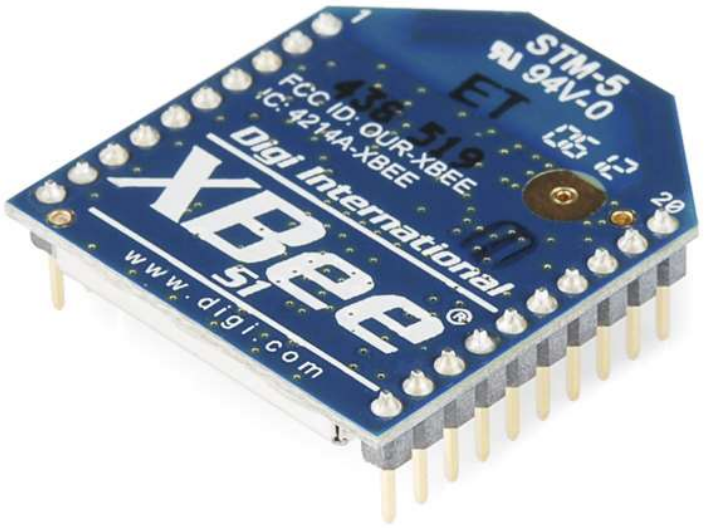
Xbee Interference Guide



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Interference? What Interference?

Covered in this section

Outlined in this document is the information gathered on the interference of other radio systems on the communication between your robot and the beacon your robot will navigate to. This guide only reports on data gathered while testing the beacon and should not be referred to for the actual construction of a beacon and black box.

The Problem

A Quick Review

To review the contents of the Beacon System Guide, the beacon is mainly composed of a compass and a radio frequency transmitter (the Xbee). The beacon sends out a signal of a certain strength to a certain address on a certain channel. The receiver configured with that address and on the same channel receives a packet of data with corresponding signals and headings. Following this the receiver parses through the packet and extracts the strongest signal from the packet along with the associated heading.

A Potential Problem

As previously discussed, the transmitter (beacon) sends out a packet of data to a certain address on a certain channel. Now, a potential problem that could arise and the basis for this document is if the beacon's signal is interfered with by another signal from another set of devices communicating through radio frequencies. If this were the case, the robot that you are working on may read in the data projected by the second system which would interfere with the robot's functions.

Experiment

Setup

To see what kind of interference could be expected from a second radio system, a test was conducted using the beacon, the black box receiver, and a second set of xbees/fios. The second set of xbees/fios were loaded onto XCTU where one was calibrated to be a transmitter and the other a receiver. To start communication, a single frame holding a string was created in the transmitter (in XCTU) and transmitted infinitely.

Test

Two tests were conducted to replicate two situations in which interference could be a problem: 1. When the second set is communicating on the same channel as the beacon (C) but with different address (7890 instead of 1234) 2. When the second set is communicating on a different channel (D) and address (7890 instead of 1234). Before beginning the tests, it was noted that the black box would display 0 if it read the signal form the second set of xbees/fios.

In both tests, the second set of communicating xbees/fios were placed 50 feet from the beacon's position. After turning on the beacon, readings from the black box were observed at distances of 10 feet, 25 feet, 50 feet, 60 feet, 80 feet, and 100 feet. For each distance, readings were observed for 2 minutes and instances when the black box displayed zero were recorded which can be seen in the Table 1.

Results and Discussion

Distances [ft]	Same Channel, Different Address [#]	Different Channel, Different Address [#]
10	0	0
25	1	0
50	'Every Reading'	0
60	10	0
80	3	0
100	2	0

Table 1: Number of Instances of Interference per Distance

As can be seen in the table, the affect the channel has over which a second set of xbees/fios is communicating is significant. However, it should be noted that the results shown when the channels are the same are constrained to a straight path between the beacon, the second set of xbees/fios, and beyond. In addition, it can be seen that as the black box's position is placed further from the interference system, fewer instances of interference are observed.

Conclusions and Recommendations

After conducting the tests previously mentioned, there is a clear advantage to communicating over a different channel than on the same channel as the beacon. If you are a team building a robot which has the capability to communicate with some other device other than the beacon, then it would be best to make sure that the two are communicating over a channel that differs to the beacon's.