EE16A Lab 101
Monday 8-11

TA: Joy

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Semester Outline

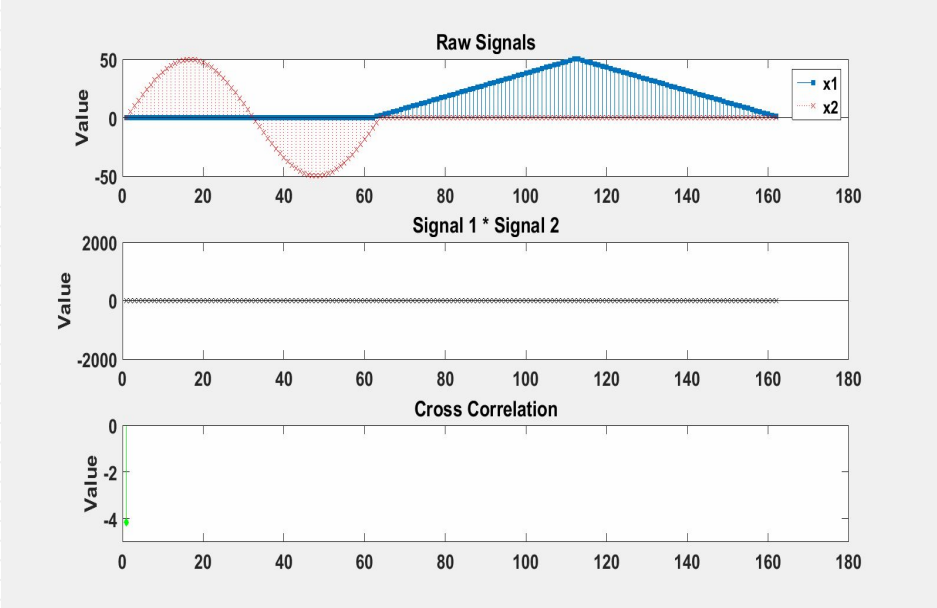
~~Imaging Module~~

~~Touchscreen Module~~

APS Module

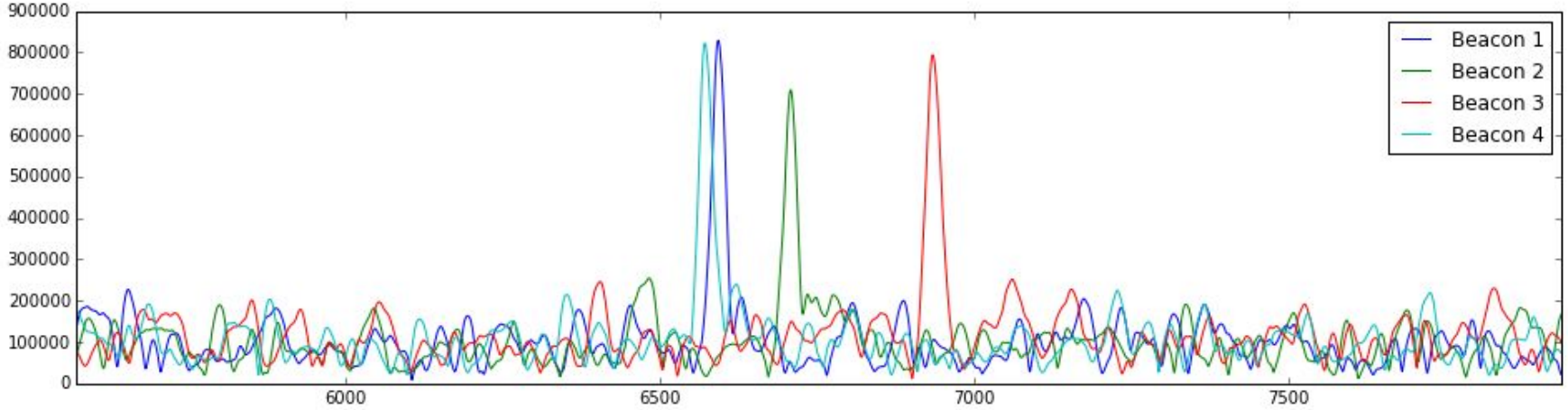
Last lab

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



