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Wireless Sensors Networks Used In Precision Farming

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ABSTRACT:
The main aim of this project is to propose a state of art wireless sensor technology in agriculture, which can show the path to the rural farming community to replace some of the traditional techniques. In this project, the sensor motes have several external sensors namely soil moisture and soil pH attached to it. Based on the value of soil moisture sensor the mote triggers the water sprinkler during the period of water scarcity. Once the field is sprinkled with adequate water, the water sprinkler is switched off. Hereby water can be conserved. Also the value of soil pH sensor is sent to the base station and in turn base station intimates the farmer about the soil pH via SMS using GSM modem. Obtaining the soil pH value in his mobile the farmer selects the necessary fertilizer and crop for his next season. Hereby the amount of fertilizer can be reduced.

Keywords: wireless sensor network; precision agriculture; grid topology; random topology; Wi-Fi network

INTRODUCTION

In the field of soil environmental monitoring, real-time monitoring the temperature and humidity of soil can correctly guide agricultural production and improve crop yield. It also can provide scientific basis for high-precision monitoring and calculating for farmland drought and flood area. Traditional wired communications exist many problems. It has broad application prospects in soil environmental monitoring field. The age of the Internet of things comes; wireless sensor networks become the core of networking. In order to achieve greater things on the technical requirements of the Internet of things, we adopt the technology of wireless sensor network. India being an agricultural country needs some innovation in the field of agriculture. This can be achieved through modern technologies which assist computing, communication and control within devices.WSN suit for this purpose. Wireless sensor networks (WSN) technologies have become a backbone for modern precision agriculture monitoring. WSN in agriculture helps in distributed data collection, monitoring in harsh environments, precise irrigation and fertilizer supply to produce profuse crop production while diminishing cost and assisting farmers in real time data gathering. This paper presents the preliminary design on the development of WSN for crop monitoring application. The proposed WSN system will be able to communicate each other with lower power consumption in order to deliver their real data collected to the farmer's mobile via GSM technology and to actuate the water sprinklers during the period of water scarcity.

SOFTWARE REQUIREMENT SPECIFICATIONS

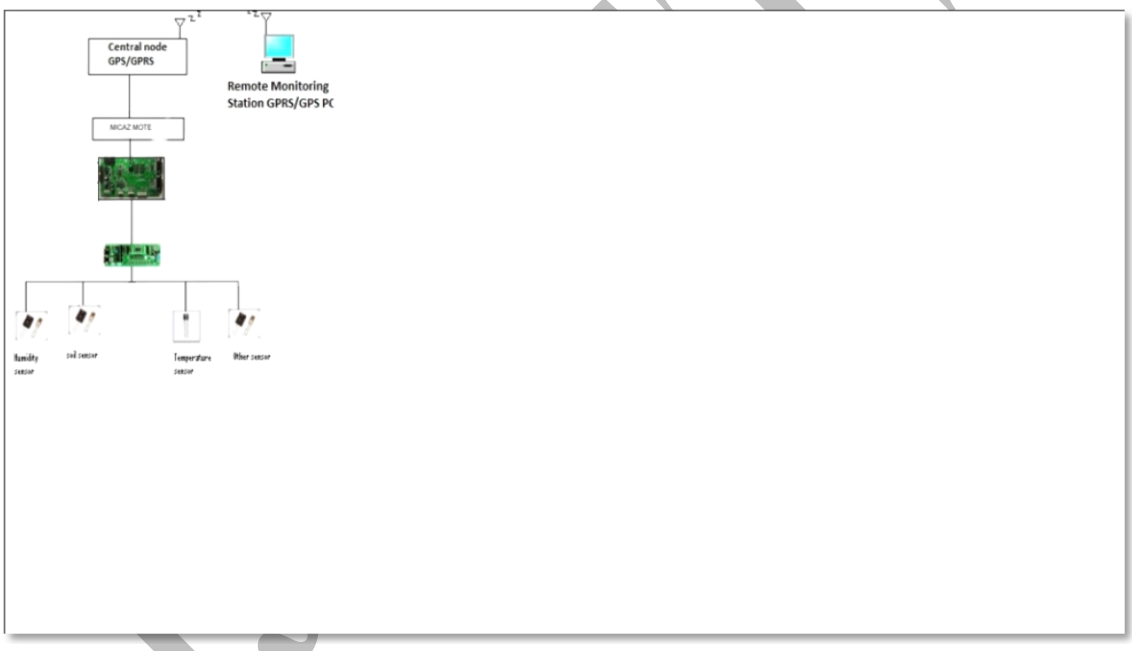
The requirements that adopting a WSN are expected to satisfy in effective agricultural monitoring concern both system level issues (i.e. unattended operation, maximum network lifetime, adaptability or even functionality and protocol self configurability) and final user needs friendliness, versatile and powerful graphical userinterfaces). The system comprises an overall self-organizing mesh WSN with sensing capabilities, monitoring and interacting with the instrumented environment. The crop management system using Wireless Sensor Network (WSN) is a kind

