# Intelligent Robot Homework 6 Report

**Problem 1: Please generate the beam-based measurement models with a mixture of four distributions (by choosing five different sets of parameters).**

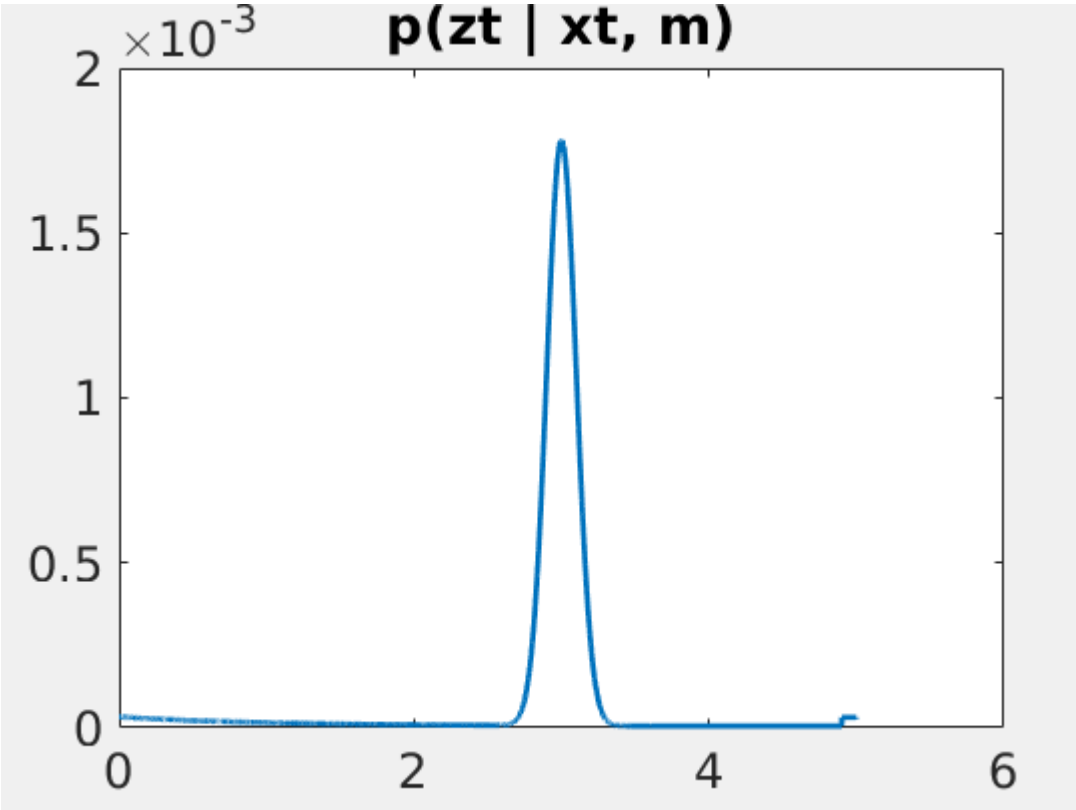
```
% this ara parameter (z_hit, z_short, z_max, z_rand, sigma_hit, z_MAX, lambda_short)
Theta1 = [0.85  0.05  0.05  0.05  0.1  5  1]; % parameter group 1
Theta2 = [0.50  0.15  0.15  0.20  0.5  5  1]; % parameter group 2
Theta3 = [0.45  0.05  0.25  0.25  0.5  5  1]; % parameter group 3
Theta4 = [0.45  0.05  0.25  0.25  0.5  5  1]; % parameter group 4
Theta5 = [0.15  0.10  0.30  0.45  0.5  5  1]; % parameter group 5
```

the core code is:

