

# Wireless Mobile Communication

## ECE - 3003

### J Component Review - 1

*Project Title : **MATLAB simulation of RSS based channel modelling localization and tracking***

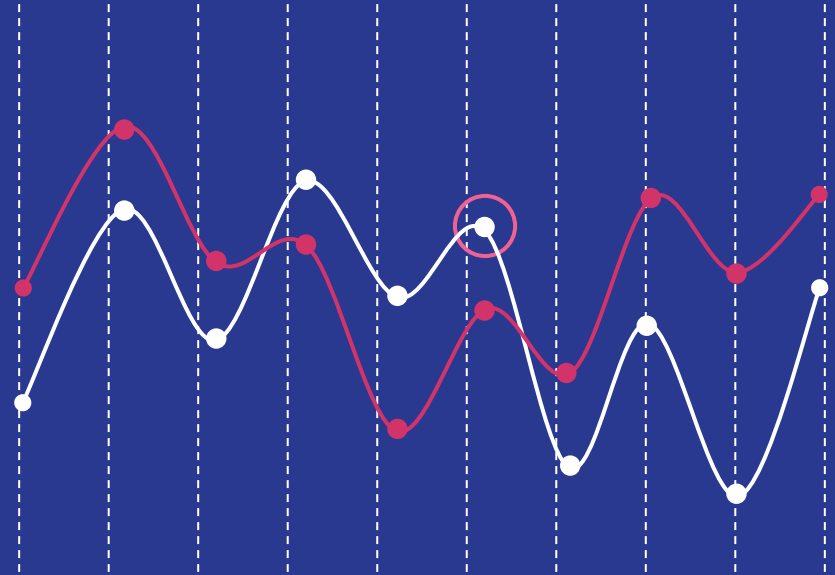
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Slot - B1

# Objective

In this project our focus is to show a MATLAB simulation of Received Signal Strength based channel modelling localisation and tracking.

Many factors have to be considered when RSS-based localization applications are designed, starting from selection of the proper propagation model, which has to represent in a relatively accurate way the interaction between the RF signal and the environment.

It is demonstrated that the RSS can be used for outdoor localization.



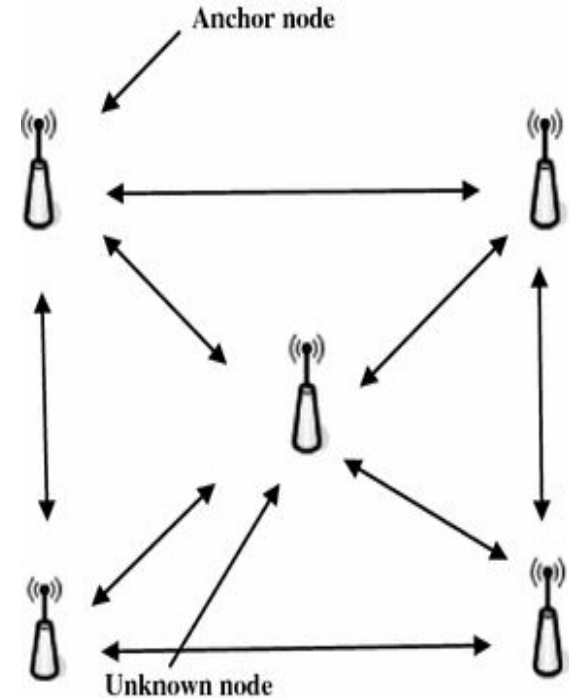
# Basic setup considered during simulation

## 4 Anchor Nodes

In WSN, only a limited amount of nodes in the network can know their locations by a variety of positioning mechanisms. These nodes are commonly called as anchor nodes. Anchor nodes are positioned by employing RSS measurements in this proposed method.

## 1 Mobile Nodes

A Mobile Node thus is the basic Node object with added functionalities of a wireless and mobile node like ability to move within a given topology, ability to receive and transmit signals to and from a wireless channel etc.



# Basic methods used

## RSS

The received signal strength (RSS) is the strength of a received signal measured at the receiver's antenna. RSS is determined by the transmission power, the distance between the transmitter and the receiver, and the radio environment.

## Lognormal Path Loss

The log-distance path loss model is a radio propagation model that predicts the path loss a signal encounters inside a building or densely populated areas over distance.

Log-distance path loss model is formally expressed as:

$$PL = P_{T_{dBm}} - P_{R_{dBm}} = PL_0 + 10\gamma \log_{10} \frac{d}{d_0} + X_g,$$

## LLS Algorithm

Linear least squares (LLS) is the least squares approximation of linear functions to data. It is a set of formulations for solving statistical problems involved in linear regression, including variants for ordinary (unweighted), weighted, and generalized (correlated) residuals. Numerical methods for linear least squares include inverting the matrix of the normal equations and orthogonal decomposition methods.

