Intelligent Automation Incorporated

Coherent distributed radar for high-resolution through-wall imaging

Progress Report 24

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1   Work performed this reporting period

1.1   Technical work performed in this reporting period

1.1.1   Radar imaging with synchronized Master and Slave nodes

In this performance period, we have processed data for radar imaging. Data were taken near two buildings 15400 Calhoun Drive. Both data sets were processed using a coherent back projection algorithm. We show one of the outdoor testing scenarios in Figure 1. The other scenario is similar, but taken near the next building over.

Figure 1. Outdoor testing scenario 1.

We show the back projection imaging results in Figure 2 below. We suspect the bright features in the images correspond to the reflection of the nearby building. We are confirming this suspicion with additional experiments at different distances from the building.
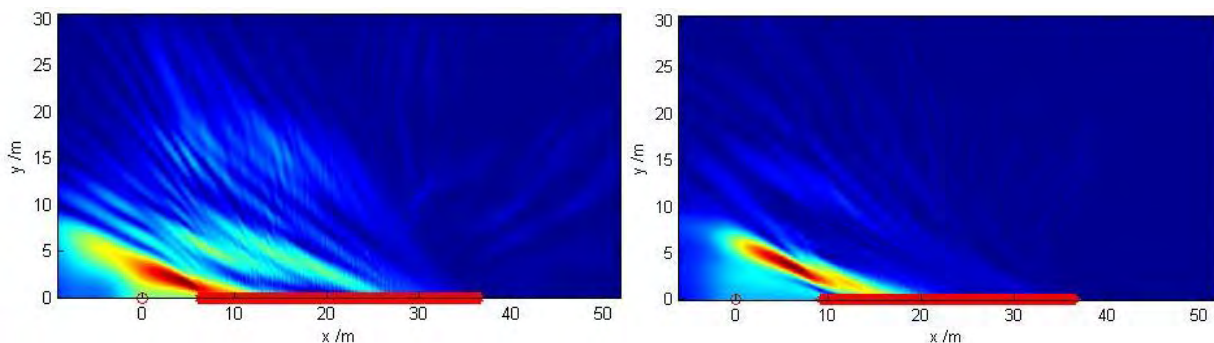

Figure 2. Back projection images for scenarios 1 and 2.

We will also perform radar imaging for a scenario with a human intruder. Initially the intruder will be outside, and near the LOS. We will detect and locate the intruder by image change detection over the course of the experiment. Next, we will try the same with a moving intruder inside the building.

In this reporting period, we have also implemented the beamforming algorithm, and tested it outdoors. We are still analyzing the results, but it appears to correctly point in the direction of the slave, as the direction to the slave changes as the master moves around.

We have also studied the performance of different ranging algorithms for both outdoor and indoor tests. For short range (~200ft) outdoor experiments, we obtain ~60cm accuracy. For indoor experiments, we obtain ~1m accuracy in corridors, and about 6m accuracy for NLOS ranges in an office environment. We show a representative result for a corridor test in Figure 3, below.
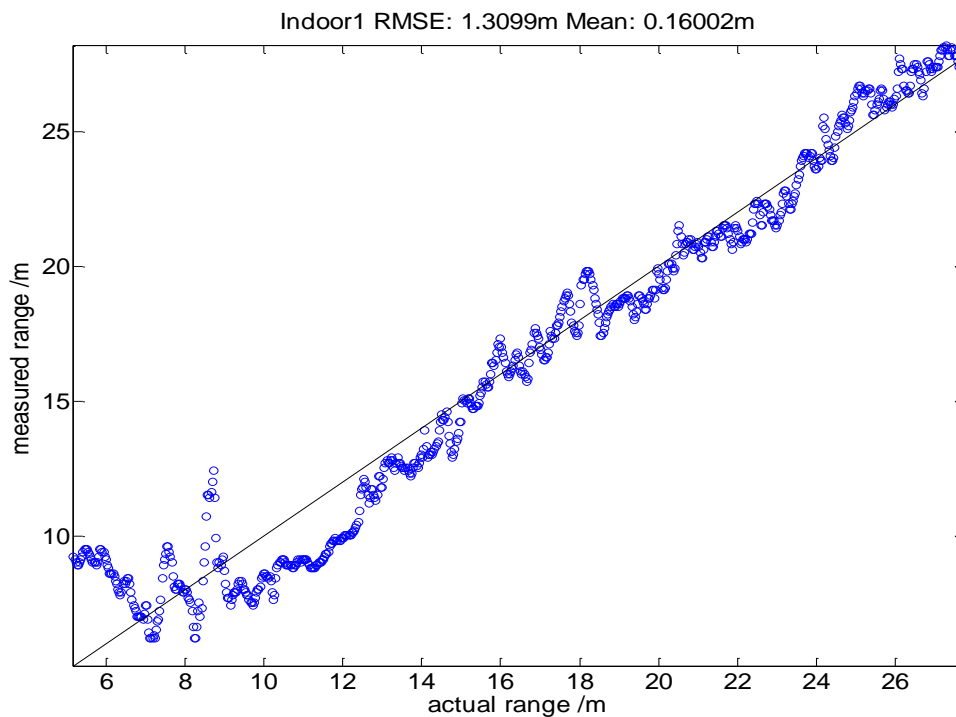
Figure 3. Indoor ranging experiment, office corridor.

In the next reporting period we are continuing to take data, develop imaging, ranging, and localization algorithms, and prepare for the final demonstration.