HYPOTHESIS

By knowing the MUSIC Algorithm

- Useful for estimating
  - Number of sources
  - Strength of cross-correlation between source signals
  - Directions of Arrival
  - Strength of noise

- Assumes number of sources < Number of antenna elements.
  - else signals may be poorly resolved

- Estimates noise subspace from available samples
  \[ U(t) = As(t) + n(t) \]

Taking the Expectation of both sides

\[ R_{uu} = E[u(t)u(t + \tau)^H] = E[As(t) + n(t)(As(t) + n(t))^H] \]

where H denotes Hermitian Matrix

Thus,

\[ R_{uu} = AE[ss^H]A^H + E[nn^H] \]

\[ R_{uu} = AR_{ss}A^H + \sigma_n^2 I \]

Assumes that noise at each array element is additive white and Gaussian (AWGN) uncorrelated between elements with the same variance and that arriving signals have a mean of zero.

- After computing the Eigen values of Ruu, the Eigen values of ARssA\(^H\) can be computing by subtracting the variances as follows:
  \[ \nu_i = \lambda_i - \sigma_n^2 \]

- If number of incident signals D, is less than number of number of antenna elements M, then M-D Eigen values are zero.

Based on the above, the comparison study of a few direction-of-arrival estimation methods will be done. I have to show by computer simulation the results for the MUSIC algorithm that must be the best angle resolution method followed by Min-Norm method. As followed by Capon’s algorithm and finally Barlett’s algorithm. That shows how increasing the sampling number will improve the angle of resolution of all DOA methods.