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Wireless Sensor Network Application for Agricultural Environmental Sensing

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Abstract— **India is defined for the agriculture system. India ranks second in agriculture activities. To maintain such a big industry it is important to increase the productivity of farms. India faces many problems in agriculture system and one of the major problems is the optimum use of water. We use the irrigation system to overcome the problem in agriculture. Farms heavily depend on the rain because they lack the access to irrigation facilities. Their crop yields are highly unreliable due to the variability in both rainfall amount and its distribution apart from this, on the various factors such as weather, water, soil, etc.**

Here we describe the wireless sensor networks for improved water management and for controlling their parameters of farm such as *temperature, soil, moisture, Co2 and humidity.* The target population is the resource poor farmers in the semi-arid areas .Wireless sensor network might help them to store and utilize the rain water, to increase their crop productivity, to reduce the cost for cultivation and make use of real time values.

Index Terms— Wireles sensor network, Zigbee, Efficient, monitoring

I. INTRODUCTION

Wireless Sensor Network is a self-configuring network of small sensor nodes (so-called motes) communicating among them using radio signals, and deployed in quantity to sense the physical world. Sensor nodes are essentially small computers with extremely basic functionality. They consist of a processing unit with limited computational power and a limited memory, a radio communication device, a power source and one or more sensors. Agricultural Sensing is an oft-cited application for sensor networks. Sensor data can be integrated into electronic agricultural records and can be retrieved for later analysis. Wireless sensors would permit data acquisition at higher resolution and for longer durations than existing monitoring solutions. The communication protocols for data transfer can enhance efficiency in agricultural. The installed sensor networks can also monitor and detect changes in field. These small sensor nodes allow the subject a greater freedom of movement and allow identify pre-defined

II. LITERATURE SURVEY

The COMMON-Sense project (Community-Oriented Management and Monitoring of Natural resources via a Sensor network) aims at designing and developing an integrated network of sensors for agricultural water management in the semi-arid rural areas of India. Indeed, this system will have an effect on yield at the local level but, in addition, it will allow collecting extensive data that can be used to better understand the effects of water and other environmental parameters on agriculture, and thus to develop replicable strategies. Technically speaking, the COMMON-Sense network consists in a wireless network of ground sensors that record periodically the state (moisture, Watermark, etc.) of the soil. In the system design, sensors record data on a periodic basis and send them in a multi-hop fashion to a centralized processing unit where computations are performed, stored and used.

- Netsens has designed a new monitoring system called Vine Sense based on WSN technology and oriented towards user.
- Remote sensing is also increasingly being used for large-scale environmental monitoring programs like the State of the Environment Report and state-wide projects in irrigation

III Implementation Details

A crop yield heavily depends on unpredictable natural factors like monsoon, floods, and especially drought. The last factor has recently become a major problem for farmers. Additionally, many marginal farmers still make use of archaic agricultural techniques and so do not have the possibility to compete with large western multinationals. In this context, an efficient water management technique to avoid wastes can mitigate the above mentioned effects. Main concept in these systems is a sensor node, small microcontroller integrated

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with number of sensors. In our system we are using Zigbee Serial1 module having range of 100ft Indoor & 300ft Outdoor. Job within this project is mainly to develop the application for gathering of sensor data towards a sink in this wireless sensor network. Moreover we have to integrate the application with a MAC/Routing layer and with a network programming tools. The server side application and user interface will have to be reprogramming to work with the new system.

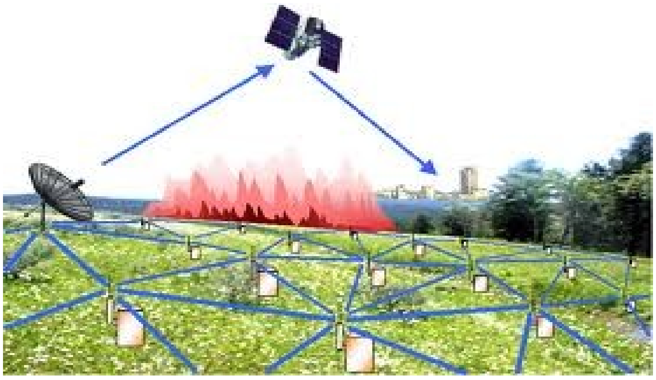
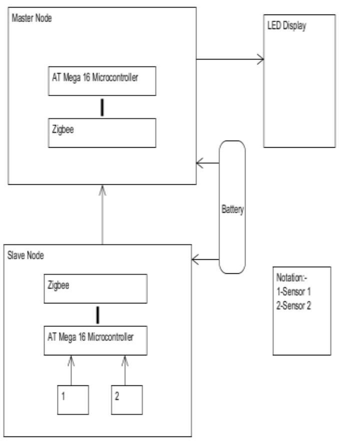


Fig. Wireless Sensor Network

A. Architecture Diagram:



1. Atmega 16 Microcontroller:-

The ATmega16 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC Architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed.

2. Zigbee:-

In our system we are using Zigbee series1 module having range of 100 ft Indoor to 300 ft Outdoor. Zigbee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring application. Low power-usage allows longer life with smaller batteries. Mesh networking provides high reliability and more extensive rang. Zigbee chip vendors typically sell integrated radios and microcontroller with between 60KB and 256 Kb Flash memories.

A. Analog to digital conversion result:

The calculation of the conversion can be found in ADC. The result can be found in the following equation.

$$ADC = \frac{V_{IN} \cdot 1024}{V_{REF}} \quad (1)$$

V_{ref} - +5V

Where (V_{in}) is accepted the input and V_{ref} is the reference which is set +5V externally.

B. Temperature :

The equation is used for to find the temperature.

