

Ad-hoc Based Outdoor Positioning System

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Abstract: Ad-hoc is a collection of flexible nodes making it an infrastructure less network, allowing wireless communication between the nodes. Even in the absence of centre authorization in dynamic as well as distributed environment it provides communication among nodes. We propose this method to allow communication between the nodes and the receiver using Ad-hoc network. It is useful for safety purpose of people travelling in groups. While finding a specific route from source to destination, even an intermediate node replies with its cached entry. This module using Ad-hoc thus provides the first hand help to easily track people without getting lost.

Keywords - Ad-hoc, Safety, Nodes, Communication Tracking, Wireless, Network.

Introduction:

As the technology is getting advanced day by day, the usage of wireless networks has increased. Even though devices have become more advanced and smart, they are restricted to cost, small memory, battery and limited CPU (Central Processing Unit). As each node is responsible for reliable operations, it acts as both master and slave. Hence there is no need for administrative node to control the entire network, thus making Ad-hoc an infrastructure less network.

This methodology is feasible than RFID (Radio Frequency Identification) as it has limited coverage range. Ad-hoc is based on open transmission and helps to maintain nodes within the coverage range. As each node acts as the router, end to end connections can be established in this infrastructure less environment. Being a volatile network it provides limited resource to mobile nodes. Thus they are inadequate for performing resource operations.

Ad-hoc network is apparently transparent as it provides the essential trust between the nodes and also influences security and safety features. When the nodes near the coverage range, an alert message is received by the receiver as well as the neighboring nodes. As temperature sensors which can detect extreme temperature ranges are fixed with the nodes. Such incidents like wildfire accidents in Kurugumalai of Theni can be prevented and thus people can be easily tracked.

Existing System:

The GPS (global positioning system) is the existing system for outdoor purpose, which provides more access as long as line

of sight path exist between the GPS satellite signals and receiver. This is not applicable for indoor scenarios as it suffers attenuation by the construction of the wall and multipath reflections. GPS has reduced the capture time, generally too few seconds and also works in normal environment. Passing of signals in solid structures in indoor as well as in dense environment is the major disadvantage of GPS, which consumes more power. Thus it makes GPS unreliable and not feasible in all environment.

Proposed system:

The purpose is to build a safety module based on outdoor positioning system using wireless Ad-hoc networks. This network can work both in indoor as well as outdoor which can transmit messages between the flexible nodes and the receiver. The distance of the person can be located by distance between the nodes along with its particular own path. It provides large coverage area as well as reduced power consumption. Location a person can be solved by using Ad hoc by continuously giving position of the node. It is more reliable and flexible in all types of environment when compared to GPS, so thus Ad-hoc provides node to node communication and has the unique feature of acting as both master slave. If a node cannot directly transmit the information, it will pass the information via the neighboring node, by finding its shortest path using distance vector routing algorithm.

Methodological Approach

The people travelling in group are associated with the number of nodes. The nodes are monitored by the receiver simultaneously the temperature of the surrounding is also monitored. The coverage range is set by the receiver, if the receiver cross the coverage range, an alert message is sent to receiver and also the neighbouring nodes. This methodology helps in tracking people as well as in detecting natural rainfall and wild fire with the help of temperature sensor.

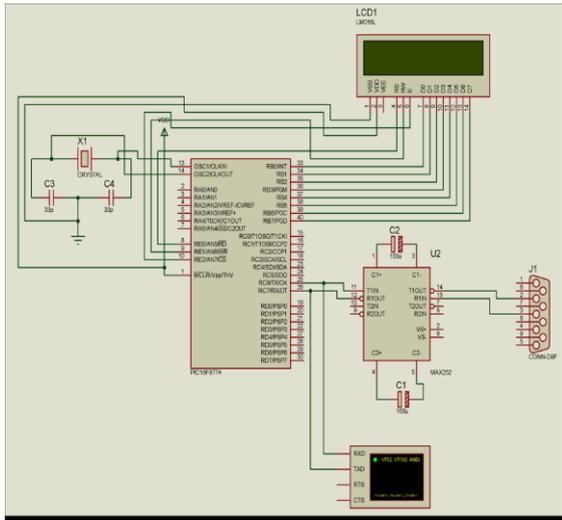


Fig-2: Schematic Diagram

Component

It consists of both hardware and software components used in this module.