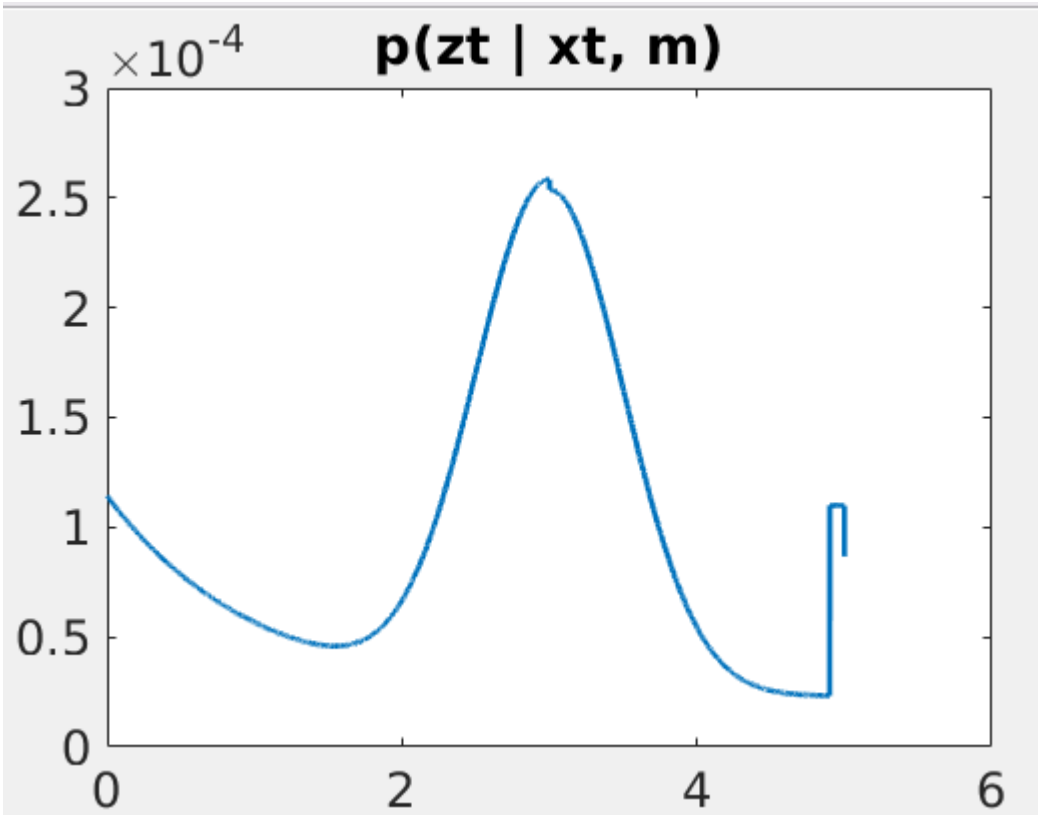
```
q=ones(1,K);

%%Multiply the probability with weight
for k = 1:K

    z_tk = zt(k);

    %%  TODO
    p1 = z_hit * p_hit(z_tk,z_tk_star,sigma_hit,z_MAX);
    p2 = z_short * p_short(z_tk,z_tk_star,lambda_short);
    p3 = z_max * p_max(z_tk,z_MAX);
    p4 = z_rand * p_rand(z_tk,z_MAX);
    q(k)= (p1+p2+p3+p4);
end
```

The result figure with parameter Theta1 is:

