RECONFIGURABLE SMART SENSOR INTERFACE FOR WSN ENVIRONMENT

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ABSTRACT

The system is about to design and construction of a system to collect the environmental data using wireless sensor network (WSN). The system uses the concepts like cooperative network to avoid the data loss during system failure. Wireless Sensor Networks (WSN) can be used to monitor surrounding environments parameter and therefore have broad range of interesting applications. The wireless sensor network has adopted concept of data transmission from node to node via wireless media. So, the system has three nodes in which the first node is server node and other two nodes are identical sensor node which will perform the data collection operation and server node will monitor the data received by sensor nodes. The concept of cooperative communication network is used in this system to avoid the interruption in monitoring the data in case of system failure. In this paper we will therefore focus on the design of a re-configurable hardware architecture that reduces the chances of data loss in case of failure of any node. We propose a new real-time data collecting and monitoring method by using wireless sensor networks. Our goal is to collect and monitor the data on android phone. Sensors used on each node nodes collect measured data (e.g., temperature, humidity, light intensity) and send to android phone.

Keyword: - *Wireless sensor network, Cooperative communication, Data Acquisition System, and Android Application*

1. INTRODUCTION

Today, data collection and monitoring is very important in various applications like Green Agriculture, Industrial monitoring, Environmental monitoring etc. Advances in Information and Communications Technologies have led to a number of available services and devices for data collection and monitoring. The primary goals of research and industry efforts are to facilitate user in adopting the correct data collection and monitoring of various environmental parameter to help industries to continue with their daily life activities by making data collection and monitoring services unobtrusive and to provide alert in case of emergencies. Towards this direction, small and fast sensor platforms comprised of controller transceiver modules with sensing capabilities have been designed for uninterrupted data collection and monitoring. We can make use of such autonomous distributed devices in Wireless Sensor Networks (WSNs).

A wireless sensor network (WSN) are randomly distributed sensors to monitor physical or environmental conditions, such as temperature, light intensity, humidity, sound, pressure etc. and to cooperatively transmit their data to main location using node to node transmission fashion. The more modern networks can communicate from both side and also enabling control of sensor activity. The more development in wireless sensor networks is caused because of military applications such as battlefield monitoring. Today such networks are used in many industrial, domestic and consumer applications, such as industrial process monitoring and control, machine parameter monitoring, and so on. In this paper we will therefore focus on the design of a re-configurable hardware architecture that reduces the chances of data loss in case of failure of any node. We propose a new real-time data collecting and monitoring method by using wireless sensor networks. Our goal is to collect and monitor the data on android phone. Sensor nodes has sensors which collect the data (e.g., temperature, humidity, light intensity) from environment and send to android phone.

1.1 Wireless Sensor Network

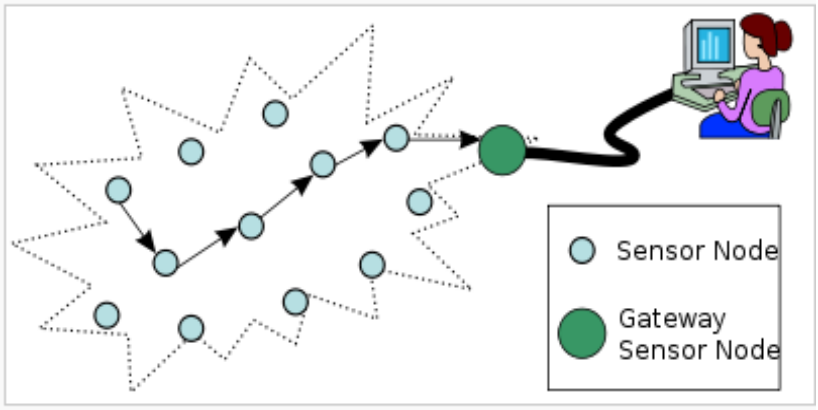

Fig-1: Wireless Sensor Network

The wireless sensor network (WSN) is a network which is used to transmit and receive data. WSN provides a wireless communication link between transmitter and receiver. For providing such link WSN has several nodes. The transfer of data is done in node to node fashion. The wireless sensor network (WSN) contains three major parts as explained below:

1. **Sensor:** The sensor a transducer which converts the physical quantity into corresponding output. A sensor is a type of transducer; sensors may provide various types of output, but mostly use electrical signals in data monitoring systems.

