FAULT NODE DETECTION IN WIRELESS SENSOR NETWORK BASED ON ROUND TRIP DELAY

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ABSTRACT:

The subject matter of this application is to send data from a remote location of a distant main station or a station server from a transmitting device. The transmitting part consists of a microcontroller, the ZigBee module is implemented as a mesh, it is surrounded by a total of three nodes. Continuously every node is transferring the message to the server node, even if anyone node receives an error message will be transmitted from the node and the receiving section the message will be displayed on the LCD with the help of ZigBee and Microcontroller. Wireless sensor networks for (WSN) application due connect with the physical world to the virtual world increases its potential. In addition, progress in microelectronics manufacturing technology reduces the cost of production portable wireless sensors. It tends to distribute the large number of portable wireless sensors in WSNs to increase service quality. Service quality such WSNs is mainly influenced by the failure of sensor nodes. The possibility of sensor node failure increases with the number of increasing sensors. In order to maintain the best Service quality in fault conditions, identification and release of such failures are crucial. A faulty sensor assembly was installed to measure round trip delay (RTD) of the discrete circular back-to-back round trip paths comparison with the threshold value.

KEYWORDS: wireless sensor networks, WSNs, zigbee, portable wireless sensors, Faulty sensor node, round trip delay etc.

I. INTRODUCTION:

Wireless sensor networks (WSNs) have potential applications in a variety of fields, such as monitoring, home security, military operations, medical, environmental and industrial monitoring, with a large number of portable sensor nodes. Due to the rapid development of electronics manufacturing technology, it is possible to create portable sensor nodes at a lower cost with better precision and sensitivity. Therefore, a large number of portable sensor nodes can be deployed in the area to increase the quality of service for such wireless sensor networks. Practicing failures of using a large number of sensor nodes increase the probability of such sensor nodes in WSNs. Based on this kind of node the data analysis is distracted from the wrong or faulty sensor. Ultimately this service has reduced the quality of WSNs. sensor node in WSNs may cause failure reasons for various reasons such as lack of battery, environmental impact, hardware or software defect. Better service quality achieved and discarded such nodes in the analysis from node of faulty sensor. This defective sensor will require efficient and accurate nodes in WSNs to detect. An embedded system is a combination of software and hardware to perform a specific task. The microprocessor is usually sent in the general process simply by providing inputs, process acceptance and output. A wireless sensor network (WSN) consists the spatial distributed autonomous sensor for the home location through the network monitor the physiological or environmental conditions such as temperature, sound, pressure, etc., and to transfer collaborative data to a main location. A microcontroller not only accepts input data but controls the data communication of different devices, controls the data and therefore gives ultimate results.

II. LITERATURE SURVEY:

With the help of Ravindra N Duche and N.P.Sarwade [1] confidence factors, sensor node failure or malfunction described the detection. The confidence factor is calculated further using the round trip delay time on the network. The projected method will identify failure sensor nodes for symmetric network conditions. The confidence factor of round trip path is calculated using the threshold and instantaneous round trip delay time. .

Hussein T. Mouftah[2] has said that a trend to present a survey on the state of art of the cross-layer service quality approach in the wireless terrestrial detector network in order to achieve significant applications delay and reliability detection limits. A unique classification of cross-layer in our articles

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provides the service quality in WSNs to measure a large number of studies with maximum clarity.

Lukman Rosyidi, Hening Pram Pradityo, Dedi Gunawan, Ruki Harwahyu, Riri Fitri Sari [3]ZigBee's network has been used in the popular low-power and low-value wireless data transmission. It is necessary to find node failure to cope with network reliability. Common node failure finding ways area unit supported ZigBee mesh networking capabilities.

Fu Cai, Cui Yong Quan, Han Lan Sheng, Fang Zhi Cun [4] Checking an identity system based on wormhole search prediction based on Projection Pursuit to detect Wormhole. Projection pursuit is a novel statistical method and its basic idea is on high-dimensional project data in the structure and data characteristics shown by low-dimensional works (1-3 dimensional) to find the projector.

Different documents are based on sensor nodes; there are various reasons that node failures and techniques used to detect failed nodes. Fault search is the study of documents. The simplest method is to select an existing system to avoid such problems that review an existing system. Some sensors nodes based on round trip delay and paths in WSNs.Data security is a major concern for all communication systems. The information is required to be sent without damages to remote place are studied.