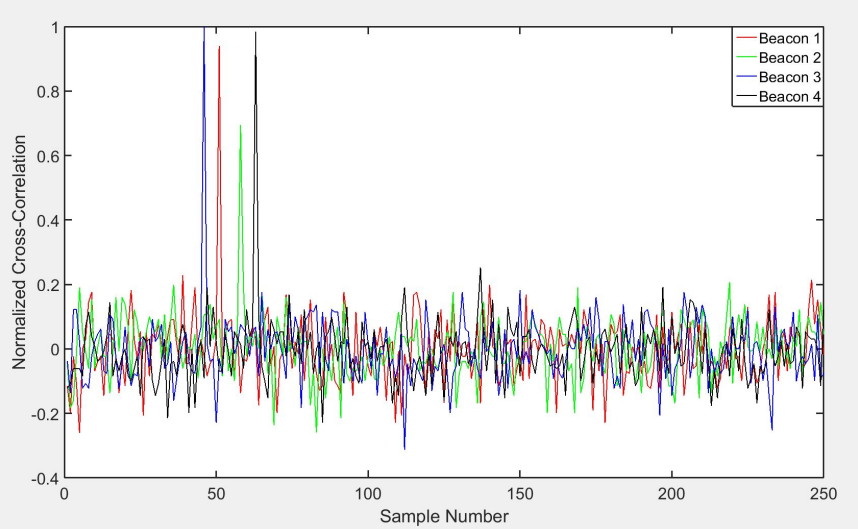
Task 1: Separating Beacons

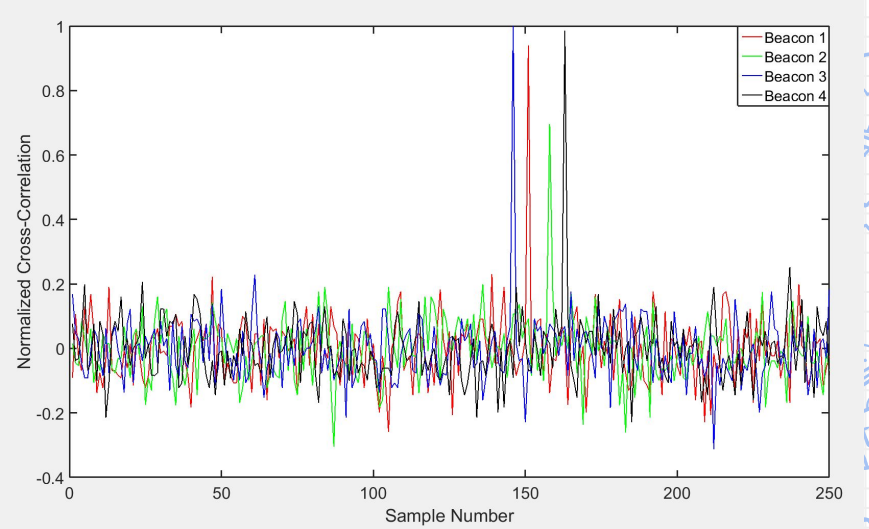
```
def separate_signal(raw_signal):
    Input: raw signal from microphone
    Output: list of cross-correlations of raw signal with each beacon signal
```



