EE16A Lab: Locationing
Wed 8-11

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Semester Outline

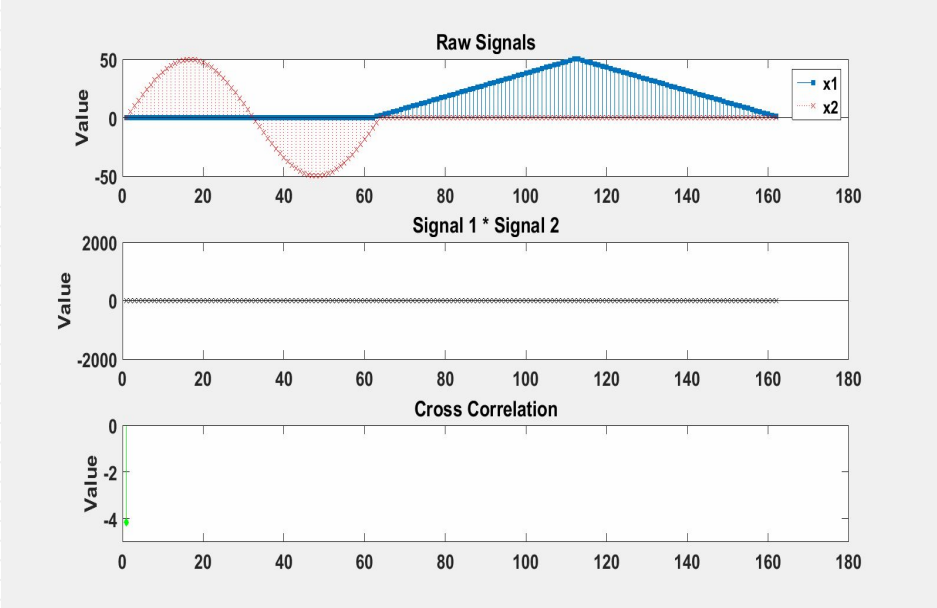
~~Imaging Module~~

~~Touchscreen Module~~

Locationing Module

Last lab

- Cross Correlation
  - Similarity between signals
  - Separate signals
  - Find index where signal arrived
- Signal arrival time to distance
  - How can we do this?

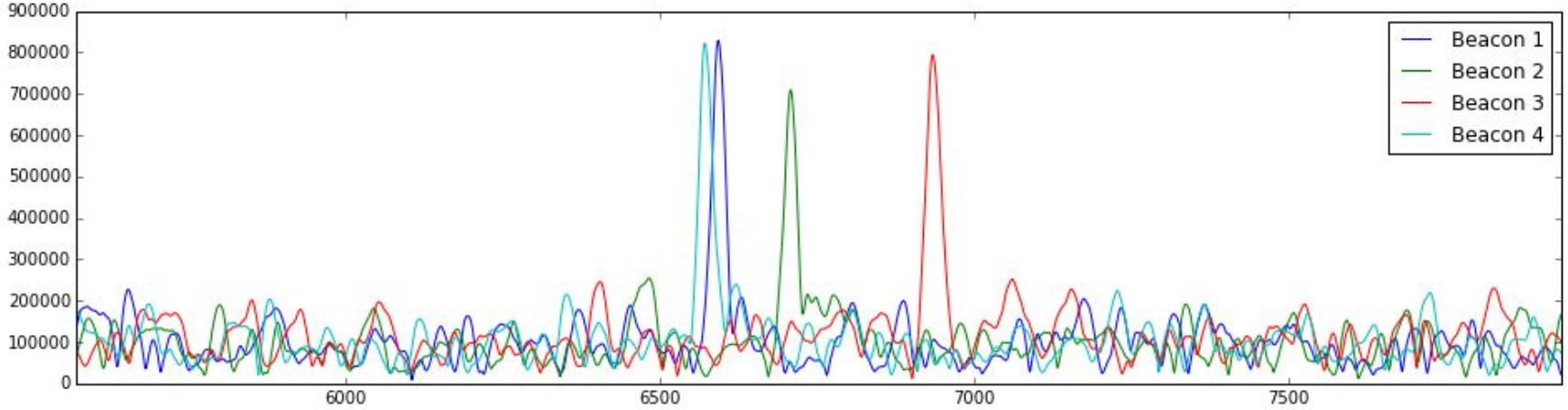


Separating Beacons

def separate_signal(raw_signal):