III. RESEARCH METHODOLOGY:

Wireless sensor networks (WSNs) with Portable sensor nodes are a large number of potential applications such as surveillance, security, military operations, and medical, environmental and industrial inspection fields. Due to the rapid enhancement of electronic production technology it is possible to produce the cost of portable sensor node with good accuracy and sensitivity. Therefore, large portable sensor nodes can be used in the area to maximize the quality of such wireless sensor network service. Practice increases such sensor node errors in such WSNs, sensor nodes are used extensively. Such faulty sensor nodes based data analysis is wrong or different from the mean value. This will eventually degrade WSNs service quality. WSNs may be corrupted by sensor nodes such as battery failure, environmental impact, hardware or software errors for various reasons. Such faulty sensor node data rejection in analysis has achieved a good quality service. These WSNs require efficient and accurate detection of faulty sensor nodes. The faulty sensor node is used in different ways to measure Round Trip Delay (RTD) time of discrete round trip paths in the form of comparison with threshold value First, the proposed method of WSNs is the experiment of six sensor nodes that have been designed in microcontroller and ZigBee.

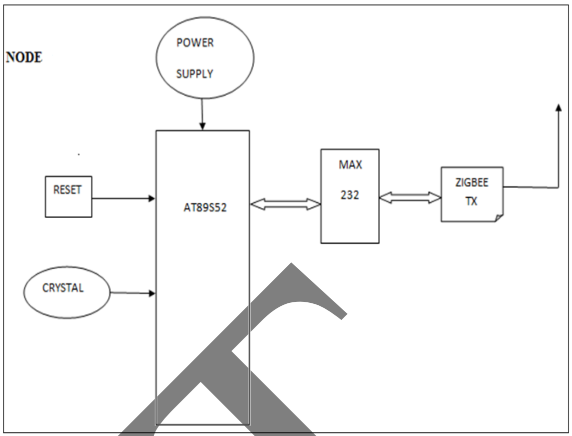

Fig.1: BLOCK DIAGRAM OF TRANSMITTER SECTION

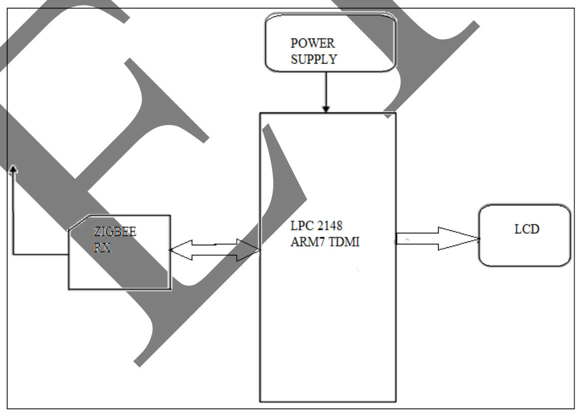

Fig.2: BLOCK DIAGRAM OF RECEIVER SECTION

This project has been built around MCU. Here, we use ZigBee sensor. The detection method proposed is based on RTD time measurement RTP. RTD timing discrete RTP determines failure or failure sensor node, compared to a range of time. First of all, this method is tested on three wireless sensor nodes that are applied on a microcontroller and applied using Zigbee, are validated. The normalized model is that detection of WSN's error determines timing analysis, different RTPs usage has been proposed. Analysis time in detection of failure in all cases is determined with the help of a normalized model. Implementation of the overall design is divided into two separate classes. This transfers data from isolated place to the main station or server station from a remote location to the transmitter section. The transmitter section is composed of a microcontroller and a ZigBee module, surrounded by a total of three nodes. Here, even if one of the nodes fails, the message is transmitted to another node, each node is continuously forwarded message to the server node.

In the receiver section, message is displayed on LCD with the help of ZigBee and microcontroller. LPC2148 is based on a128/512 KB embedded high

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speed flash memory to support 16 and 32-bit ARM7TDMI CPUs and real-time simulation.

