clear

close all

clc

viewer = siteviewer("Buildings","Ukmmap.osm","Basemap","topographic");

fq =6e9;

ss\_perfect = zeros(1,100);

ss\_concrete = zeros(1,100);

ss\_weather = zeros(1,100);

ss\_foliage = zeros(1,100);

% Define the number of users

num\_users = 100;

% Define the location as a latitude and longitude coordinate

location = [2.922137, 101.779533];

% Define the radius of the circular region around the location

radius = 0.005;

% Pre-allocate an array to hold the users

rxs = repmat(rxsite(), 1, num\_users);

% Generate random points within the circular region around the location

theta = linspace(0, 2\*pi, num\_users+1)';

theta = theta(1:end-1);

r = radius \* ones(num\_users, 1);

latitudes = location(1) + r .\* cos(theta);

longitudes = location(2) + r .\* sin(theta);

% Calculate the distance of each user from the center of the region

distances = distance(location(1), location(2), latitudes, longitudes);

% Sort the users in ascending order of distance from the center of the region

[distances, idx] = sort(distances);

latitudes = latitudes(idx);

longitudes = longitudes(idx);

% Create users at each fixed point within the circular region with numbered names

for i = 1:num\_users

rxs(i) = rxsite("Name", num2str(i), ...

"Latitude", latitudes(i), ...

"Longitude", longitudes(i), ...

"AntennaHeight", 1.5);

end

show(rxs);

for f = 1:size(fq)

tx = txsite("Name","Asrama ibrahim Yaaku", ... % Transmitter

"Latitude",2.92109, ...

"Longitude",101.779560, ...

"AntennaHeight",120,...

"TransmitterPower",5, ...

"TransmitterFrequency",fq(f));

end

rtpm = propagationModel("raytracing", ...

"Method","SBR", ...

"MaxNumReflections",10, ...

"BuildingsMaterial","perfect-reflector", ...

"TerrainMaterial","perfect-reflector");

% coverage(tx,rtpm, ...

% "SignalStrengths",-80:-40, ...

% "MaxRange",1000, ...

% "Resolution",3, ...

% "Transparency",0.6)

% los(tx,rxs)

rtpm.MaxNumReflections =10;

raytrace(tx, rxs, rtpm);

for i = 1:size(rxs,2)

rx = rxs(i);

ss\_perfect(f,i) = sigstrength(rx, tx, rtpm);

disp("Received power using perfect reflection: " + rx.Name + ":")

disp(ss\_perfect(f,i) + " dBm")

end

rtpm.BuildingsMaterial = "concrete";

rtpm.TerrainMaterial = "concrete";

for i = 1:size(rxs,2)

rx = rxs(i);

ss\_concrete(f,i) = sigstrength(rx, tx, rtpm);

disp("Received power using concrete materials: " + rx.Name + ":")

disp(ss\_concrete(f,i) + " dBm")

end

rtPlusWeather = rtpm + propagationModel("gas") + propagationModel("rain");

raytrace(tx,rx,rtPlusWeather)

for i = 1:size(rxs,2)

rx = rxs(i);

ss\_weather(f,i) = sigstrength(rx,tx, rtPlusWeather);

disp("Received power including weather loss: " + rx.Name + ":")

disp(ss\_weather(f,i) + " dBm")

end

% Assume that propagation path travels through 5 m of foliage

foliageDepth = 5;

L = 0.45\*((fq(f)/1e9)^0.284)\*foliageDepth; % Weissberger model for d < 5

disp("Path loss due to foliage: " + L + " dB")

% Assign foliage loss as static SystemLoss on each receiver site

for i = 1:size(rxs,2)

rx = rxs(i);

rx.SystemLoss = L;

end

% Compute signal strength with foliage loss

for i = 1:size(rxs,2)

rx = rxs(i);

rx.SystemLoss = L;

ss\_foliage(f,i) = sigstrength(rx,tx,rtPlusWeather);

disp(" foliage Signal strength at " + rx.Name + ":")

disp(ss\_foliage(f,i) + " dBm")

end

for i = 1:size(rx, 2)

rx = rxs(i);

% Calculate the distance between the TX and the RX

dme = distance(tx, rxs(i,: ));

dkm = dme / 1000;

end

%Calculate the azimuth and elevation angles between the sites

for i = 1:size(rx, 2)

rx = rxs(i);

[azD,elD] = angle(tx, rxs(i,: ));

end

for i = 1:size(tx, 2)

rx = rxs(i);

[az,el] = angle(rxs, tx(i,: ));

end

testmatrix = [ss\_perfect; ss\_concrete; ss\_weather; ss\_foliage];

writematrix("testmatrix", "testfile.xlsx", "FileType", "spreadsheet")