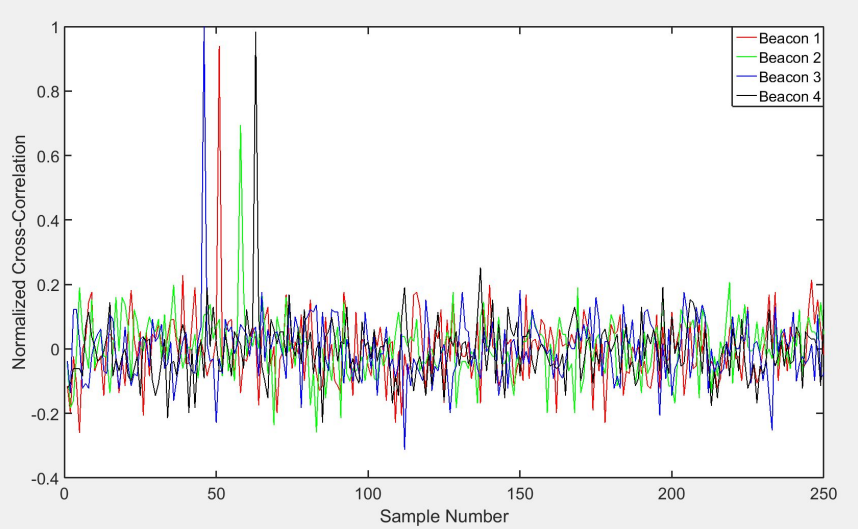
input: raw signal from microphone

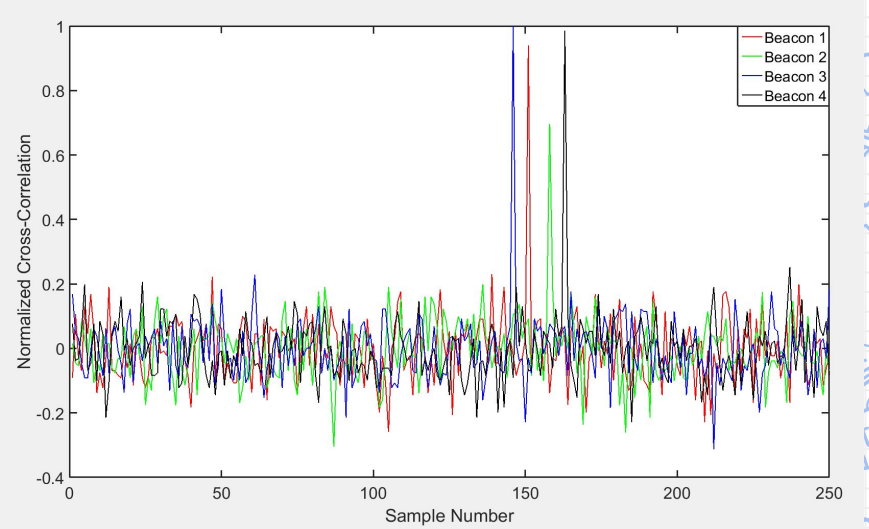
output: list of cross-correlations of raw signal with each beacon signal



