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Multiple Sensor Nodes Implementation of ADHOC Network using ARM 7

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Abstract: A peer-to-peer wireless network called Adhoc network is backbone of today's remote data sensing networks. Implementing corresponding Adhoc protocol onto the ARM device and forming multiple sensor nodes to collect huge database from remote sites without interrupt. The device built proves the platform developed is the successful implementation of wireless sensor routing algorithm (WSR). Based on this protocol the optimum performance of Ad-hoc network is realized over hazardous or remote areas. This Ad-Hoc Network consists of three ARM nodes connected to ZigBee modules and various sensors like temperature, moisture, humidity and light sensor. The entire analog inputs from various sensors are given to the ARM node. When the first ARM node 'A' is not in the communication range of node 'C' but by using node 'B' communication can be done. The case in which communication between node 'A' and node 'C' which is out of range or at far distance cannot be established directly; here the concept of Ad-Hoc network come into picture. The communication established between node 'A' and 'C' through node 'B' even in the worst case of network traffic is reliably achieved. This system is used as most significant sensor network at places.

Keywords: Embedded platform, Ad-hoc network, Protocol, Zigbee, WSR.

I. INTRODUCTION

Ad Hoc Networks are collections of wireless mobile nodes, requires multiple hops for one node to exchange data with another one across the network due to the limited transmission range of wireless network interfaces. Ad Hoc network is organized dynamically without existing network infrastructure or centralized administration, so every node can forward the messages for others and act as a dynamic router. However, a practical application has some limitations. Short range of communication is limitation of high performance and cost-effective hardware. So the embedded internet technology is one of the solutions to the problem. . The network function demonstration is shown in Fig. 1 When the first ARM node 'A' is not in the communication range of node 'B' but by using node 'C' communication can be done. The case in which communication between node 'A' and node 'B' which is out of range or at far distance cannot be established directly; here the concept of Ad-

Hoc network come into the picture. The communication established between node ‘A’ and ‘B’ through node ‘C’ even in the worst case of network traffic is reliably achieved.

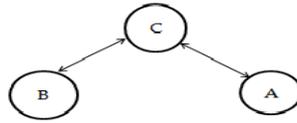


Fig.1 Nodes in communication

II. BLOCK DIAGRAM

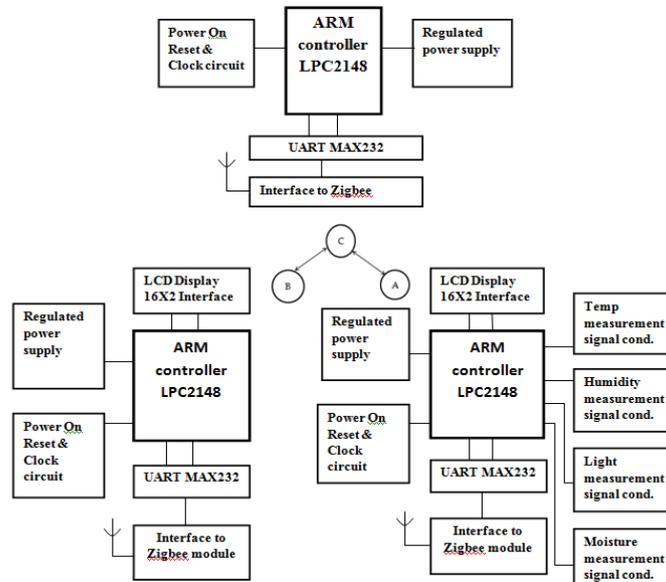


Fig.2 Block Diagram of Ad Hoc network based on embedded ARM platform

This system will consist of three nodes node A, node B, node C. Each node will consist of ARM Processor, MAX 232, Regulated Power Supply, Zig-Bee Module and LCD display. As shown in the fig.2, node A and node B cannot communicate directly due to the limited transmission range of wireless network nodes. For this purpose node C will be provided, which facilitates communication between node A and node B.

In this project, sensors at various nodes senses the respective parameters like temperature, humidity, sunlight and moisture and will give the output to the ARM processor. The output of sensor is in analog form. The ARM processor will convert the signal from analog to digital by the help of ADC which is inbuilt. The need of converting the signal into digital is because of fact that ARM processors are digital devices and can work only on digital data so the analog to digital conversion of the sensor output is important. After the conversion this output can be displayed on LCD as well as passed on to the Zig-bee module using UART MAX232. In this way the communication between node A and node B is done via node C.

The input section for the signal conditioner card for temperature consists of the voltage regulator using IC7805. The PT 100, which is a temperature sensor, is connected in one arm of the bridge and resistors of rest of the arms are selected such that at 0°C the bridge is balanced and 0V appear at the output of the bridge circuit. The resistance of the sensor changes with respect to temperature, widely specifying RTD is having positive temperature coefficient that is as the temperature increases so the resistance of the sensor also increases and vice – versa.