of an autonomous solution to enhance the agricultural technology. Precision agriculture could raise the crops yield, labour cost saving and environmental protection against over pesticide or fertilizing. Therefore in this project we would like to propose a wireless sensor system that will communicate each other with lower power consumption. This is served with the help of Micaz motes from crossbow technologies. The architecture then to be implemented in the sensor nodes will construct a wireless networking data collection at crop field likely to replace the conventional manually data collection system. A general Micaz mote with MDA300 data acquisition board has standard measurement parameters sensors such as ambient air temperature and humidity and also has external terminals for soil Ph and soil moisturesensors all to be integrated in all nodes. All the deployed nodes will collect the parameters and report to the central co-ordinator /sink. The coordinator will coordinate the data collection. The individual nodes based on the soil moisture sensor content attached to it will excite the water sprinklers in that particular region. Meanwhile the soil pH sensor value will be reported to the central coordinator and then the soil pH value is reported to the farmer using SMS system via GSM modem intimating him to fertilize the particular region. There by we can conserve water and fertilizer using this project.

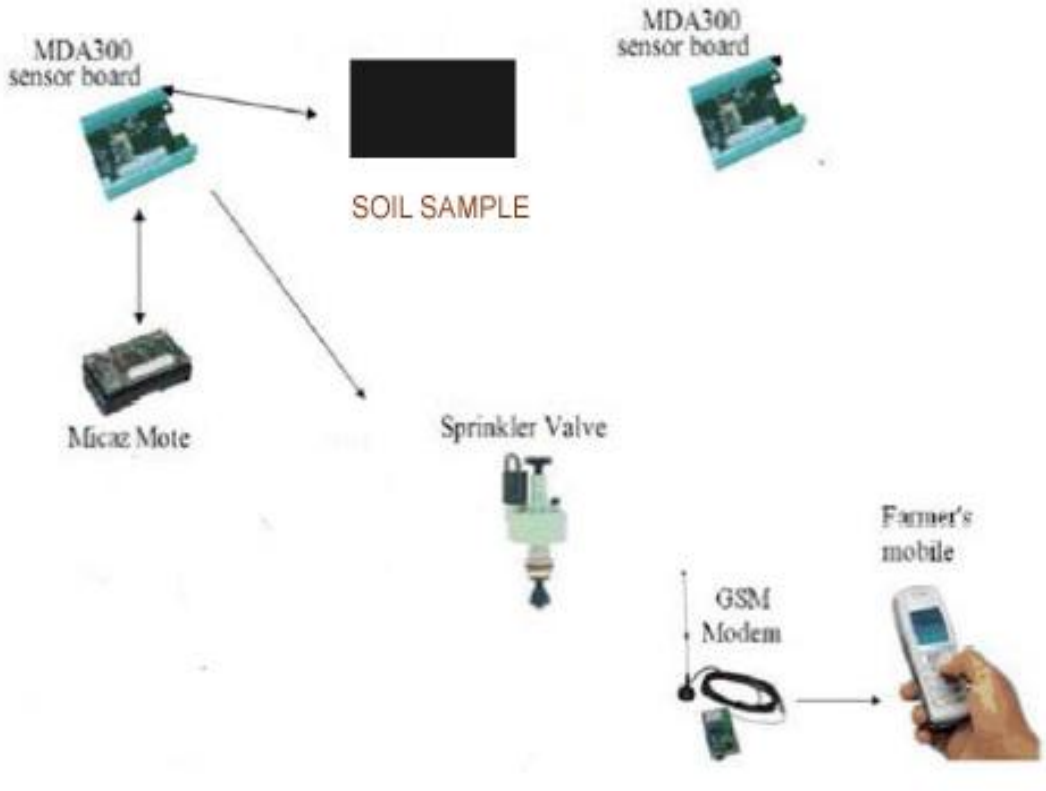
Requirements of Wsn Based Monitoring: According to Project, researches on the modern agriculture are becoming increasingly concentrated on monitoring and controlling the entire greenhouse yielding process. The requirements in the aspect of WSN based crop monitoring system functions can be mainly summarized as the following points:

* Hardware – sensors, connectors, interface boards, input and display panels, routers, computers environments, precise irrigation and fertilizer supply etc.
* Software – communication

DATA FLOW DIAGRAM



ARCHITECTURE



DATABASE SCHEMA

By selecting the right crop for given conditions, one can optimise the requirement of irrigation water and added fertiliser and increase yields.

The crop water needs mainly depend on:

- The climate
- The crop type
- The growth stage

The crop water needs are high in sunny, hot and windy climates and low in cloudy, cool, humid climates with little wind speed.

- **The Climate**

  In a sunny and hot climate, crops need more water per day than in a cloudy and cool climate. One has to consider the amount of rainfall and water loss trough percolation and evapotranspiration in order to calculate the right amount of irrigation water needed. Soil moisture conservation through mulching, tillage techniques, soil cover or soil amendment.

- **The Crop Type**

There exist crops like rice or sugarcane, which need more water than crops like beans and wheat. The table below gives some idea about the different seasonal water needs of the most important field crops.

Crop	Crop water need (mm/total growing period)
Alfalfa	800-1600
Banana	1200-2200
Barley/Oats/Wheat	450-650
Bean	300-500
Cabbage	350-500
Citrus	900-1200
Cotton	700-1300
Maize	500-800
Melon	400-600
Onion	350-550
Peanut	500-700
Pea	350-500
Pepper	600-900
Potato	500-700

The Growing Stage

A fully-grown crop will need more water than a crop that has just been planted. It is estimated that 50% of the crop water is needed during the mid-season stage, when the crop is fully developed. During the so-called crop development stage the crop water need gradually increases to the maximum crop water need (100%). The maximum crop water need is reached at the end of the crop development stage, which is the beginning of the mid-season stage.

Fresh harvested crops, such as lettuce, cabbage, etc. need the same amount of water during the late season stage as during the mid-season stage. The crops are harvested fresh and thus they need water up to the last moment.