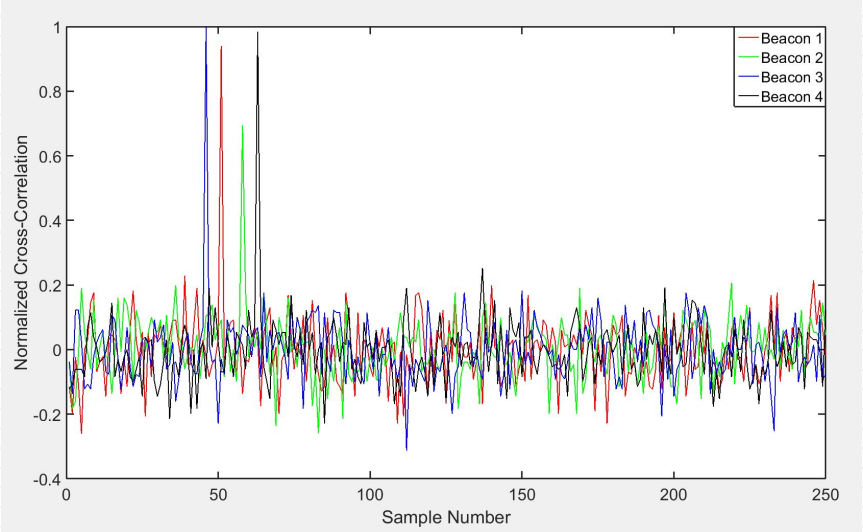
Issue With Locationing System

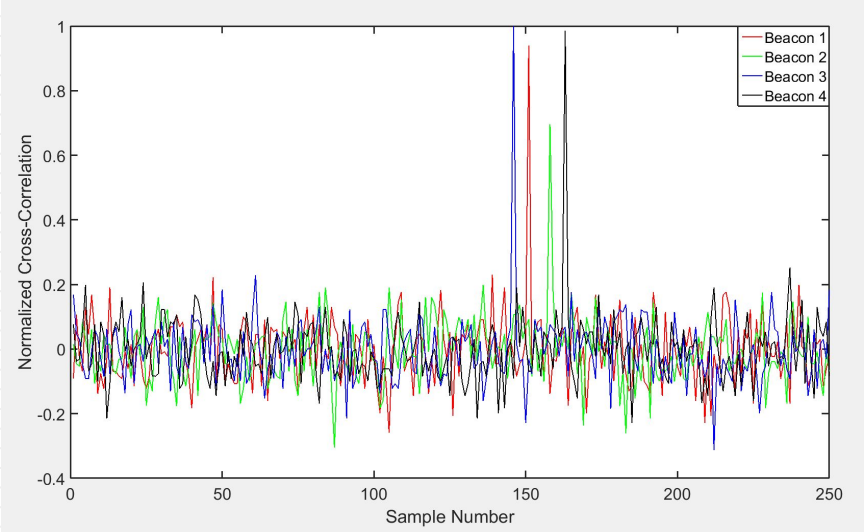
- ✘ Beacons signal every 230ms
- ✘ Don't know when the signals were actually sent
- ✘ Cannot use beginning of recording as a reference





Task 2a: Computing Distances

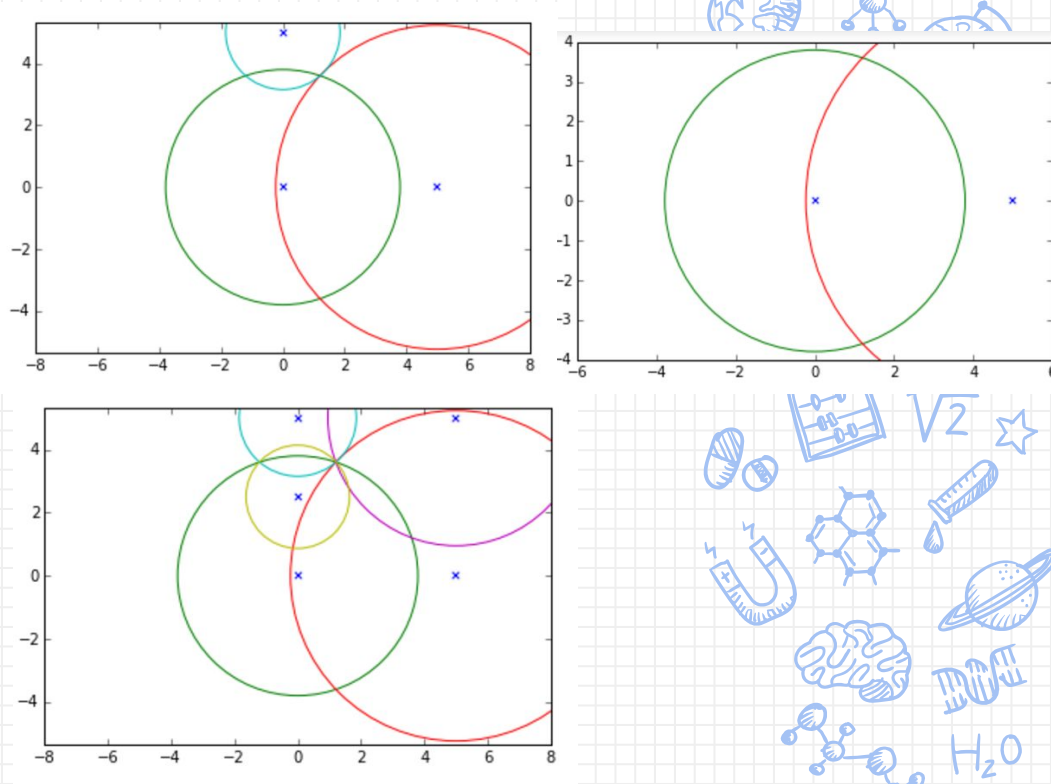




- Use a particular beacon as a reference
- Find offsets of other beacons with respect to reference beacon
- Turn these offsets into time difference of arrival (TDOA) then distances

Number of Beacons

- What is the difference among using 2, 3 and 5 beacons?
- Any benefit to using more?
- What do the circles represent?
- What do their intersections represent?



Today:

- Relative difference in arrival times is preserved
- Pick a beacon to be the reference
  - WLOG, beacon 0
- Compute difference in times of flight / distance to speakers:
  - Signal from beacon i > 0 arrived x seconds after that of beacon 0, so beacon i is y metres farther away than beacon 0.

Notes:

- If we knew distance / time of flight for beacon 0, finding location is easy
- Today this value will be given to you for testing purposes
- In the real system, we still won't know this
  - Turns out we don't need to -- next week!

Notes

- ✘ Plug the microphone in before starting your iPython notebook to avoid having to restart the kernel later on.

Question Form:

http://tinyurl.com/lab114-form

Question Queue:

http://tinyurl.com/lab114-queue

Questionnaire:

http://tinyurl.com/foodiscool