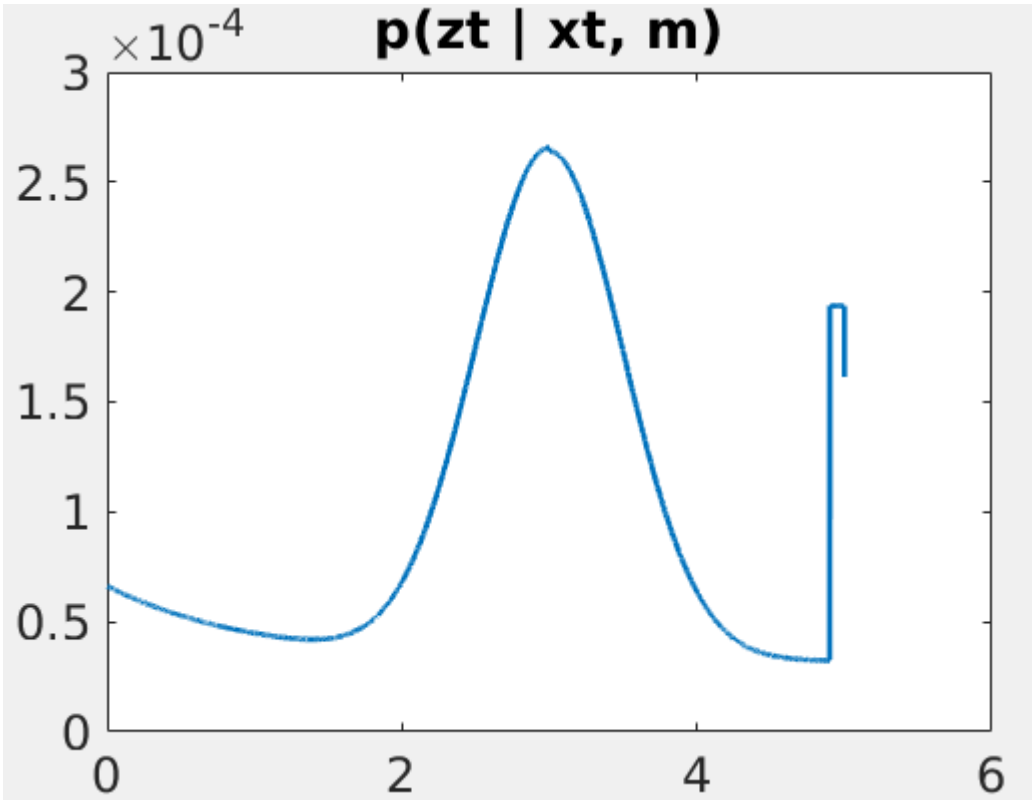
Theta1 = [0.85 0.05 0.05 0.05 0.1 5 1]; % parameter group 1



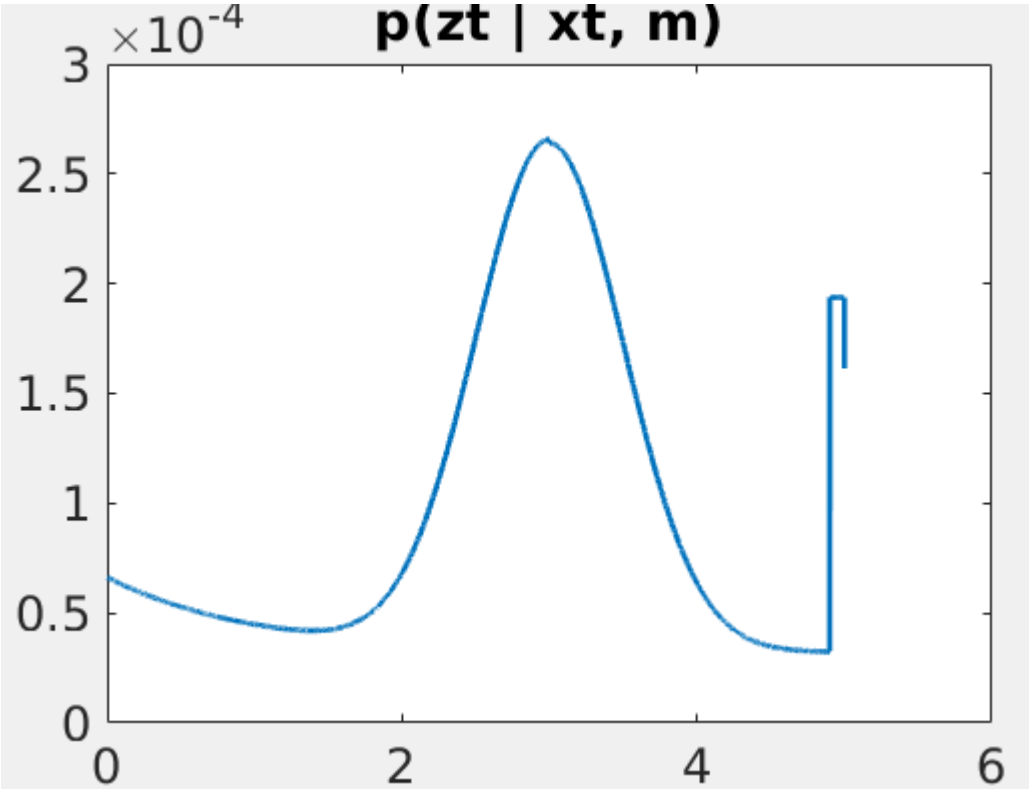
Theta2 = [0.50 0.15 0.15 0.20 0.5 5 1]; % parameter group 2



