology that would monitor the soil moisture and would make decisions as to when and for how long to irrigate the field. The system proposed her will use soil moisture sensor, microcontrollers and a GSM module. The sensors will sense the environmental parameters like temperature, humidity, moisture etc. and will send the information to the microcontroller. The microcontroller will process this information and will take decisions based on a pre-defined algorithm. The GSM module serves as a tool for communicating with the farmer. A navigation robot is employed to navigate and collect the soil moisture reading at random points in the agricultural field.Zigbee communication protocol is being used to provide communication between the main microcontroller and the navigation robot.

II. BLOCK DIAGRAMS AND WORKING

A. Irrigation System

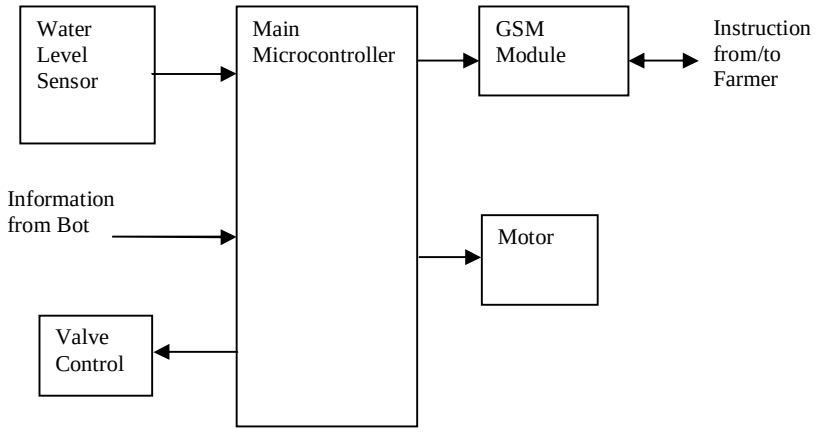

Figure 1: Irrigation system

The microcontroller is at the heart of the system. The navigation robot that is travelling across the field will take measurements of the environmental factors and then will send the information to the microcontroller. The microcontroller will process this information and make a decision as to irrigate the field or not. The water level sensor is used to keep a track of how much water is available for irrigation. The valve control is used to allow water flow to only

that part of the field that is to be irrigated. If the controller decides to irrigate the field then the GSM module is used to inform the farmer of the same. The motor is used to pump water to the fields.

B. Navigation Robot

The navigation robot is designed to travel across the field and take readings at regular intervals. After processing the information, it will decide whether or not to irrigate the field. The block diagram of the robot is shown in figure 2.

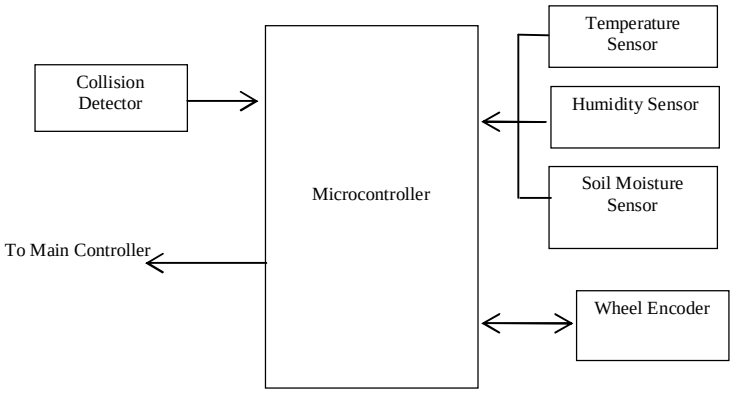

Figure 2: Navigation Robot

The various sensors are used to measure the environmental factors that affect the crop growth. The ADC converts the analog signals from the sensors to digital form before they are processed. The wheel encoder is used make sure that the robot is travelling in the desired path. If not, then corrective actions are taken. Collision detector detects any obstacles that are in the robots path.

