IMPLEMENTATION OF RECEIVED SIGNAL STRENGTH BASED DYNAMIC TRANSMISSION POWER CONTROL ALGORITHMS FOR WSN

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ABSTRACT

Node localization is one of the basic problems in wireless sensor networks. Because the RF signal is affected by the environment, the exact distance between the nodes can obtain by RSSI measurement. we perform some measurements to estimate the power consumption of the XBee-Pro S2B module which supports ZigBee protocol. We measure the power consumption in different operational modes for coordinator, router and end device. The improved RSSI measurement can improve the accuracy of the unknown nodes localization further correct the measurement data, which can reduce the measurement error. The above methods can effectively reduce the measurement error.

I.INTRODUCTION

A wireless sensor network (WSN) is a special ad-hoc, multi-hop and self-organizing network that consists of a huge number of nodes deployed in a wide area in order to monitor the phenomena of interest. They can be useful for medical, environmental, scientific and military applications.

WSNs mainly consist of sensor nodes or motes responsible for sensing a phenomenon and base nodes which are responsible for managing the network and collecting data from remote nodes. However, the design of the sensor network is influenced by many factors including scalability, operation system, fault tolerance, sensor network topology, hardware constraints, transmission media and power consumption. XBee is a device that supports full functionality of ZigBee protocol with many features such as different transmit power levels and encryption capability. Generally, the transceiver in sensor nodes drains much more current from the battery than the microprocessor in active mode, where the ratio between the energy needed for transmitting and for processing a bit of information is usually assumed to be much larger than one (more than one hundred or one thousand in most commercial platforms). Thus for a successful deployment of wireless sensor networks, basic parameters such as radio performance (received signal strength, coverage range and link failure probability), packet delay and throughput should be evaluated.

II.CELLULAR NETWORK

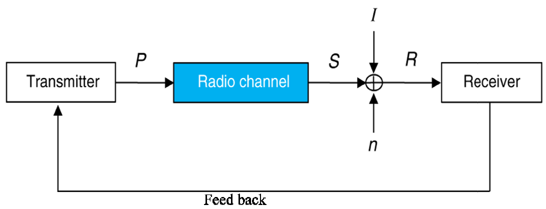
A cellular network or mobile network is a communications network where the last link is wireless. The network is distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site base station. In a cellular network, each cell uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed bandwidth within each cell.

When joined together these cells provide radio coverage over a wide geographic area. This enables a large number of portable transceivers (e.g., mobile phones, pagers, etc.) To communicate with each other and with fixed transceivers and telephones anywhere in the network, via base stations, even if some of the transceivers are moving through more than one cell during transmission

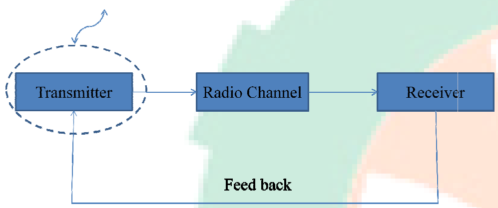
(Top Of Cellular Radio Tower)

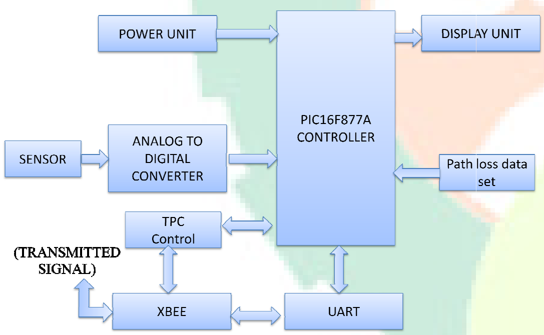
III.BLOCK DIAGRAM TRANSMITTER SECTION

With Fixed Node,

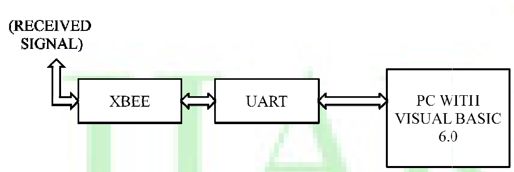


With moving node,





RECEIVER SECTION



IV.DESIGN METHODOLOGY

Our proposed method to reducing the power consumption of the communication interface. One standard approach for reducing power consumption involves lowering the transmit power to the minimum level that still achieves correct reception of a packet despite intervening path loss and fading. Adopting this minimization approach, we describe an implementation of transmit power control for 802.15.4b wireless networks. Both for, Fixed node & Movable node by finding the change, we can control the transmit power. While the mobile users may in fixed or movable at the time there should be handoff will occure .To prevent from that we design this methodology. Where the mobile user is in movable means, if there may call has disconnect at the time we measure the distance between user and base station. By using this distance we calculate the received signal strength accordance with RSSI algorithm. Based on this distance signal strength will increased. If there is short distance means lower signal strength is enough for good communication. But in existing there is high signal strength is used, due to this power consumption will reduced. So that here the signal strength will adjust accordance with it's distance.