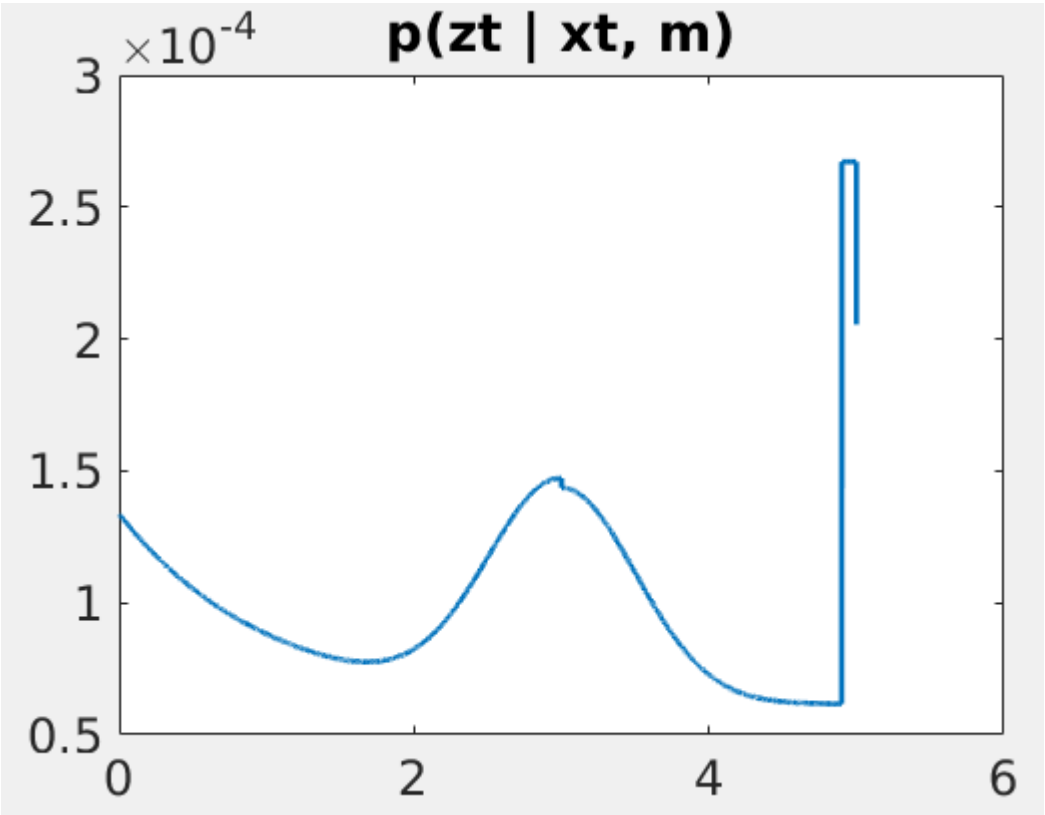

Theta3 = [0.45 0.05 0.25 0.25 0.5 5 1]; % parameter group 3



Theta4 = [0.45 0.05 0.25 0.25 0.5 5 1]; % parameter group 4




Theta5 = [0.15 0.10 0.30 0.45 0.5 5 1]; % parameter group 5



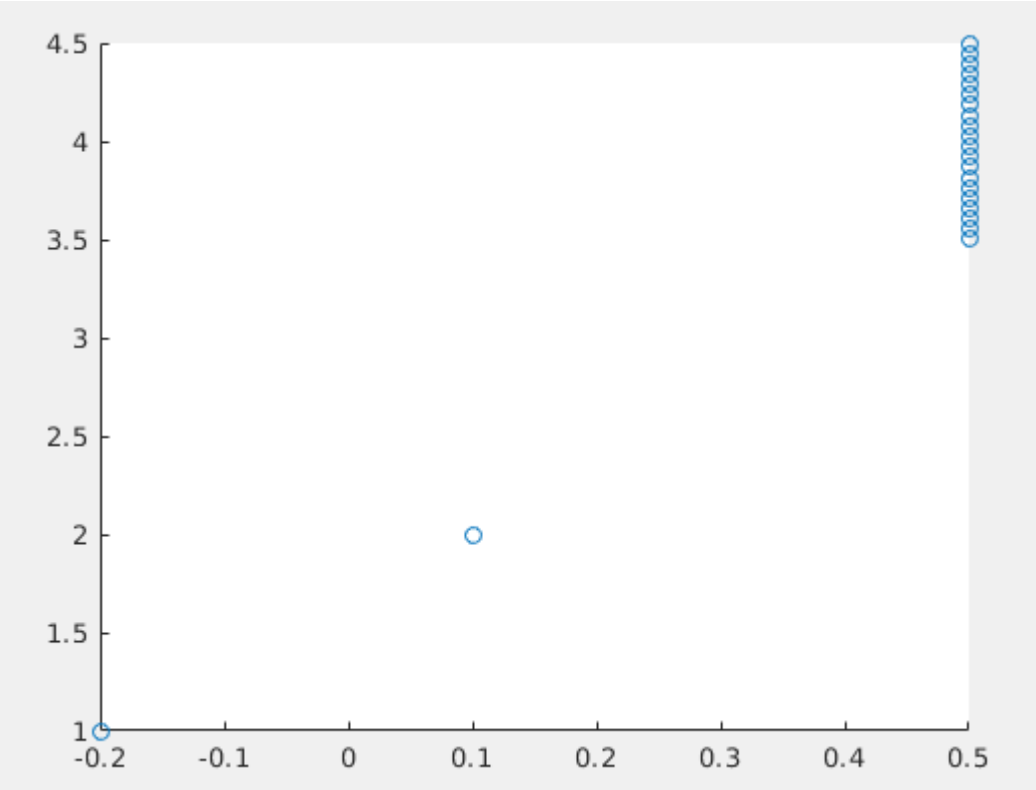
