%%

clc; clear all;

%% GIS Data Loading

uae\_shape = shaperead('UAE.shp');

coastline = shaperead('Export\_Output\_3.shp');

coastline.X = deg2km(coastline.X)-5635;

coastline.Y = deg2km(coastline.Y)-2450;

uae\_shape.X = deg2km(uae\_shape.X)-5635;

uae\_shape.Y = deg2km(uae\_shape.Y)-2450;

%% Grid Creation

stepkm = 10;

y\_step = 48:stepkm:477-stepkm;

y\_step = y\_step(:);

x\_step = 69:stepkm:665-stepkm;

x\_step = x\_step(:);

x\_temp = [0 0];

lx = length(x\_step);

ly = length(y\_step);

for w = 1:lx

T = [x\_step(w)\*ones(ly,1) y\_step];

x\_temp = [x\_temp; T];

end

%% Region of Interest Processing

q=1;

while q <= length(x\_temp)

if inpolygon(x\_temp(q,1),x\_temp(q,2),coastline.X,coastline.Y) == 0

x\_temp(q,:) = [];

q

else

q

q = q+1;

end

end

%% Model Implementation

i = 1;

n = 1;

count = 1;

x(1,:) = [72 240];

d\_avg = 100;

lrange = 0.99;

urange = 1.01;

m=1;

stp = 0;

while m <= length(x\_temp)

for i=1:size(x,1)

d(i) = dist(x\_temp(m,1),x\_temp(m,2),x(i,1),x(i,2));

end

if size(x,1) == 1

if d>lrange\*d\_avg && d<urange\*d\_avg

x = [x; x\_temp(m,:)];

count = count + 1

m=1;

if count == stp

m = length(x\_temp)+5;

n = length(x\_temp)+5;

end

end

else

[M1,I1] = min(d);

d\_temp = d;

d\_temp(I1) = inf;

[M2,I2] = min(d\_temp);

if M1>lrange\*d\_avg && M1<urange\*d\_avg && M2>lrange\*d\_avg && M2<urange\*d\_avg

x = [x; x\_temp(m,:)];

count = count + 1

m=1;

if count == stp

m = length(x\_temp)+5;

n = length(x\_temp)+5;

end

end

end

m=m+1;

if m == length(x\_temp)+1

n=1;

% m=1;

while n <= length(x\_temp)

for i=1:size(x,1)

d(i) = dist(x\_temp(n,1),x\_temp(n,2),x(i,1),x(i,2));

end

[M1,I1] = min(d);

d\_temp = d;

d\_temp(I1) = inf;

[M2,I2] = min(d\_temp);

if M1>lrange\*d\_avg && M1<urange\*d\_avg && M2>urange\*d\_avg

x = [x; x\_temp(n,:)];

count = count + 1

m=1;

n = length(x\_temp)+5;

if count == stp

n = length(x\_temp)+5;

m = length(x\_temp)+5;

end

else

n = n+1;

end

end

end

end

%% Clip final results to UAE shape

in\_UAE = inpolygon(x(:,1), x(:,2), uae\_shape.X, uae\_shape.Y);

stations\_in\_UAE = x(in\_UAE, :);

%% Results Plotting

figure

mapshow(uae\_shape);

grid on; grid minor;

hold on

plot(stations\_in\_UAE(:,1), stations\_in\_UAE(:,2), 'rx', 'LineWidth', 2)

xlabel('km')

ylabel('km')

title('Optimal Locations of Alternative Fuel Stations within UAE')

function d = dist(x1,y1,x2,y2)

d = sqrt((x1-x2)^2 + (y1-y2)^2);

end