

STA 250 2014 Winter Project

In this webpage we visualize the RSSI data presented at [crawdad](#). The dataset consists of RSSI data measured at 179 locations among which we discard 2 locations where the data is incomplete. At each location, RSSI is measured with an omni-directional antenna at four directions (up, down, left and right). On each direction, the measurement takes place during the transmitting of around 500 packets. In the first figure, we plot the floor plan along with the locations of measurements and base stations. We evaluate the mean and standard deviation of RSSI at each of the 177 locations on each of the 4 directions for each of the 5 base stations. As a result, we get 177 RSSI data records corresponding to each location of dimension $4 \times 5 \times 2 = 40$. Assuming that for a given location, the RSSIs on each direction for each BS follow independent Gaussian distribution. Based on this assumption, we evaluate the [Bhattacharyya distance](#) between the each pair of the 177 RSSI data records, and then use multidimensional scaling (MDS) to reduce the dimension of RSSI record space from 40 to 2. The results are plotted in figure 2. You can move your mouse over each location on [Figure 1](#) or each MDS point on [Figure 2](#) to highlight it and its counterpart in the other figure. We also compute the hierarchical clustering of the RSSI data. By clicking the two buttons below different clusters will be filled with different colors in both figures.

The original .txt file are converted to .csv file with libreoffice, then we use R to import the data and manually plot [Figure 1](#) as .svg file and annotate it with the mean and standard deviation data with the XML package (plotSVG.R). Then [Figure 1](#) is imported into R with [XML package](#) and the mds is performed with the classical multidimensional scaling function `cmdscale()`, then [Figure 2](#) is plotted as .svg file manually with the XML package. Note that other MDS method implemented in R are listed [here](#). Later on, both .svg files are annotated manually using XML package (`annotateMDS_RSSI.R`) to enable interactive visualization and copied into this file. Since [Figure 1](#) has multiple groups of elements ("layers"), we manually add javascript code to enable the interactive visualization instead of using function `linkPlots()` in the [SVGAnnotation package](#) in order to have more low-level control.

Cluster Uncluster

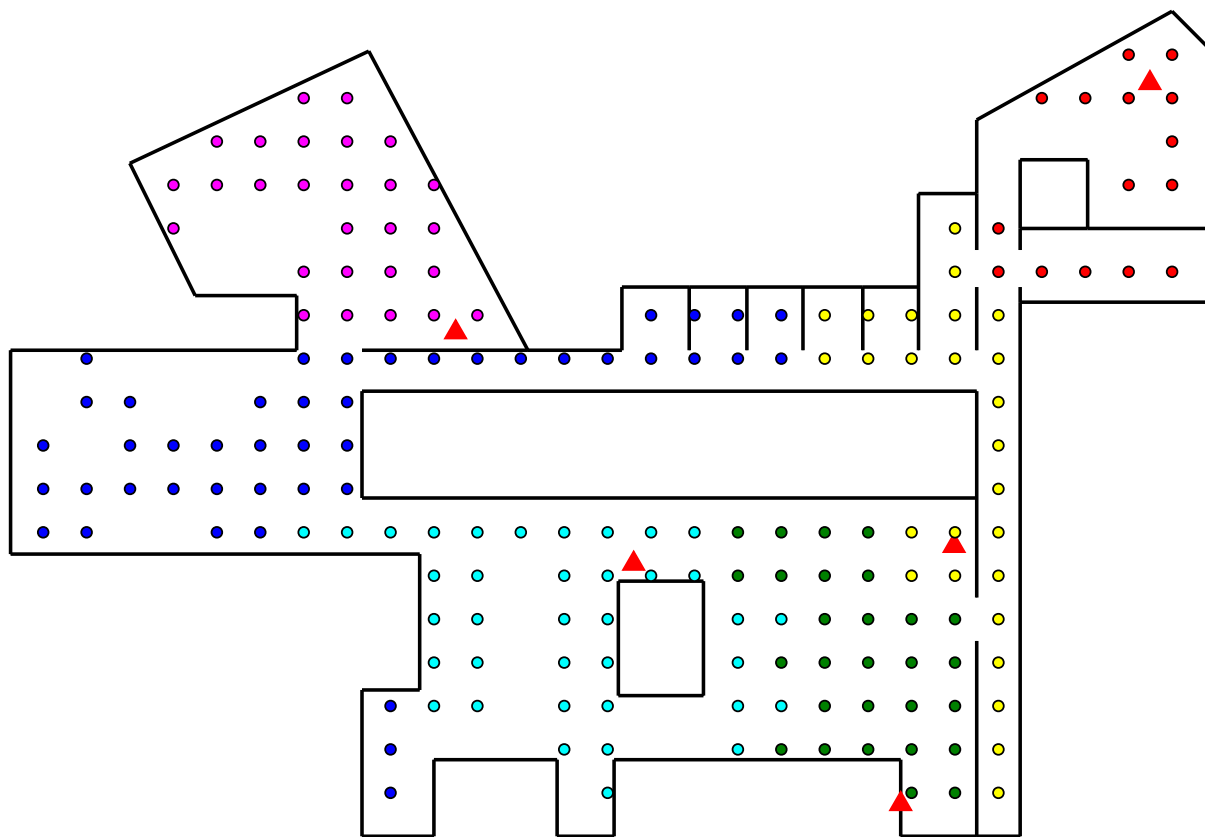


Figure 1. Floor plan, location of measurements and location of BSs.

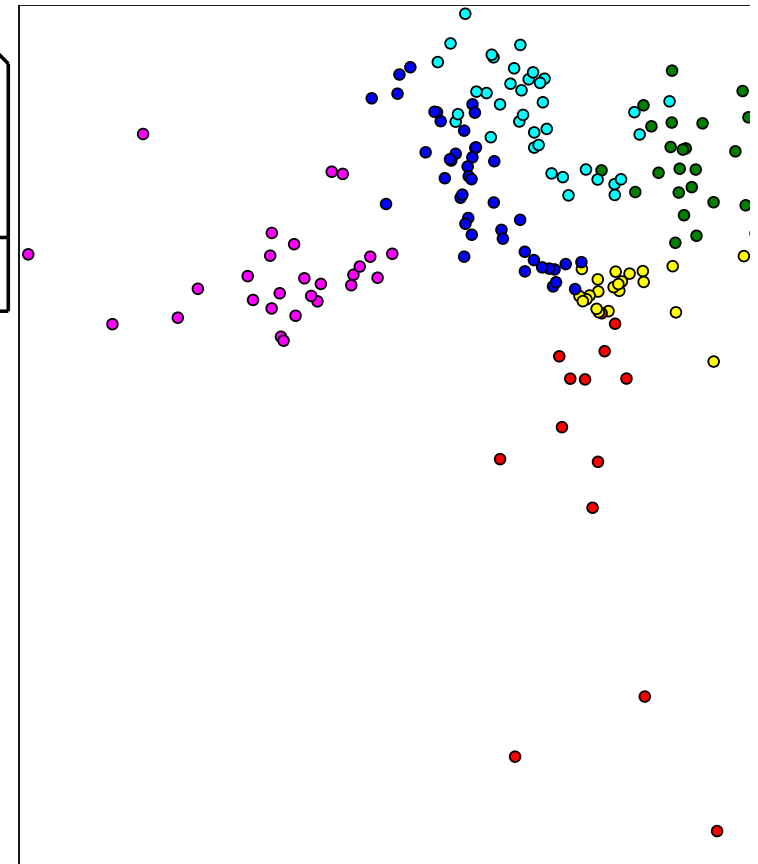


Figure 2. Multidimensional scaling of the RSSI data based on BI