All codes are in hw6_q1.m.

**Problem 2: Given the following map, please generate scan measurement probability model and the beam measurement probability model.**

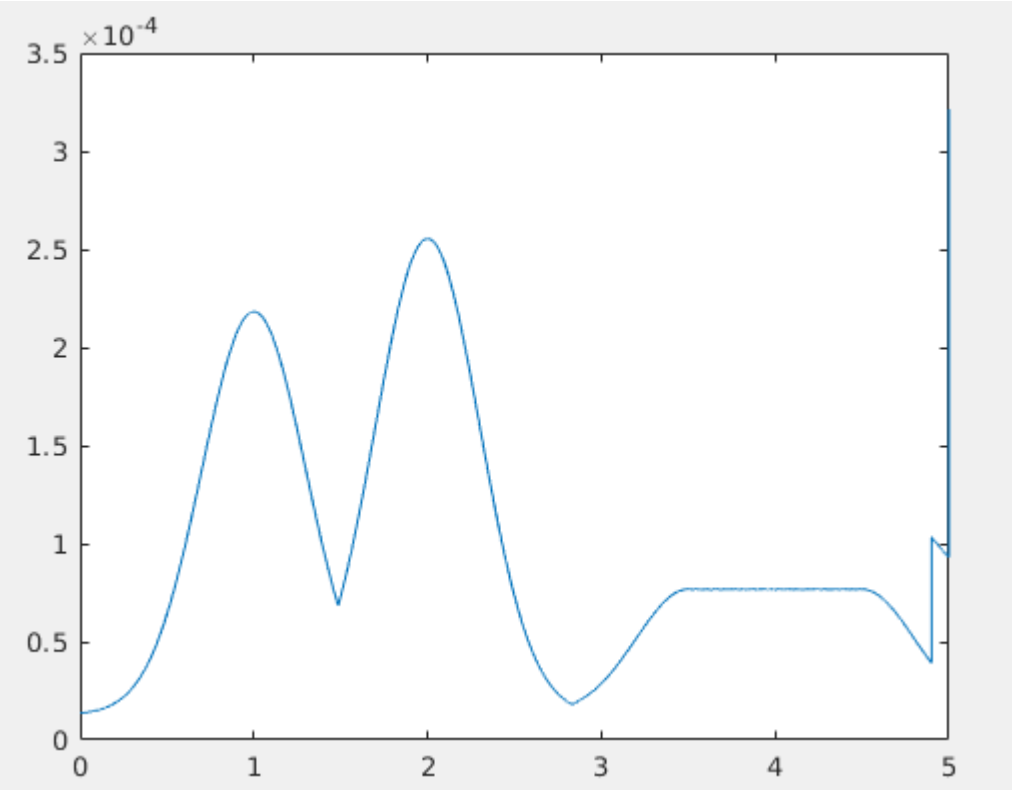
I set some point and a obstacle in the sense's scan path.