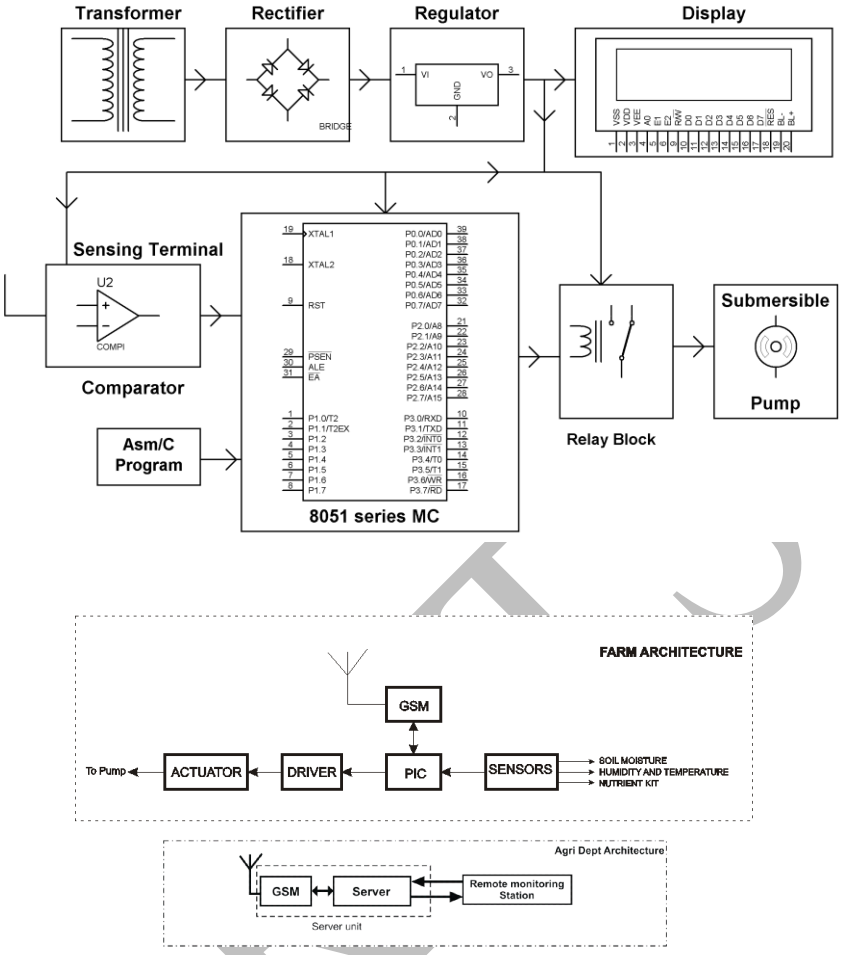
Dry harvested crops, such as cotton, maize (for grain production), sunflower, etc. are allowed to dry out and sometimes even die during the late season stage these crops. Thus their water needs during the late season stage are minimal.

Nutrient Requirements

Proper nutrition is essential for satisfactory crop growth and production. The use of soil tests can help to determine the status of plant-available nutrients to develop fertilizer recommendations in order to achieve optimum crop production.

There are at least 16 elements known, which are normally derived from the soil in the form of inorganic salts, to be essential for plant growth (see table below). 94 to 99.5 % of fresh plant material is made up of carbon, hydrogen and oxygen. The other nutrients make up the remaining 0.5 to 6.0 per cent. Macronutrients refer to those elements that are used in relatively large amounts, whereas micronutrients refer to those elements that are required in relatively small amounts.

CIRCUIT DIAGRAM



CONCLUSION

On-the-go sensors have the advantage of providing non-destructive and rapid quantification of soil variability to enable precision soil nutrient management and monitoring. The prospects of electrochemical sensors for real-time mapping of important soil chemical and physical properties to facilitate precision soil nutrient management and monitoring are promising. Using this system, one can save manpower, water to improve production and ultimately profit. In today's life human being is becoming so busy that he can't pay his attention to work like water supply. But plants and trees are the sources of oxygen for human being and their existence is also important from growth is also important, but it is necessary that excess supply of water should be avoided to save the water. By providing precise timing for water supply this will help to save water. Water saving is the main aim of our system and with the help of scheduling principle we have tried to achieve that, it will definitely helps the human being to save water and in such a way it will be helpful for earth. It can also help in increasing the fertility as we can provide timely fertilizers to the soil and can have a database of that maintained.

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