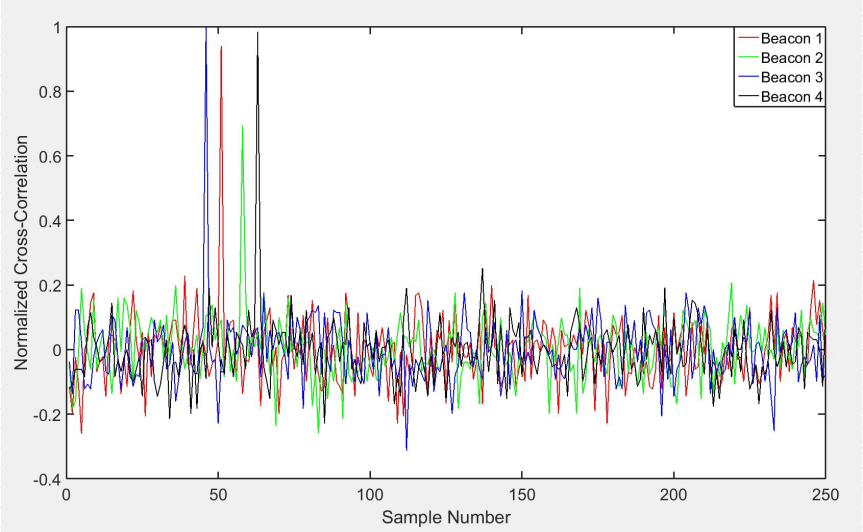
Issue With APS System

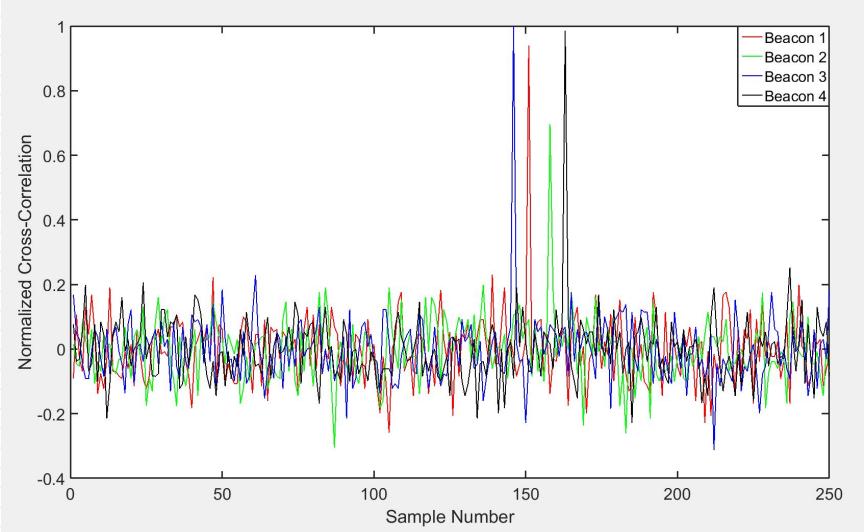
- ✘ Beacons signal every 230ms
- ✘ Don't know when the signals were actually sent
- ✘ Cannot use beginning of recording as a reference





Task 2a: Computing Distances

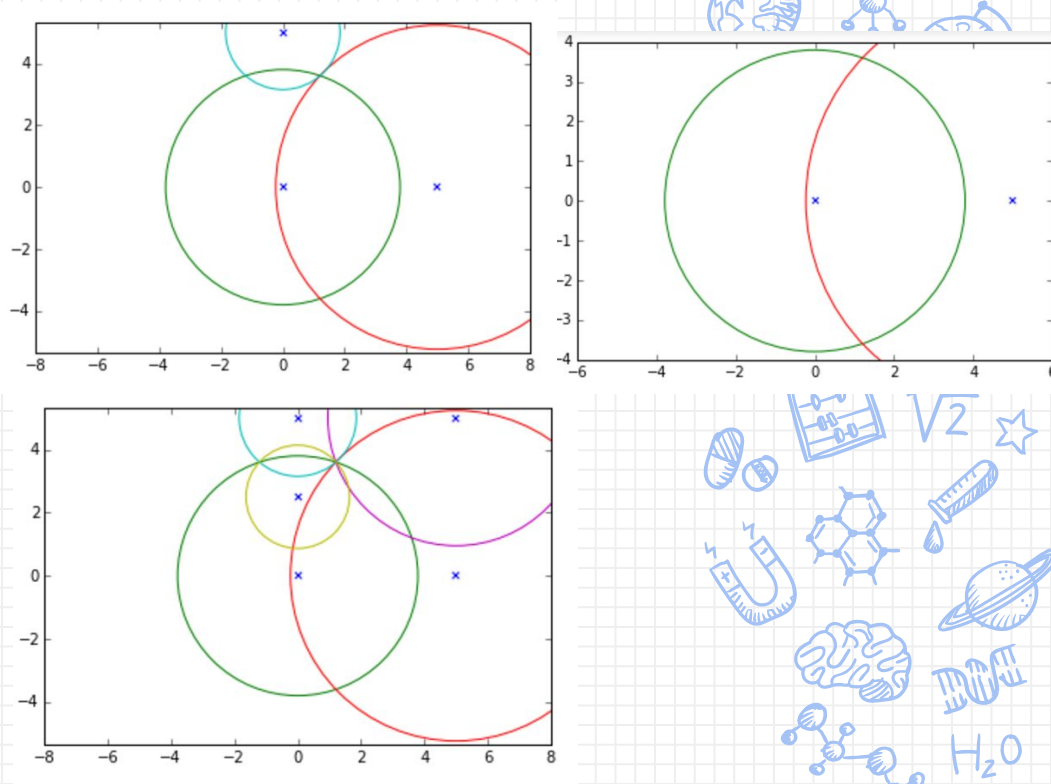




- Use a particular beacon as a reference
- Find offsets of other beacons with respect to reference beacon
- Turn these offsets into time difference of arrival (TDOA) then distances

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.
- Don't forget to copy over APS 1.py from Lab 1!
  - If you did not save it, you may have to work at the same lab station as last week

Questions + Checkoff

- Question Form:
  - http://tinyurl.com/lab101-sp17-questions
- Responses:
  - http://tinyurl.com/lab101-sp17-queue

Check off at http://tinyurl.com/16a-lab-checkoff