The relative humidity of the atmosphere can be measured with the help of humidity sensor. The sensor gives output in millivolt directly proportional to relative humidity. By providing the external biasing and faithful amplification of the DC millivolt we can calibrated to relative humidity from 0% to 100%. The amplification is done with the help of differential amplifier having gain from 1.5 to 2.5 and is adjusted to 0-5V for a span of relative humidity. This voltage is applied to respective channel of ADC.

To measure and calibrate light parameter a light dependent resistor is used. By depositing a layer of photo sensitive semi-conducting material on a non conducting substrate, we can make a component whose ohmic value is highly sensitive to light radiation. The photo sensor is cadmium sulphide or cadmium solenoid. The substrate is a ceramic disc which after fabrication has a translucent top and hermetically sealed encapsulation.

Water content of soil is measured using transistor BC547. Base and emitter terminals are inserted in soil using suitable probe. As per the water content in soil, transistor works in active region and will change its collector or emitter current which is proportional to the moisture content in soil. In this way the communication between node A and node B is done via node C.

III. FLOW CHART

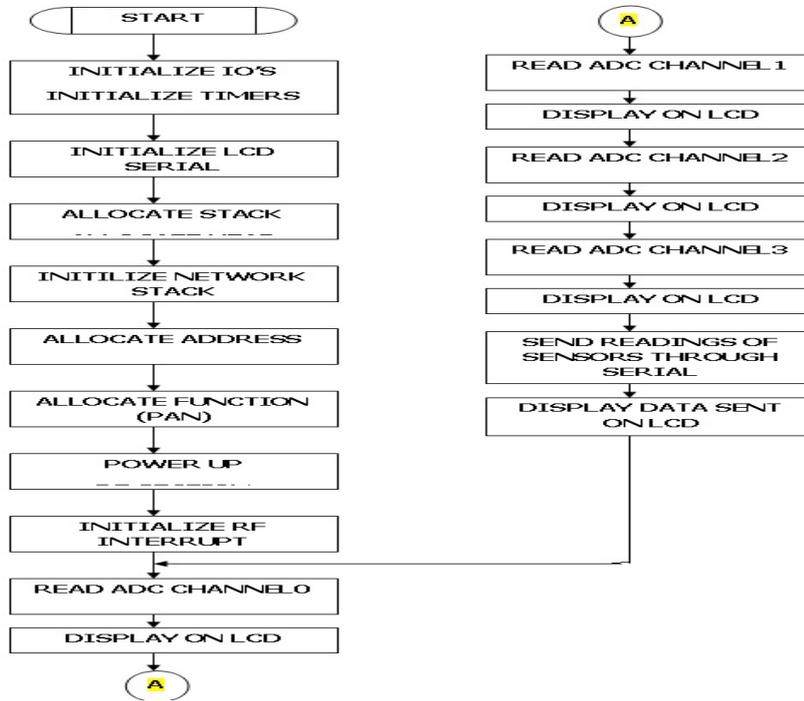


Fig.3 Flowchart 1

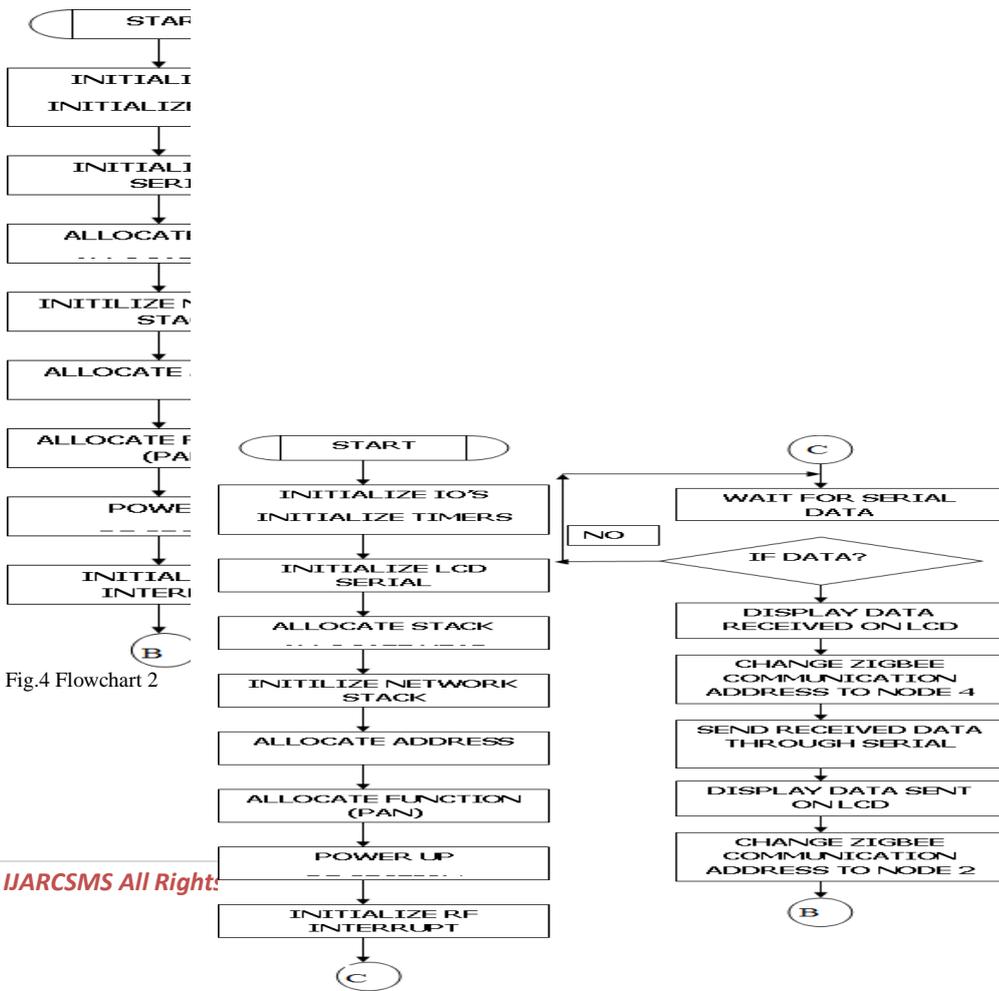


Fig.4 Flowchart 2

Fig.5 Flowchart 3

IV. ADVANTAGES

1. No need to install base stations, easier temporary setup.
2. Well suited to free unlicensed spectrum.
3. Wireless ad-hoc networking is playing a more and more important role in extending the coverage of traditional wireless infrastructure (cellular networks, wireless LAN, etc).
4. Self-creation, self-organization and self administration
5. Simple to configure and install.
6. Work well as a temporary fallback mechanism.
7. Peer to peer network.
8. Increased flexibility and reliability in routing.
9. Better coverage and connectivity

V. APPLICATIONS

1. Military communication and disaster recovery, replacement of fixed infrastructure.
2. Transmission of road and weather condition.
3. Coverage extension.