set initial coondition:

```
x=0;
y=0;
theta=pi/2;
x_sens=0;
y_sens=0;
theta_sens=0;
```




The scan measurement probability model result is:



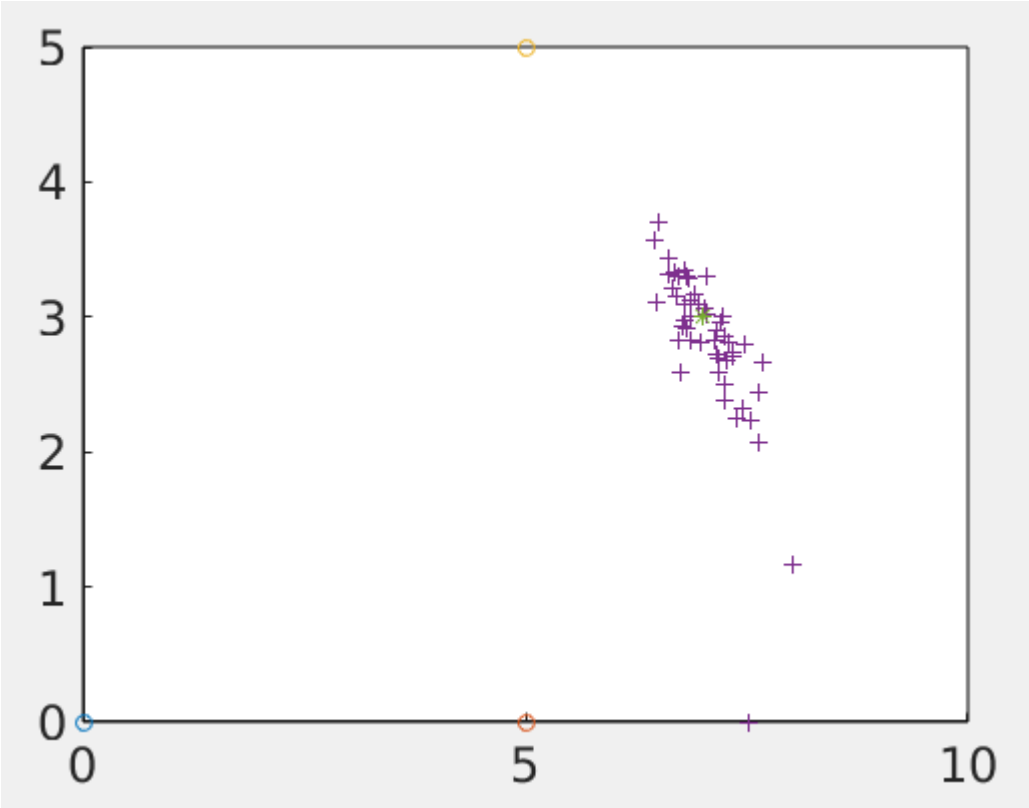

All the code of this problem is in hw6_q2.m.

**Problem 3: Please generate the following landmark measurement probability model by using 3 ranging sensors.**

The initial position of sensor is:

```
aim = [7 3];
rectangle('Position',pos);
hold on

sensor1 = [0 0];
sensor2 = [5 0];
sensor3 = [5 5];
```

Result of sensor detect is:




The green point is aim point, purple point is the position sensor predicted.

All code is in hw6_q3.m.