FREQUENCY(Mhz)	CELL RADIUS(Km)	CELL AREA(Km^2)	RELATIVE CELL COUNT
450	48.9	7521	1
950	26.9	2269	3.3
1800	14.0	618	12.2
2100	12.0	449	16.2

(Coverage Comparison Of Different Frequencies)

A.COVERAGE RANGE TEST

We are interested in measuring the RSSI level when the distance changes between two nodes. Therefore, we measure the change in the level of RSSI in relation to the change in distance between the nodes. This measurement is implemented for the various transmit powers of the remote node and constant transmit power of coordinator.

B.RSSI BASED TRANSMISSION POWER CONTROL ALGORITHMS

In location based Transmission Power Control (TPC) algorithms, it is observed that the distance information is derived from the Received Signal Strength Index (RSSI). Hence, TPC algorithms can be implemented efficiently using RSSI values directly. RSSI based TPC algorithms utilize the currently observed RSSI value of a received packet as the primary input along with additional inputs such as transmission power of the source node (Ptsrc) and Link Quality Index (LQI) for deciding the required transmission power (Ptreq).

C.RSSI CALCULATION

$$RSSI = -(10*n*\log10(d) + A)$$

Where,

RSSI is the RSSI value received (dBm)

n is the path-loss exponent

d is the distance

A is the RSSI value at a reference distance

D.PATH LOSS EXPONENT

The path loss exponent has to be determined experimentally. The path loss variable ranges from around 2 to 4, where 2 is the free-space value (no obstruction, line of sight) and 4 represents a very lossy environment.

N	Environment
2.0	Free space
1.6 to 1.8	Inside a building, line of sight [2]
1.8	Grocery store [2]
1.8	Paper/cereal factory building [2]
2.09	A typical 15 m × 7.6 m conference room with table and chairs [3]
2.2	Retail store [2]
2 to 3	Inside a factory, no line of sight [2]
2.8	Indoor residential [4]
2.7 to 4.3	Inside a typical office building, no line of sight [1]

E.POWER LOSS MODEL

The path loss of a wireless link can be represented by the difference between the transmit power ptx and receive power prx(Path loss = ptx – prx) In this expression, we are grouping a variety of effects, including multipath fading, shadowing, and path loss, under the general term "path loss" which reducing the transmitted power down to the received signal strength.

F.XBEE-PRO S2B ZIGBEE COVERAGE RANGE AND POWER CONSUMPTION

The results of our measurements show that ZigBee and XBee modules are reliable in the presence of various obstacles in both fixed and movable scenarios. In movable measurement the maximum, line of sight, range of XBee-Pro S2B at power level 0 is 160m. This can be due to many factors which cause signal outage propagation, such as trees and the presence of obstacles. This can be a problem for designing a WSN which can be avoided by rising the transmit power of module to P4 then the distance will become 220m. On the other hand, applications such as those for monitoring agriculture fields may use XBee modules at power level P0 in case the modules are placed on a level higher than the plants and hence faces less obstacles. For fixed nodes, the discussion follows the same track as the movable case where the maximum, non-line of sight, range at transmit power level 0 is 35m and at level 4 is 44m.On the other hand, we can see that the difference in power consumption between every two consecutive levels is not large, through it can have an influence on the network life time in the case of P0 and P4. Thus we can conclude that the transmit power of

XBee-Pro S2B can be reduced in an environment with less obstacles, then the power consumption of the node can be reduces

IV.CONCLUSION

In this work, we intensively studied different architectural aspects and requirements for designing WSNs. Later we investigated different technologies and protocols of WSNs Including a comprehensive study of RSSI capabilities, an analysis of the power consumption of XBee modules as well as a comparison with other wireless devices.In this paper, we have analyzed the RSSI model for location estimation in sensor networks.

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