Wireless Sensor Networks
Gang of Three

Report
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May 11, 2018

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Chapter 1: Introduction

1.1 Scenario

1.1.1 Source: Node A

Source node A will be transmitting at a periodic transmission rate. Different levels of power consumption will be determined by the chosen protocol, but, in any case, the power consumption will be considered, over a period of one second, constant. The less power consumption of node A will give longer individual lifetime and runtime for the runner, but low signal strength of node A might not give a lowest possible system power consumption. Depending on the needed quality of the received package, e.g. -3db, a cut of distance will be calculated and measured. Distance measuring will be limited by interference providing a need for a scalable transfer function estimate and an average over multiple measurements. Life time of node A will be considered when half of the battery capacity is used.

1.1.2 Sink and Source: North and South Station

Idle time, receiving and transmitting power consumption will be calculated and measure. When out of range the "pole" stations will go to an idle state to save power. When in transmitting mode different measurements will be conducted depending on the chosen protocol. E.g. firm or no handshakes between pole station and base station will be measured leading to different possible distances between jumps.

1.1.3 Sink: Base Station

The required detail of information needed to give a good user estimate will raise the question of acceptable package loss. Signal strength, package frequency, package loss vs reliability from both pole stations and source will determine the power consumption of the base station and the system. The base station will never be in idle state and it must be able to reach pole station resulting in the highest cost function of the system.

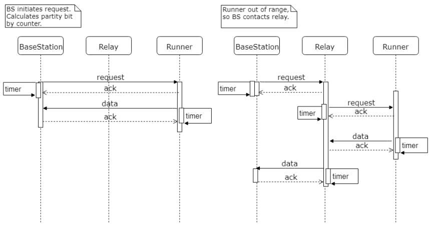
1.1.4 Test Scenario

On the datasheet of the TelosB, the current draw when on receive mode is stated to be $23mA$. However since the transmit power is not given in the datasheet, testing is needed to gain further knowledge of how much power is used when sending and receiving data between nodes. The test data will be used to conduct different scenarios of the main scenario in which the end result will be the lifetime of the WSN and the minimum power consumption of the WSN. The conclusion will then be used together with the conclusion of the signal strength testing, to conduct the best scenarios for when to hop or not to hop.

Chapter 2: Theory

2.1 Protocol

bla bla Protocol



Chapter 3: Implementaition

3.1 Basestation

3.2 Relay

3.3 Runner

The runner nodes task in our wireless sensor network is to respond to RequestMessages that can be sent from basetation or the relay nodes. As seen in the sequence digram shown in figure 2.1. The data it respond with is the pluse from the runner and in this scenario we just return a constant value. We

3.4 Energy Lab

Chapter 4: Test and Performance

4.1 Setup

Scenario	Channel	RSSI	Length of track
1	11	-40	43.5
2	11	-40	56
3	4	-40	43.5
4	4	-40	56

Table 4.1: Four test scenarios using channel 11/4 and different track length.

Chapter 5: Results

Using the test setup and mechanics described in 4, we conducted a experiment of four different scenarios. We wanted to see whether the hopping frequency would increase, when we increased the circumference of the track, evaluate the package sent/loss ratio and measure the overall perception of data. The test results would indicate if our hopping algorithm, the implemented stop-and-wait ARQ protocol and distance measurements were correct and working. All results are gathered from the base station.

To quickly examine the parameters measured in the test runs:

***n* request packages sent (p_1):** Number of packages sent from the base station over the course of the test. These include retries due to ARQ timers expiring. View this number as "the times we have asked for data".

***n* packages relayed (p_2):** Number of packages relayed to each relay station. Packages are relayed when running is out of range.

***n* ACK's received (p_3):** Number of acknowledgments received by the ARQ protocol. The closer this number is to the packages sent, the more stable the data link connection between our endpoints is.

***n* DAT's received (p_4):** Number of data packages received. Ideally, this should be close to the packages sent as well. If $p_4 < p_1$, then p_1-p_4 requests are presumably lost.

***n* packages not acknowledged in time (p_5):** Number of packages not acknowledged before the ARQ timer ran out. This is strongly related to the timers on the base station and heavily influenced by interference and signal noise. Also in our test set-up we tried to get as much data from the runner as possible, so timers were strict.

// n packeges sent vs. ACK's received // n packages sent vs. DAT's received. // n packages relayed for each scenario (node 1 or 2 or total) // n packages not ACK in time

Chapter 6: Discussion

Chapter 7: Conclusion

Chapter 8: Perspective