C. Valve Control System

We use the following valve mechanism to allow water flow only to a specific part of the field. This system consists of a stepper motor, chain drive and a microcontroller to control the valve. The diagram in figure 3 illustrates the mechanism-

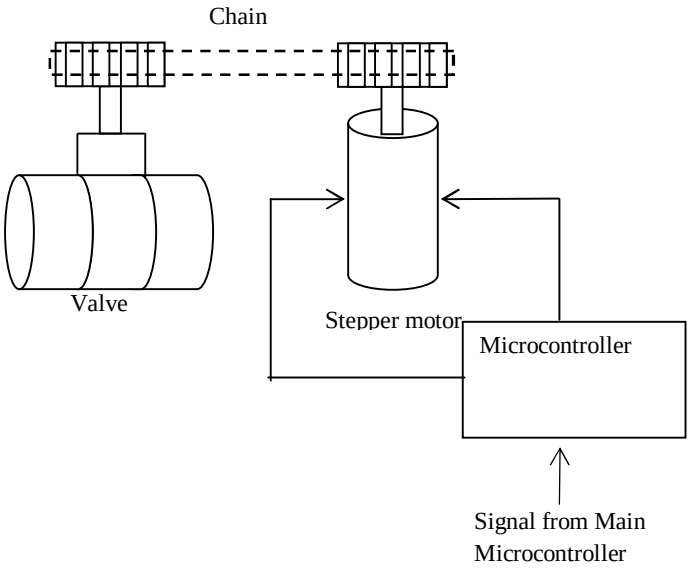

Figure 3: Valve Control System

D. Fertilization System

Crops require different types of fertilizers (amounts of nitrogen [N], phosphorous [P], potassium [K]) during different stages of its growth. Depending on the crops requirements, farmer controls the amount of N, P &K type fertilisers to be released into the water during irrigation using water soluble standards. Farmer will send a command to GSM module (via mobile). The command is interpreted by the microcontroller which in turn controls the valves associated with the different types of fertilisers. The mechanism is illustrated using the block diagram shown in figure 4.

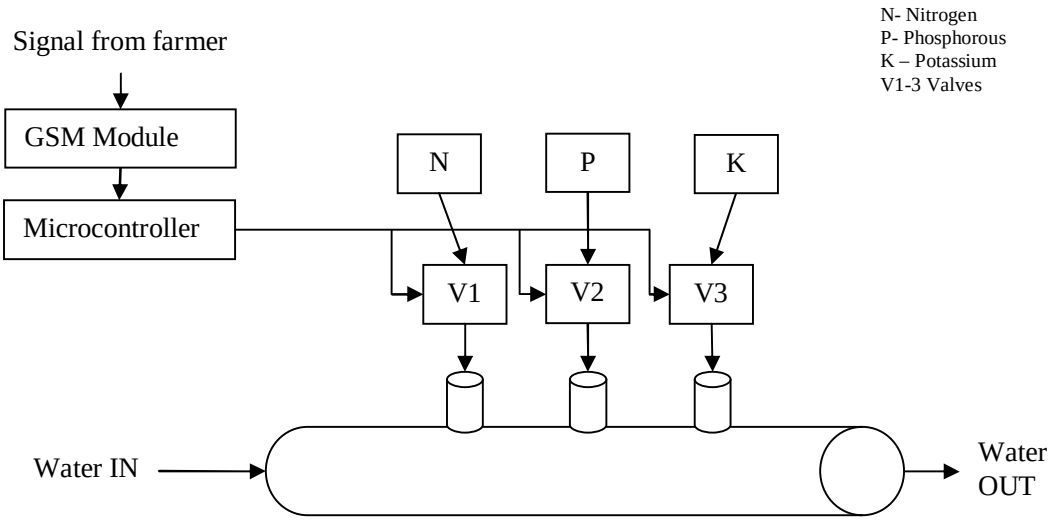

Figure 4: Fertilization System

III. CONCLUSIONS

There is an urgent need for a system that makes the agricultural process easier and burden free from the farmer's side. With the recent advancement of technology it has become necessary to increase the annual crop production output of our country India, an entirely agro-centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. To save farmer's effort, water and time has been the most important consideration. The system developed makes use of zigbee protocol for communication. IN a large field, a network using the XBee modems will be developed. The regularly monitoring the soil moisture levels and maintaining it at an optimum level it is possible to have maximum crop output. By doing this we make the life of a farmer relatively easier.

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