4. Linking up with the Internet and intranet
5. This system can be used in the field of emergency services – search and rescue operation, etc.
6. This system can be used in education applications such as – University and virtual classroom.

VI. CONCLUSION

In this paper, hardware of Ad-Hoc network sensor node based on embedded technology is implemented. Short distance ZigBee transmission can be achieved with high accuracy and reliability. The system presented has many significant excellences such as networked, wireless, moveable, low power consuming, high accuracy. The developed system has a broad application foreground in the real application field such as military communication, emergency services - disaster recovery and rescue operations when the wired network is not available.

References

1. Implementation of adhoc network terminal based on embedded arm platform xiaosong shen, muqing wu, xuechao lu, yan zhen, jingfang su ,Proceeding of IC-NIDC 2009
2. Zhou lidong and haas zygmont j., "securing ad hoc networks", in iee network magazine, special issue on networking security, vol. 13, no. 6, november/december, (1999), pages 24–30.
3. C. E. Perkins, "Ad Hoc Networking", New York, Addison-Wesley, 2001.
4. C. Perkins, E. Belding-Royer and S. Das, "RFC 3561: Ad hoc On-Demand Distance Vector (AODV) Routing", July 2003.
5. B. David, D. A. Johnson, Hu Yih-Chun, "The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)", July 2004.
6. T. Clausen, P. Jacquet, "RFC3626-Optimized Link State Routing Protocol (OLSR)", Network Working Group, IETF, October 2003.
7. Zhang Siqun, Chen Tiequn School of Mechanical Engineering South China University of Technology. The Design of an Embedded System Based on ARM Microprocessor and Implementation of an IP sharer with IP tables of Linux. 2007 IEEE International Conference on Control and Automation WeC7-5.
8. An Opportunistic Routing Mechanism for Real-time Voice Service in Mobile Ad hoc Networks, Y. Zhen. M.Q. Wu. D.P. Wu. B. Su. X.Y. Li. C.X. Xu, INTERNATIONAL JOURNAL OF COMMUNICATION SYSTEMS.
9. J. Mitola et al., "Cognitive radio: making software radios more personal," IEEE Pers. Commun., vol 6, no. 4, pp. 13-18, Aug. 1999.

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