HARDWARE COMPONENTS :

Zigbee:

ZigBee is a specification for a suite of high level communication protocols using small, low-power digital radios. One ZigBee network can contain more than 65,000 nodes (active devices). The network they form in cooperation with each other may take the shape of a star, a branching tree or a net (mesh). This is used to transmit information from one node to the receiver. ZigBee protocols are intended for use in embedded applications requiring low data rates and low power consumption.

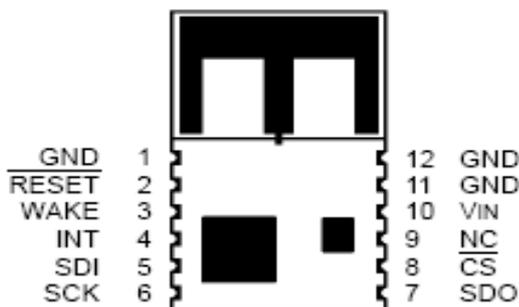


Fig-1: Zigbee pin configuration

Liquid Crystal Display:

In addition, we use 16*2 LCD to display the alert message to other nodes when it is lost. It consists of 16 rows and 2 columns. It consists of eight bits for data and three control lines. The control lines are register select that allows user to send data or else it sends data to be displayed.

Universal Asynchronous Transmitter and Receiver:

A universal asynchronous receiver/transmitter is a type of "asynchronous receiver/transmitter", a piece of computer hardware that translates data between parallel and serial forms. The UART takes bytes of data and transmits the individual bits in a sequential fashion.

Basically uart contributes of two components viz

- Max232 ic.
- Rs232 serial cable.

Power Supply:

A power supply is used as a reference for electrical power. It includes transformer, rectifier, regulator and filter circuits to give constant 5v supply to the controller. Its input voltage is 90vac to 264vac and output voltage is 12vdc. The frequency used here is 47Hz to 63Hz.

Microcontroller:

The A microcontroller is an all in one' processor, the processor, RAM, ROM, IO all on the one chip. Microcontroller is specific purpose device. PIC16F877A- is the microcontroller being used. It has a high performance RISC CPU and CMOS technology is also used here. It has three memory blocks. The program memory has 13 bit program counter capable of addressing 8k word*14 bit program memory space. Similarly, data memory has general purpose register and special function register. Microcontroller is used to control the device.

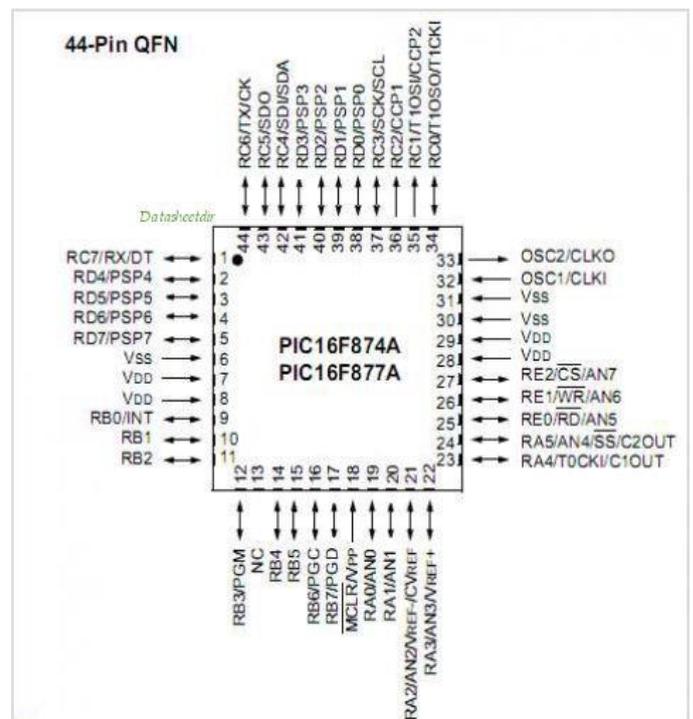


Fig-3: Microcontroller configuration

Temperature Sensor:

This sensor is used to detect the temperature in the surrounding. One temperature sensor is connected to a node that sends the temperature to all other nodes and receiver.