# Components and functions in simulation

Main testing  
function

parameters for  
estimating the  
RSS using the  
lognormal path  
loss model

Function to  
compute  
distance  
between AN  
and MN

Function to  
compute RSS  
between MN  
and AN

Estimate  
function that  
gives RSS  
vector

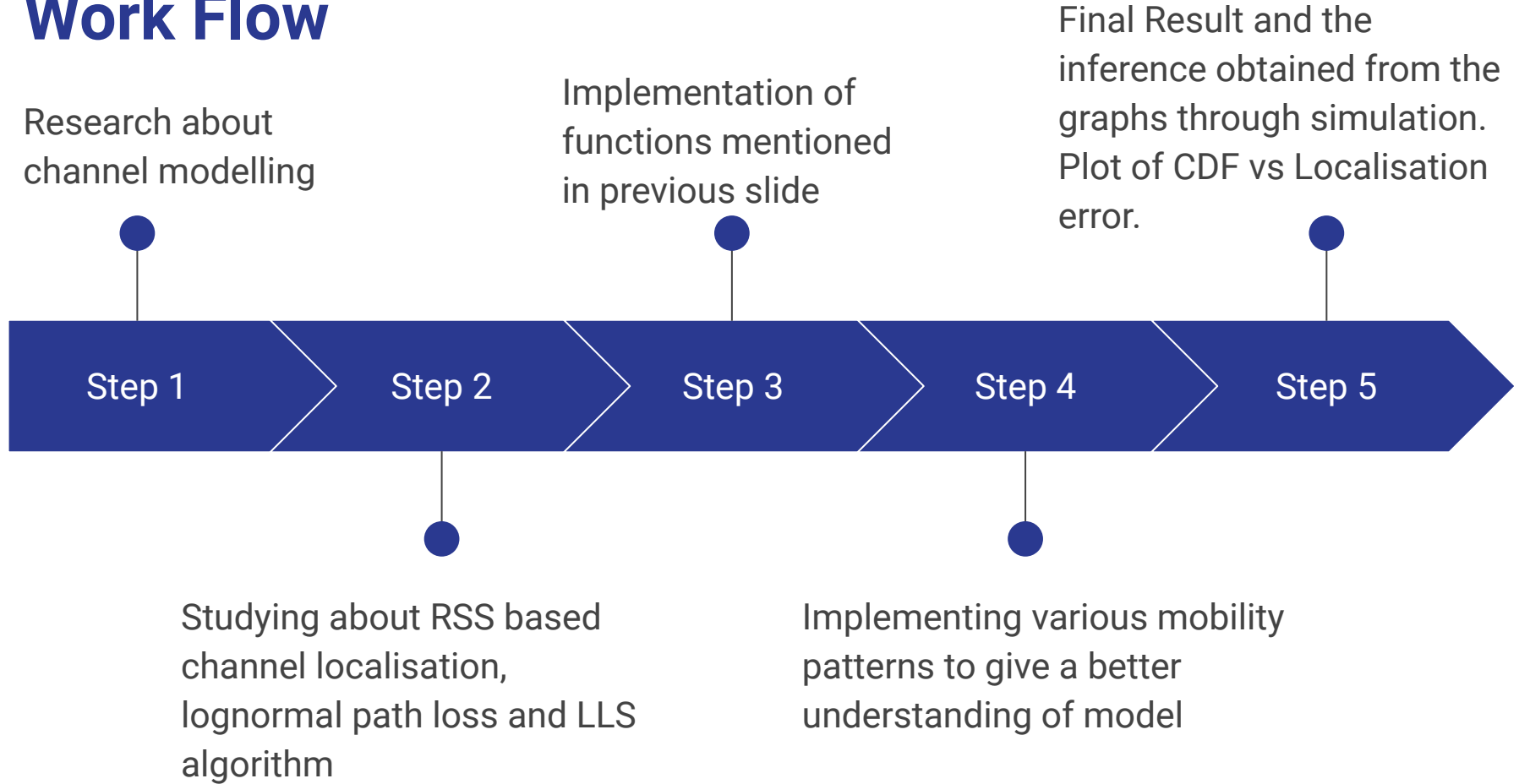
Function to  
create array of  
the given  
number of  
uniformly  
distributed  
random variable

Function to find  
coordinates of  
MN using LLS  
algorithm

A looping LLS  
function to find  
MN coordinates  
100 times

Filter function  
And function to  
determine error

# Work Flow



# Literature Survey

1. Location Estimation Methods - Shahin Farahani, in ZigBee Wireless Networks and Transceivers, 2008
2. Fundamentals of communication networks - Shiwen Mao, in Cognitive Radio Communications and Networks, 2010
3. Optimization of anchor nodes in wireless sensor network - Devendra Kumar Yadav ; Pragyan Mishra ; Sasmita Behera
4. Application of Channel Modeling for Indoor Localization Using TOA and RSS - Ahmad Hatami
5. Analysis of path loss exponent error in ranging and localization of wireless sensor network - Chuan Chin Pu ; Pei Cheng Ooi ; Boon Giin Lee ; Wan-Young Chung