Vout = Temperature (°C)/ (100mV/ °C)

Where,
Vout =1V
Temperature = 100 °C.
The output voltage can be continuously varying linearly

C. Hardware :

The LM35 series are precision integrated-circuit temperature sensors. the output voltage is linearly proportional to the Celsius temperature The LM35 does not require any external calibration to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C, over a full −55 to +150°C temperature range .MG 811 is carbon dioxide sensor with Good sensitivity and selectivity to CO_2, humidity and temperature dependency, long stability and reproducibility

LM35 also have following features:

1) Operates from 4 to 30 V

2) Less than 60-µA Current Drain

3) Low Self-Heating, 0.08°C in Still Air

4) Nonlinearity Only ±¼°C Typical

5) Low Impedance Output, 0.1 Ω for 1 mA Load

IV ALGORITHM

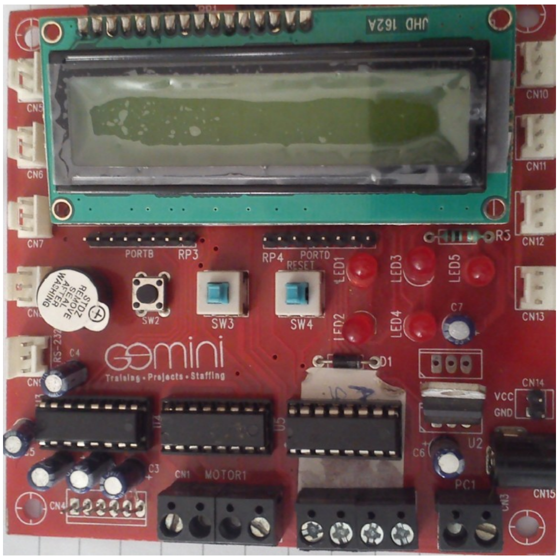
- Step 1: START
- Step 2: Initialize 16x2LCD
- Step 3: Initialize ADC
- Step 4: Initialize USART
- Step 5: Declare variables temp, Humidity, Co2.
- Step 6: Read ADC-1 for Temperature Detection
- Step 7: Convert ADC-1 Digital output into Temperature and store it in variable temp.
- Step 8: Display the value of ADC-1 on 1st row 1st column of LCD
- Step 9: Read ADC-2 for Humidity Detection
- Step 10: Convert ADC-2 Digital output into Humidity and store it in variable humidity.
- Step 11: Display the value of ADC-2 on 1st row 8 column of LCD
- Step 12: Read ADC-3 for Co2 Detection
- Step 13: Convert ADC-3 Digital output into Co2 and store it in variable Co2.
- Step 14: Display the value of ADC-3 on 2nd row 1st column of LCD
- Step 15: Make a comma separated string and transmit on USART
- @# Node number,temp,humidity, Co2#@
- Step 16: ZigBee which is connected to USART will transmit comma separated string wirelessly to the ZigBee receiver
- Step 17: Repeat Step 2 to Step 16 continuously
- Step 18: STOP

V. USER INTERFACE

Providing the lcd kit for displaying result.

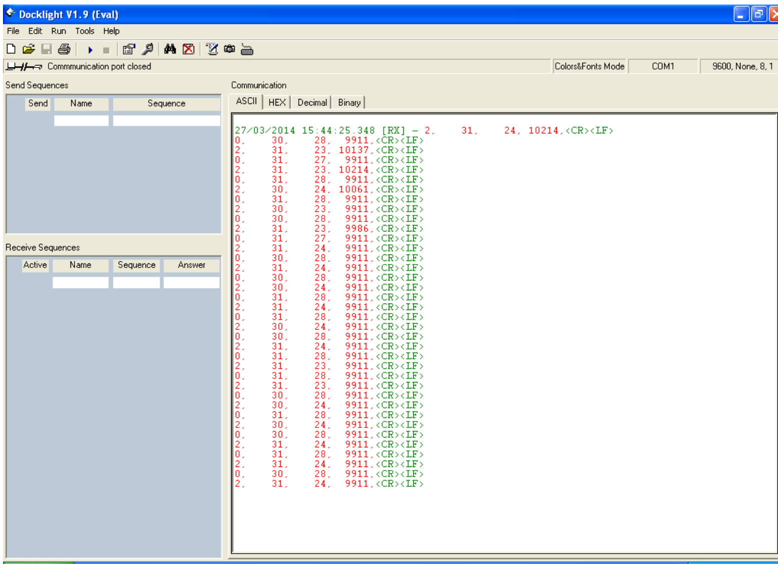
Result will displayed on LCD,
Vss - connected to ground.
Vcc - connected to +5v.
Rs - Register select
1- for data
0- For comment.
R/W –read/write.
E- Enable.
DB0 to DB7- 8 data lines.
LCD- +5v
LCD- grd

LCD connection:
RS- PB2
E- PB3
DB4- PB4
DB5- PB5
DB6-PB6
DB7-PB7



VI. RESULT

Our result is implemented successfully with the help of Docklight software



VII. CONCLUSION

Wireless Sensor Network has wide range of application. We have included sensors for carbon dioxide in addition to previous work done in same area along with temperature, soil moisture and water level. In agriculture these are major parameters. Also these application sensors are regularly used in fields. Here we are implementing water management algorithm, it is easy to build, understand and simple to apply. The following are some features that make wireless sensor network efficient from the other techniques,

VIII. FUTURE SCOPE

Looking into the future, the practical deployment i.e. feasibility and simulation, analyzing the critical conditions of the sensors and creating a web based application will determine the extent that wireless sensor networks will be successfully integrated in agricultural sensing applications and research.

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