Title
Utility Function for the Sensor Selection Problem in Localization Applications (SYS 22)

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Sensor selection for localization application

- Sensor Selection
  - Increase efficiency of the sensor network by reduced resource consumption
  - Depends heavily on sensing application and utility metric
- Utility function

  The utility function must capture the essence of the sensing application such as the model of the environment, the signature of the source and the estimation/detection/data fusion algorithm that will be used to operate on the sensed data.

- Two Classes of Utility Function
  - Sub modular: can be formulated as linear programming problem and the greedy algorithm can provide a good solution
  - Super modular: difficult to solve

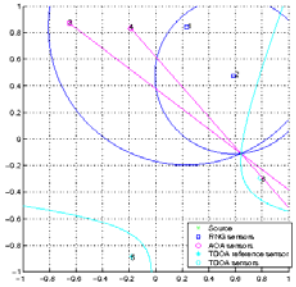
Localization application sensor selection

Model Considered

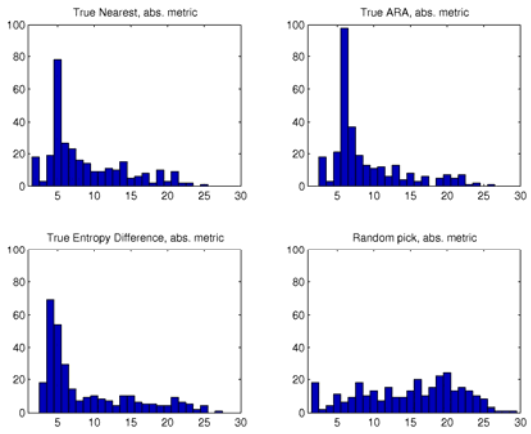
- **Mixture of Range (RNG) and Angle of Arrival (AOA) sensors**
- **Using the trace of Fisher Information Matrix (FIM) as utility function for the selected sensors**
- **Already selected sufficient number of sensors to resolve source location ambiguity (i.e., at least 2 AOA sensor or 3 RNG sensors)**

When the source falls within the convex hull of the sensors, this utility function is sub modular utility function

In a more complex environment, how to select the next sensor?



Sensor selection Algorithm Statistic

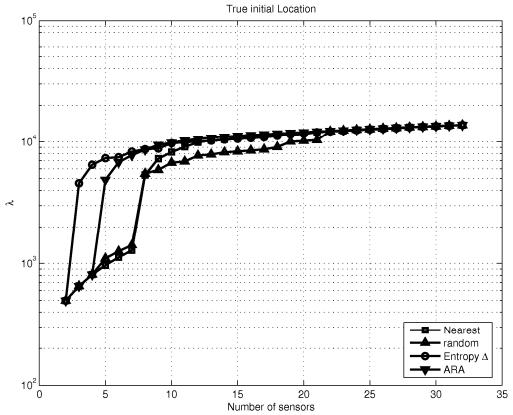


–Most intelligent algorithms behave similarly

–Minor differences in first few sensors

–Behavior driven by utility function

One trial Sample



Utility function selected above caused the utility function to improve by $O(\log(k))$, k = number of sensors used.

This behavior can be expected for all utility functions that are summations of the utilities of individual sensors.