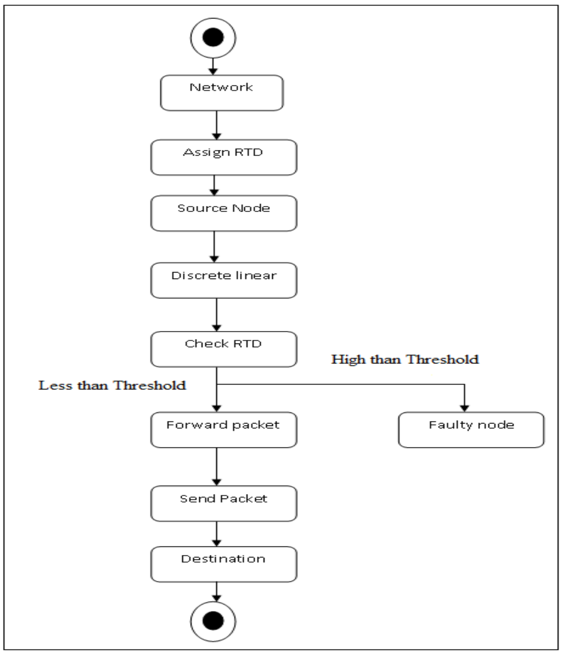

Fig.3: ACTIVITY DIAGRAM

IV. PERFORMANCE ANALYSIS:

The detection method proposed is based on RTD time measurement RTP. RTD timing discrete RTP determines failure or failure sensor node, compared to a range of time or threshold value. Firstly, this method of testing a implementation microcontroller and Zigbee, they are made for the six wireless sensor nodes that are valid. In order to verify this concept of scalability, WSN has been developed with a large number of sensor nodes simulated in open source softwareNS2. A placed model is suggested for fault identification analysis using various RTP. Various experiments are ongoing in public time-based hardware and software. Analysis time of fault detection is done with the help of a generalized model in all cases. Analysis of hardware and software results indicates that RTD time measurement in both cases is fairly similar, validating the real-time applicability of this method

A. ROUND TRIP DELAY AND PATHS ANALYSIS:

The RTP return delay time changes due to faulty sensor node. The fault sensor node is detected by comparing the RTD time of RTP with a threshold value. The RTP-specific common sensor node with infinite RTD time is detected as failed. If this time is greater than the threshold value, this sensor node is detected as a malfunction. The forward and return path in WSN consists of a minimum of three sensor nodes. Therefore, the minimum delay time of RTP with three sensor nodes is given by,

$$\tau RTD=\tau 1+\tau 2+\tau 3 \qquad (1)$$

Where τ1, τ2 and τ3 are the delays for sensor node pairs (1,2), (2,3) and (3,1) respectively. Round trip delay time for RTP with uniform sensor node pair delay is attained by referring equation (1) as

$$\tau RTD = 3\tau. \qquad (2)$$

This is the minimum RTD time of an RTP in WSNs. Hence the efficiency of proposed method can be enhanced only by decreasing the RTPs in WSNs.

B. EXPERIMENTAL ANALYSIS:

1. HARDWARE IMPLEMENTATION:

The subject application is the transmission of data that is from transmitter section to the main station or server station which is remote location. The transmitter section consists of microcontrollers and ZigBee modules are made as a mesh and are surrounded by a total of three nodes. Continuously every node transfers the message to the server node even if any node receives an error message is transmitted from another node and the receiver understand the message is displayed on the display with the help of ZigBee and microcontrollers.

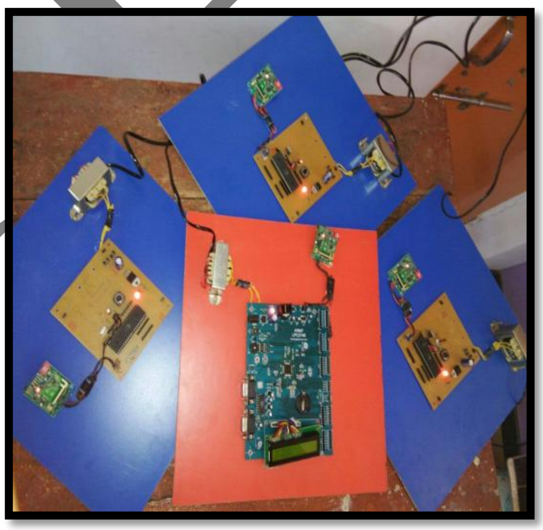

Fig.4: WSNS IMPLEMENTED IN HARDWARE WITH THREE SENSOR NODES

a) THRESHOLD RTD TIME DETECTION:

Initially all sensor nodes in WSN are assumed to be flawless (running). The WSN is simulated in real time to determine the RTT time of all linear RTP. By way of reference, the linear RTP numbers for WSN with three sensor nodes are equal to three. The RTD time depends on several WSN factors. Sometimes due to an inadequate selection limit value, the normal work of the sensor node can be detected as faulty. The proper choice of the RTD time threshold is essential for detecting the correct defective sensor node in WSNs. For this reason, the highest value of the RTD times is selected as the

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threshold value. In this method some RTPs are sufficient to obtain the required effect, thus reducing the total time of analysis.