2. **Sensor Node:** The sensor node is made of various sensors, processing circuit, transceiver, memory and power supply. It collect the data from various sensors used process it and send toward the main server.

3. **Network:** The network consists of many sensor nodes which are connected with the help of transceiver section used on each sensor node. The network can have hundreds, thousands of such sensors. Data is transferred through his nodes

1.2 Cooperative Communication

In cooperative communication both the sensor nodes are assumed to collect the data from environment but monitoring of data is done with the help of only one sensor node among them. If this node gets fail then the monitored data is of other sensor node.

1.3 Data Acquisition System

The data acquisition system (DAS) is a system which processes analog sensor signals sensed from physical environment and convert them into digital form. The system has sensors, signal conditioning circuits, analog to digital converter.

2. ACTUAL METHOD AND ANALYSIS

Data collection and monitoring has become very important in many applications. There are so many techniques are available in the market for it. We are using the wireless sensor network and ad-hoc network concepts for collection of data. For monitoring the data collected from the sensor nodes we are developing the android application

2.1 Block Diagram of System

The following figure shows the block diagram of Re-configurable Smart Sensor interface for WSN Environment. We are using concept of the wireless sensor network (WSN) and ad-hoc network so, there are three nodes used. One is master node and remaining two nodes are sub nodes. Both the sub nodes are identical. The block diagram for each node is given below:

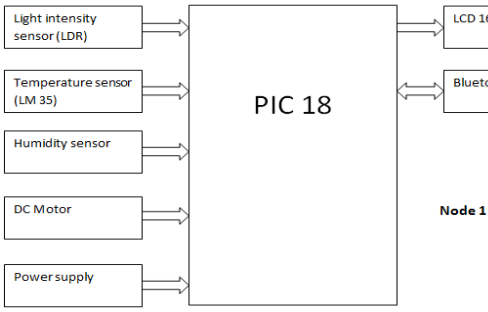

Fig-1: Sensor node 1

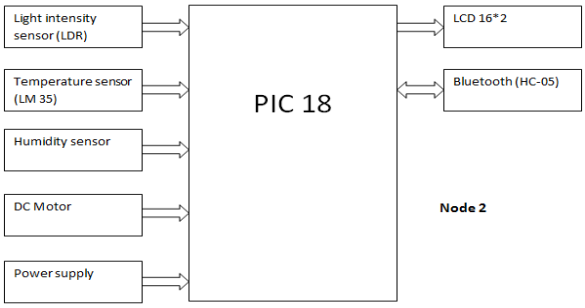

Fig-2: Sensor node 2

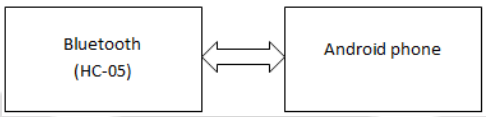

Fig-3: Master Node

2.2 Block Diagram Description

Above figure shows the block diagram of 'Reconfigurable smart sensor interface for WSN environment'. Basically the system is used to collect and monitor the environmental parameters. Here we are monitoring light intensity, temperature, humidity of surrounding environment. Also we are showing the RPM of the DC motor. All the sensors and DC motor is connected to the PIC micro-controller. The data collected by the sensors and RPM of DC motor will be displayed on the LCD display as well as the data will be displayed on the android phone. The data will be send to the android phone via Bluetooth.

The sensors are nothing but the transducer which converts the physical parameter into the equivalent electrical signal. The signal generated by the sensors is analog signals. The signal conditioning and conversion of signals into the digital form is done by the ADC of the controller used.

