

EE 164 HW 11

(1) Mechanical Localization

A IPython \rightarrow 40B IPython $[-6, 6, 10, 22, 18, 6, -6, 10, -22, 18]^T$

(2) GPS Receivers

See IPython

(3) Finding Signal in Noise

A The largest noise peaks are MUCH smaller than the correlation over product with itself.

B Yes, this moves the spike over

C Same, close to zero, but not zero

D Yes, we can clearly see the shift of the spike

E As the noise gets higher, it becomes more difficult to differentiate spikes from noise

F We can only find 1 delay. We need an extra reference point (similar concept as in triangulation)

G Not possible to find s_2 accurately with such high noise.

H This strategy accurately cancels out the noise.

I This tells us $\Delta \theta$ is negative that it does not factor together with the correlation.

J Estimates are fairly close, if the noise is regular and small and the noise, this shall cancel time.

(4) Mechanical Test Series

$$A \quad \langle a, b \rangle = \langle b, a \rangle = \langle b, b \rangle$$

$$3+12+7 = 22$$

$$4+13+14+16 = 47$$

$$6+24+40+64 = 134$$

$$\frac{22}{43+44+64} = \frac{22}{151}$$

$$\frac{22}{50+50+50} = \frac{22}{150}$$

$$B \quad \frac{\langle b, b \rangle - \langle b, a \rangle^2}{\langle b, b \rangle} = \frac{3^2 + 6^2 + 7^2 + 8^2 - 6 \cdot 24 - 42 \cdot 64}{158}$$

$$= \frac{22}{158}$$

- (c) The error vector is orthogonal (near orthogonal) to the column of A as it is equal to $\|B - Ax\|^2$ with s approaches 0. If the inner product of 2 vectors is 0, they are orthogonal.

Therefore, the error vector is very close to being orthogonal to the column A .

\Rightarrow orthogonal.

5. True/False

A $a(x^2 + y^2 + dz + ey) = 1$

B $ax^2 + by^2 + cz^2 + dx + ey = 1$

C See Jupyter