b)EVALUATION OF EXACT RTD TIME IN HARDWARE IMPLEMENTATION

The inherent delays in the case of hardware implementation are mainly due to two hardware devices. The first delay is associated with the microcontroller and the second is due to the use of the Zigbee device for wireless communication. This processing delay in the microcontroller is about 0.403s and Zigbee is about 0.720s. So the inherent delay in each wireless sensor node is about 1.123s. Since in each RTP three nodes are used in analyzed method sensors, the total delay caused by hardware in the forward and backward trajectory will be three times the delay sensor node, namely 3 * 1.123 = 3,369s. So the inherent delay at the time of RTD is 3,369s. This inherent delay can be minimized by adjusting the delay associated with microcontrollers and Zigbee devices. The exact RTD time required in the fault detection is obtained by deducting the delay inherent in the practically measured delay.

2. SOFTWARE ANALYSIS:

Circular topology WSNs having different (N) sensor nodes are carry out using the NS2 open source software. In the method we projected round trip paths are formed by combining the three adjacent sensor nodes. Protocol RTD was developed and implemented to measure the RTD time of said RTP.

a) IMPLEMENTATION OF RTD PROTOCOL IN NS2:

In this protocol, RTP is formed between the successive sensor three nodes in the WSN circular topology. Routing RTP packets between the RTP sensor nodes. Forwarding and destination senor nodes, is routed through a source distribution in the routing table, the round trip delay. The WSN circular topology sensor nodes having eight (N = 8) and applied NS2 simulation are shown in Fig. 4.3. Circular topology sensor nodes located at a distance of one foot.

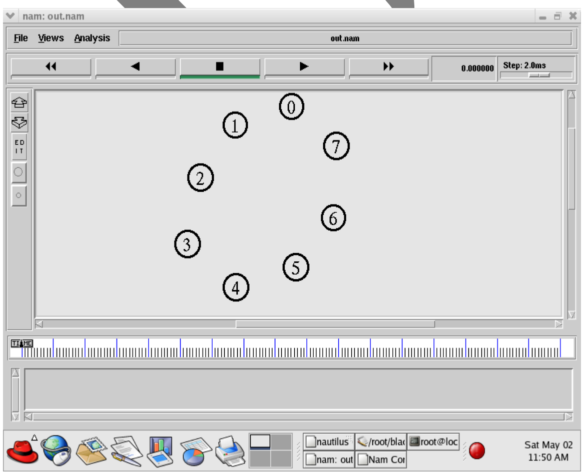

Fig. 4.3: WSNS WITH EIGHT SENSOR NODES SIMULATED IN NS2

b) THRESHOLD RTD TIME ESTIMATION:

Appropriate threshold RTD time is determined by modelling of various WSNs. It was calculated by considering the original sensor nodes in each WSN being working properly. Norm.tcl image with different number of sensor nodes such as 6, 8, 10, 20, 30, 40, 50 and 100, separately modeled using the RST protocol. RTD results for discrete RTP, modelling in a WSN for NS2 sensor nodes 10, 20, 40, 50 and 100 are shown in Figure 12. If the average time interval for the delay time in both directions was found Is 14 to 22 ms, and as long as the RST value is 22 ms. As a result, the RTP time value RTD value is chosen as 22 ms (ie, τT HR = 22 ms).

c) DETECTION OF FAULTY SENSOR:

Individual sensor nodes of RTP discrete node in WSN incorrectly declared for inspection and verification of the proposed method. Faulty sensor may be faulty or defective; therefore, two cases should be considered separately. Finding node is defective (dead) sensor assembly makes one node as in step tcl advertisement dead. Similarly, the behaviour of malfunction is detected by a sensor node delays the unique RTP. Two tcl file, named as dead.tcl and mal.tcl each wireless sensor network, a test failure (dead) and the faulty behaviour of simulated sensor node respectively. The value is infinity (∞) RTD NS2 simulation time represented by the phrase "-0.2" TCL stage. As a result, the '-0.2' present in all the results of simulation software for an unlimited time IDT.

V. CONCLUSION:

Data security is a prime concern for all communication systems. The information should be sent without loss to remote communication place. This is done through ZigBee technology. The proposed method has been successfully implemented and hardware and software tested. RTD is the discrete time comparison of RTPS sufficient to detect the faulty sensor node. The efficiency is excellent method for discrete RTPS in addition to three sensor nodes. Real-time applicability of research method certified by the results of hardware and software.

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