We are using two identical nodes as shown in above figure. Priority is given to a first node that is in ON condition. The second node comes into action in case of failure of first node. That is in case of failure of first node the second node will perform all the operations which was performed by the first node. In this method we used concepts like co-operative communication and ad-hoc network. The data displayed on android phone will be sent by the second node via Bluetooth communication.

We are designing an Android Application through which we can monitor the sensor data on the android mobile. The android device is connected to the via Bluetooth modem. Once the connection is established the Android App will display all the data on the GUI of APP. Also we are giving the graph of one environmental parameter on the android phone screen. The graph will be temperature versus time.

3 Flowcharts and Algorithm

3.1 Flowchart

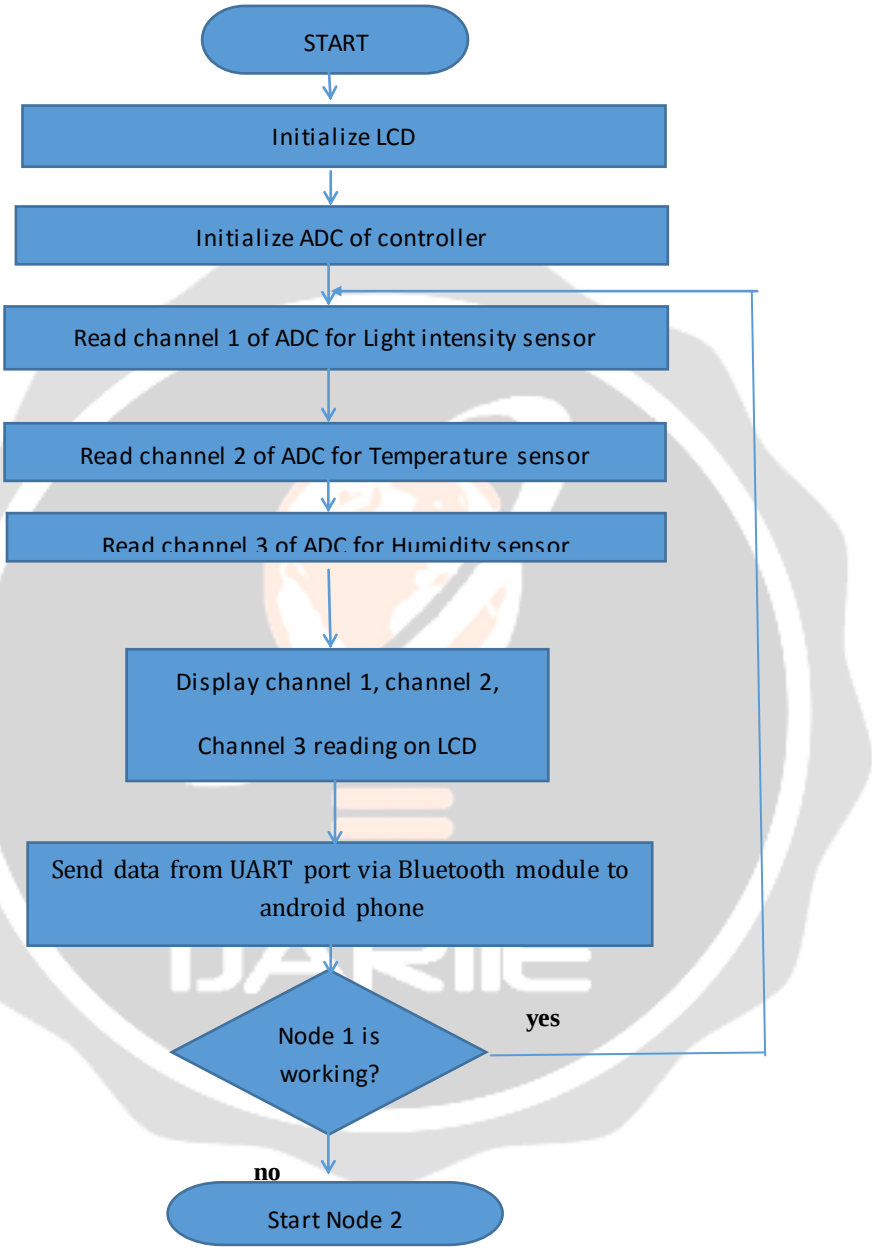

Fig-1: Flowchart of System

3.2 Algorithm:

Step 1: Start of the system.

