Wireless IP Network Gateway Using Agro Multimedia Sensors for Paddy Field Monitoring

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Abstract— **Wireless sensor network mainly used for sensing and gathering information of any desired area. WSN is more flexible and can be implemented in many research areas. These includes home automation, healthcare etc. In field of modern agriculture the sensor nodes includes mainly multimedia sensors for sensing crop growth. These sensors are used for sensing data in wide fields without intervention of human. The data under modern agriculture includes temperature, soil moisture, soil composition, light effects, intruders (human, animals, birds etc), plant growth are monitored closely. The sensor nodes periodically gather and transmit to RTOS based Gateway which is embedded with backend web server support.**

Keywords— **RTOS, Gateway, Sensor node, Modern agriculture, Paddy Field monitoring, DSP.**

I. INTRODUCTION

Wireless sensor networks are became more advantageous in various applications such as home automation, building automation, society relevant applications, etc. We are going to use these wireless sensors for paddy field monitoring in agriculture.

Nowadays, agriculture became more modern and precise to monitor the agricultural fields. There are so many challenges in the modern agriculture such as Temperature, intruder, soil moisture, soil composition, Climate changes and increased need for food production. This paper concentrates the paddy field monitoring using sensors. The physical parameters such as temperature, intruder, environmental light intensity and growth of the plant are closely monitored. For this there are three sensors and camera is used. Using matlab and embedded c, programming part has been done. And the results are shown. Future work may be implemented using other software technologies.

II. RELATED WORK

Physical parameters of the paddy field are gathered by data acquisition. Data acquisition has been done using sensor nodes. A node contains three sensors and one camera. The sensors are used for monitoring the physical parameter measurements. The camera is used for monitoring the plant growth. In paddy field monitoring, the parameters such as environmental light intensity, temperature and intruder are monitored.

These parameter measurements are gathered and processed using digital signal processing. In digital signal processing, the analog signals generated from the sensor nodes are converted into digital signals.

Again the digital signals are converted into analog signal. The analog signals from various sensor nodes are transmitted to the gateway using wireless interface. From the gateway the data has been sent to the remote view through the network interface. The general structure of the sensor node is given in figure 1.

Fig 1 General structure

III. PROPOSED WORK

The sensor node is responsible for gathering, processing and transmitting the measurement data periodically to the gateway backend server with embedded web support. The architecture of the gateway module is given in figure 2.
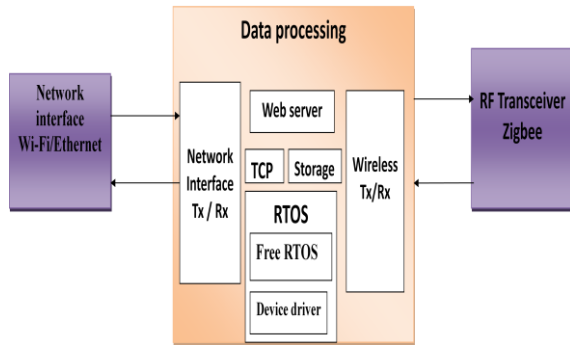

Fig 2 Architecture of the gateway node

IV. IMPLEMENTATION

A. plant's growth measurement

The first physical parameter is plant's growth. It has been monitored and measured by using the camera. A camera is placed at a certain height from the ground level. Camera measures the distance of the ground level. Set this as the initial height. Let it be i. As the plant grows, the camera measures the distance of the tip of the plant .let it be p. Now subtract this height from the initial height. This is the current growth of the plant.

$$h=i-p$$

The height of the plant has been calculated by the following formula using matlab.

Distance= (-10.73*log((area/factor)*21720)) + 127.38;

B. Light intensity

Light sensor (light dependent resistance) is used for measuring the light intensity. ARM7 2103 processor is used for signal processing.

R_L = 500 / **Lux** Kohm

R_L - Resistance

Lux - Light intensity

C. Temperature

For the temperature the LM35 sensor is used. It has an output voltage that is proportional to the Celsius temperature. It has low self heating capability.

D. Intruder

3.3v is supplied to the transmitter side (IR sensor). When the intruder is crossing the sensor, the power is not received at the receiver side. So an interruption message has been created and displayed in the monitor.

F. Wireless transmission using embedded gateway

The above parameters are gathered and processed by digital signal processor and transmitted to user using the gateway with embedded backend server. The parameter measurement has been shown in the following figure 3.

Fig 3 Temperature, Intruder and light intensity measurements

IV. CONCLUSIONS AND FUTURE WORK

In future work, the physical parameters such as pH of the soil, soil composition, humidity, solar radiation, management of the fertilizers, soil pollution and many other parameters can be monitored and that can send to the user as video using video processing.

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