Emergency Button:

In case of emergency, the person can press the button, which in turn sends a message to the neighbouring nodes and the receiver.

Step Down Transformer:

As a step-down unit, the transformer converts high-voltage, low current power into low-voltage, high current power. In this module, the 230 volts ac is converted into 12 volts dc.

SOFTWARE COMPONENTS:

MPLAB Compiler:

MPLAB is an integrated development environment. It is used for developing embedded applications related to PIC microcontrollers. It is used in dumping the embedded C language coding into the microcontroller. Single Lead Heart

Proteus Software:

Proteus software is an application used in windows that is used for drawing schematic, PCB layout, coding and even to simulate the schematic diagram.

Embedded C Language:

The coding is done in embedded C language which are dumped in microprocessors and microcontrollers to perform the specified task

BLOCK DIAGRAM:

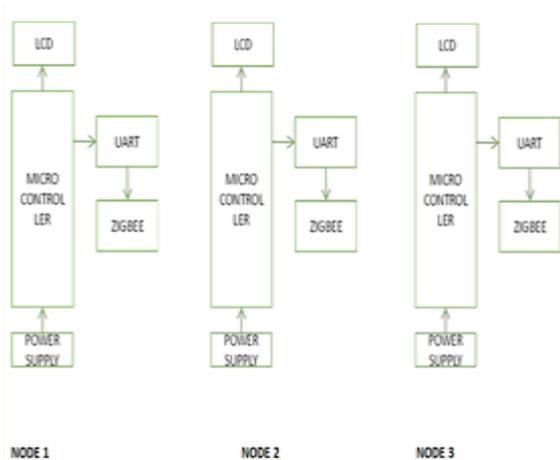


Fig-4: Transmitter unit

RECEIVER DIAGRAM:

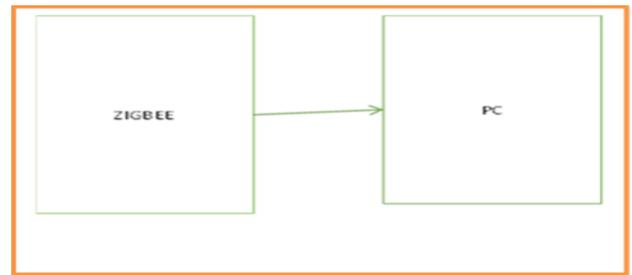


Fig-5: Receiver unit

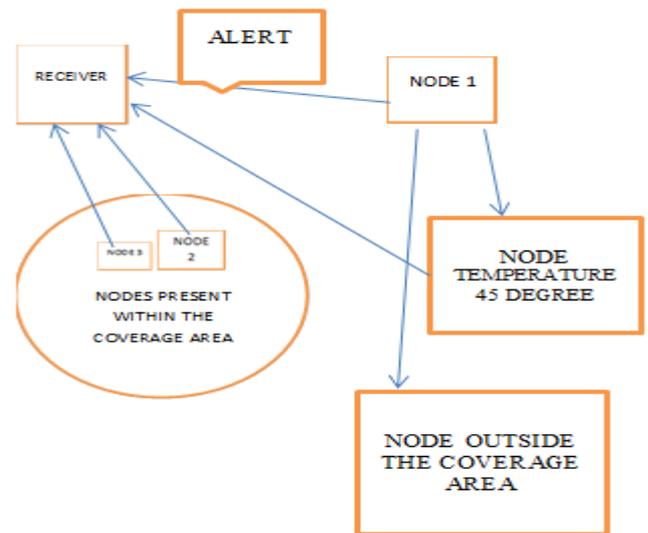


Fig-6: METHODOLOGY DIAGRAM

OUTPUT:

RESULT 1:

This output shows that the truck 2 is out of range and an alert message is sent to receiver and all the nodes. In addition to this, it displays the temperature in the surrounding environment.