Step 2: Initialize LCD.

Step 3: Initialize ADC of controller.

Step 4: Read channel 1 of ADC for Light intensity sensor.

Step 5: Read channel 2 of ADC for temperature sensor.

Step 6: Read channel 3 of ADC for humidity sensor.

Step 7: Display channel 1, channel 2 and channel 3 readings on LCD display.

Step 8: Send data using UART port via Bluetooth.

Step 9: If Node 1 is working then go to step 4. If node 1 is not working then start node 2.

Both the sensor nodes are having identical design and construction. So, the working procedure, flowchart and the algorithm for second sensor node are same as first sensor node.

4 RESULT

The results of this system is to monitor temperature, light and humidity of surrounding environment. These parameters are measured with the help of sensors used in system. We have used an android application to monitor these parameters as shown in following snap:

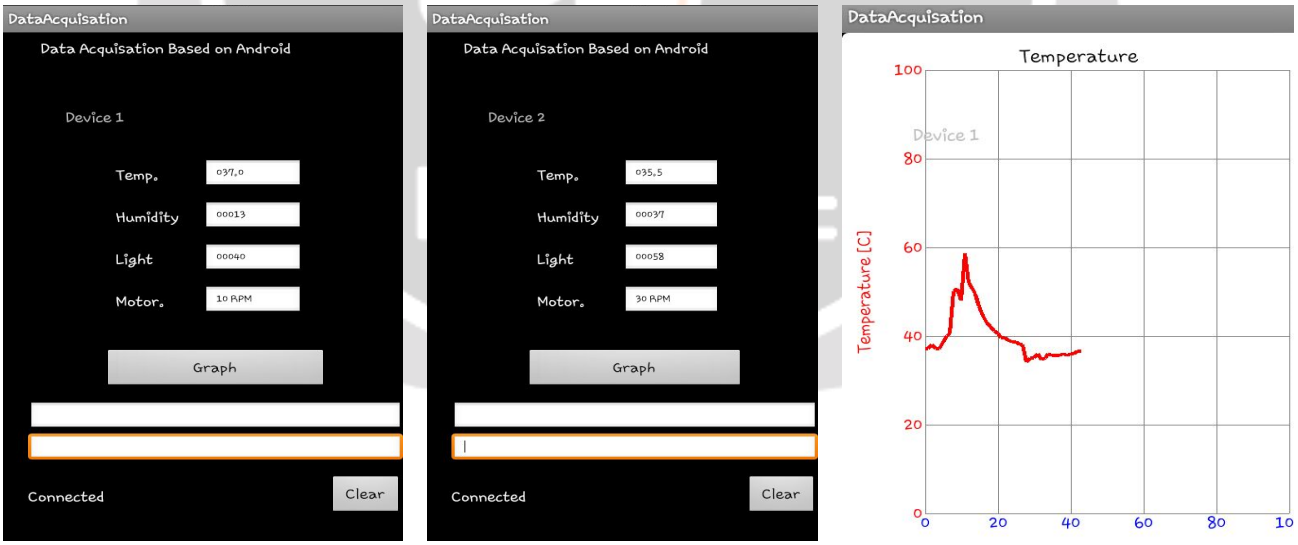

Fig-1: Project Result Snaps

First image shows that monitored data is of sensor node 1 if that sensor node gets fail then the wireless sensor network will reconfigure the network and the master node starts receiving data from sensor node 2 and results of that node shown in second image also the graph of temperature versus tie is shown in third image.

5 CONCLUSIONS

Here the R-WSN is used for data collection so, the system gives uninterrupted data monitoring in all the applications where the data monitoring is required. Due to re-configurability there is no data loss. Here we also conclude that use of concepts like co-operative communication and ad-hoc network for the data collecting and monitoring is very important to collect and monitor the data unobtrusively.

6 ACKNOWLEDGEMENT

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