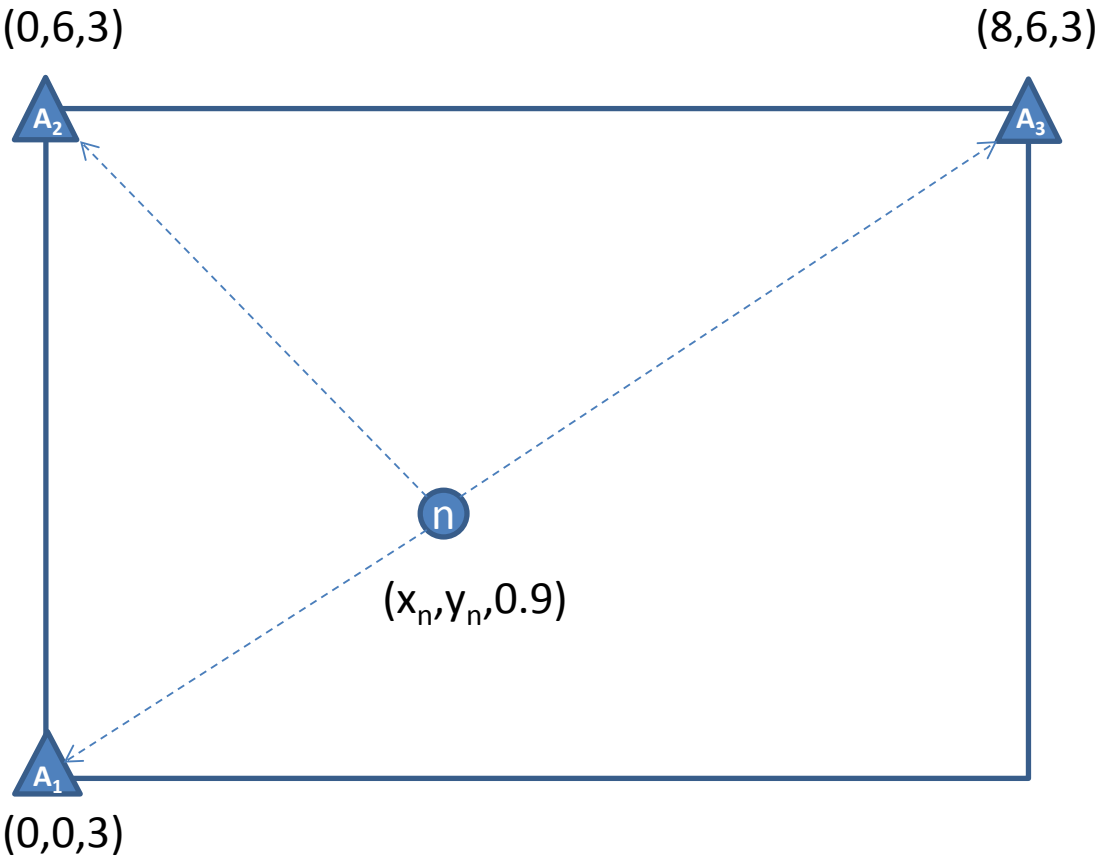
Faculty of Information Engineering & Technology
The Networks Department
Random Signals & Noise [NETW 505]

Practical Assignment 2

Due Date: Nov. 15th 2018

The objective of this assignment is to utilize stochastic filtering in estimating the location of a node that could appear within a rectangular room. Three fixed receivers are located as shown in the figure within the room at a height of 3 meters and receive signals from the node that we are trying to localize. The system is shown in the figure below.



You are required to estimate x_n, y_n given that x_n is uniformly distributed between 1,7 while y_n is uniformly distributed between 1,5. The height of node n is assumed to be always at 1.5 m. The observation of your system is the received power levels at A_1, A_2, A_3 where the received power in dBm follows:

$$P_{R_i} = P_T - 10\eta log_{10}(d_i) + X_{\sigma_i}$$

where P_{R_i} is the received dBm power at A_i, $P_T = -5\ dBm$ is the transmit power, η is the pathloss exponent, d_i is the distance between the node

n and the receiver A_i, X_{σ_i} is a Gaussian random variable with mean of 0 and standard deviation of 4 dB for all *i*.

Deliverables:

1. MATLAB code for this system
2. The optimal linear estimator H matrix for such system with $\eta = 3$
3. MATLAB Figure for the mean square error of localization given that the pathloss exponent n varies from 2.7 to 4 (Discuss the result)
4. MATLAB Figure for the mean square error of localization given that the pathloss exponent $\eta = 3$ and the standard deviation of X_{σ_i} for all *i* varies from 0 to 8 (Discuss the result)

Note: Maintain your Group of Practical Assignment 1