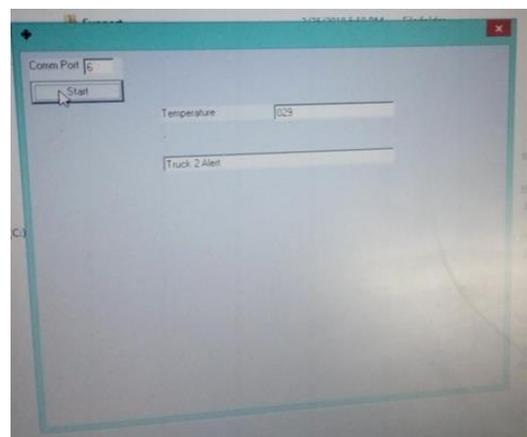


Fig-7: temperature values

RESULT 2:

In this output, it shows that the truck 1 is out of range as it exceeded the limit range. An alert message has been sent to the receiver and all the nodes that truck 1 is out of range. It also display the environment temperature.

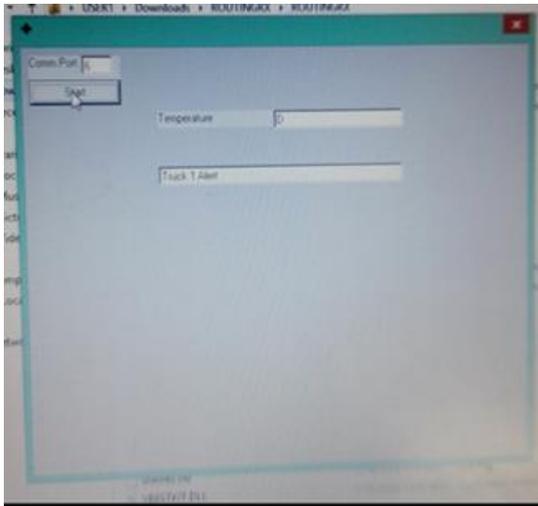


Fig-8: Environment Temperature

References

- [1] S. Kaur A. Gupta “A Review On Different Secure Routing Protocols and Security Attacks In Mobile Ad Hoc Networks” International Journal of Advanced Engineering Technology, vol. 5, pp. 01-05, December 2014.
- [2] S. K. Sarkar, T.G. Basavaraju and C. Puttamadappa “Adhoc Mobile Wireless Network” Auerbach Publication, pp.59-98, New York 2008.
- [3] B. Kannhavong, H. Nakayama, Y. Nemoto, and, “A survey of routing attacks in mobile ad hoc networks”, IEEE Wireless Communications, vol. 14, Issue 5, pp.85-91, 2007
- [4] P. Goyal, V. Parmar, and R Rishi, “MANET, Vulnerabilities, Challenges, Attacks, Application”, IJCEM International Journal of Computational Engineering & Management, vol. 11, 2011
- [5] S. Kapoor and P. Saini “A Survey on Routing Protocols and Attacks in Mobile Adhoc Networks (MANETs)” International Journal of Advanced Research in Computer Science and Software Engineering, vol. 5, pp. 453-460, March 2015.

CONCLUSION

This paper presents the model of ad-hoc network that consists of 3 nodes and explains the communication between them. Temperature sensor is added to a node so that it could detect the surrounding temperature. The highlight of this project is, an emergency button is inserted in circuit that would send alert message to nodes and receiver which will be useful in needy situation for the trekking people.

Future work can be done by using an obstacle sensor to detect objects in the dark environment as well as node-to-node communication can be implemented.

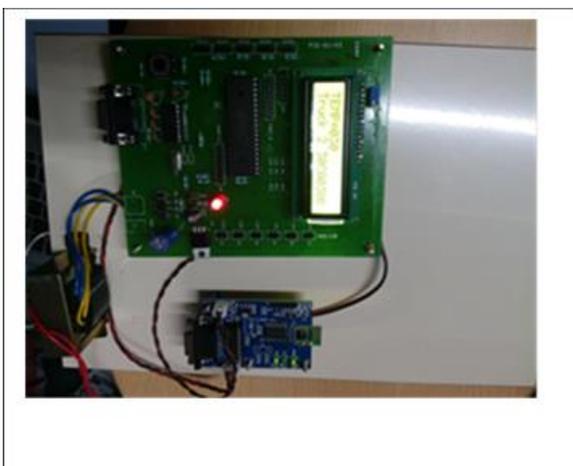


Fig-9: Experimental Hardware module