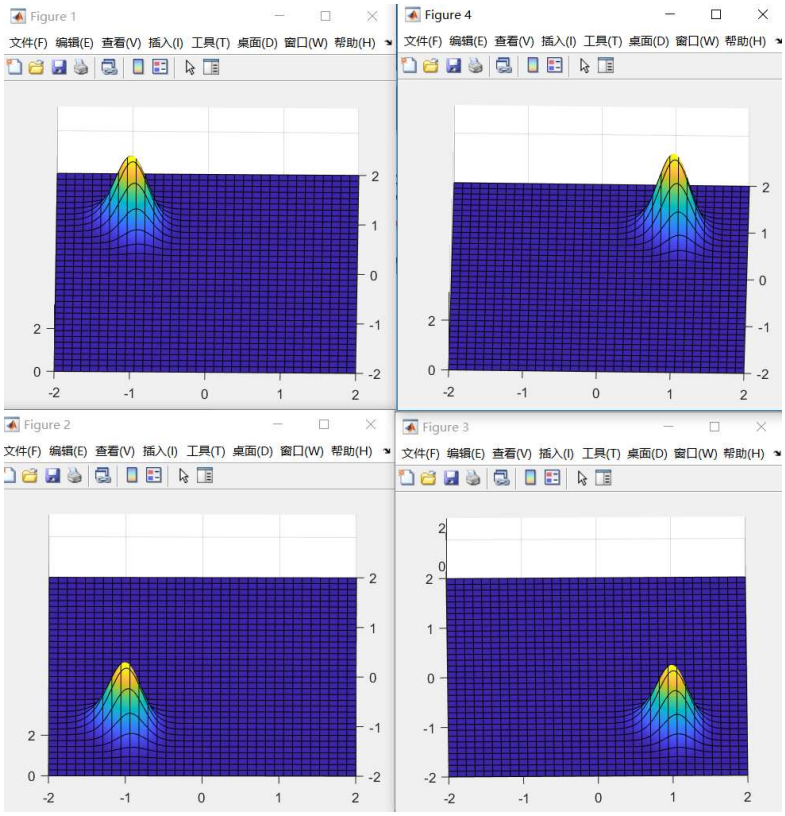
Hw9 11612126 Keming Li Intelligent Robotic

Problem 1

Gauss probability result



explanations

To find a

```
range1=max([abs(r1-r2),
            abs(r2-r3),
            abs(r3-r4),
            abs(r4-r1)]); %c>a+b
range2=min([abs(r1+r2),
            abs(r2+r3),
            abs(r3+r4),
            abs(r4+r1)]);%c<a+b
a0=rand () * (range2-range1) + range1;
a=fsolve(@F, a0);
```

take left lower landmark as example, assume the position of robot is Q

in order to calculate $\mathrm{p}(\mathrm{x}_0 = \mathrm{x}, \mathrm{y}_0 = \mathrm{y})$

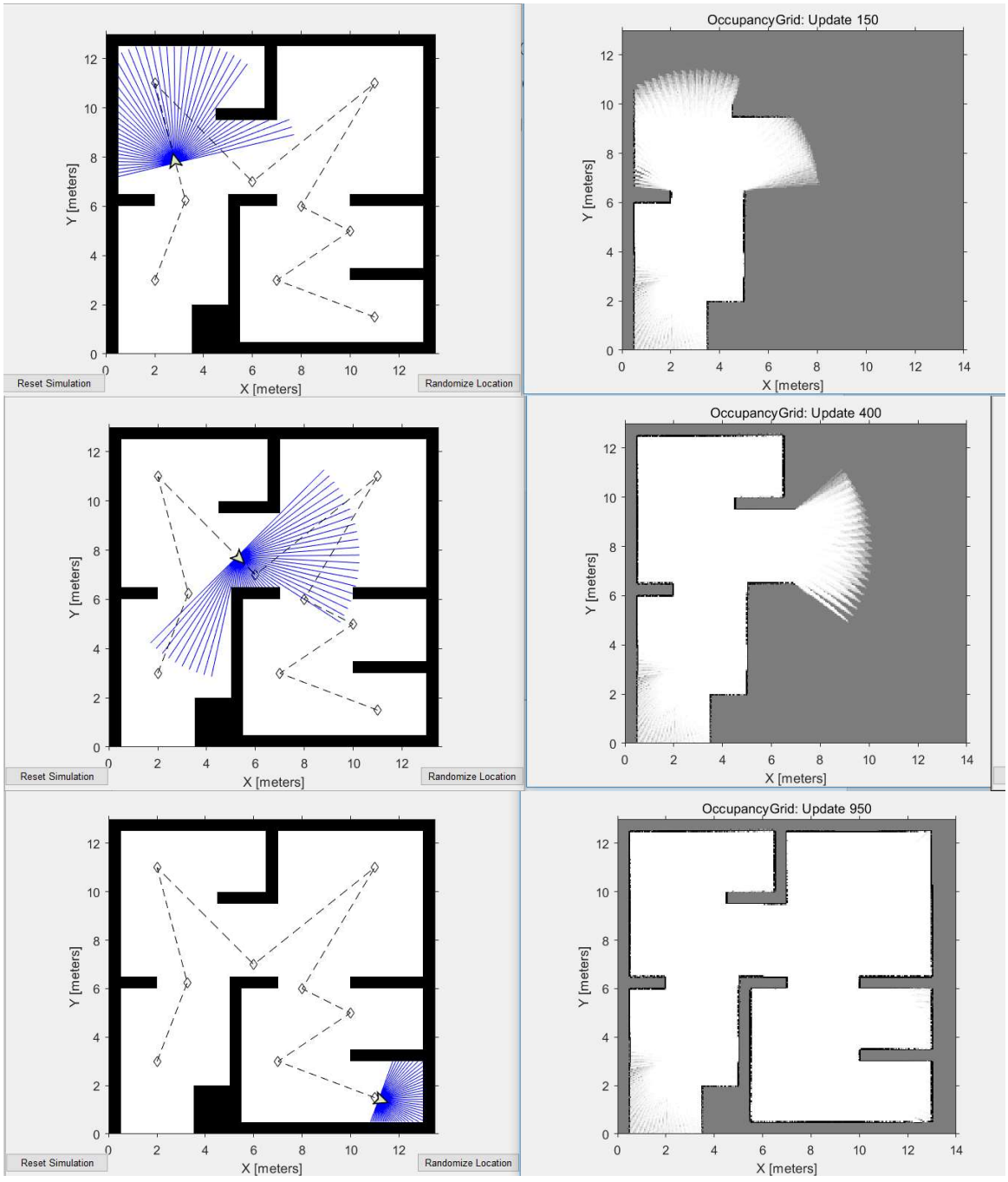
the left upper landmark pose(1) should be $(x, y + a)$

the right lower landmark pose(3) should be $(x + a, y)$

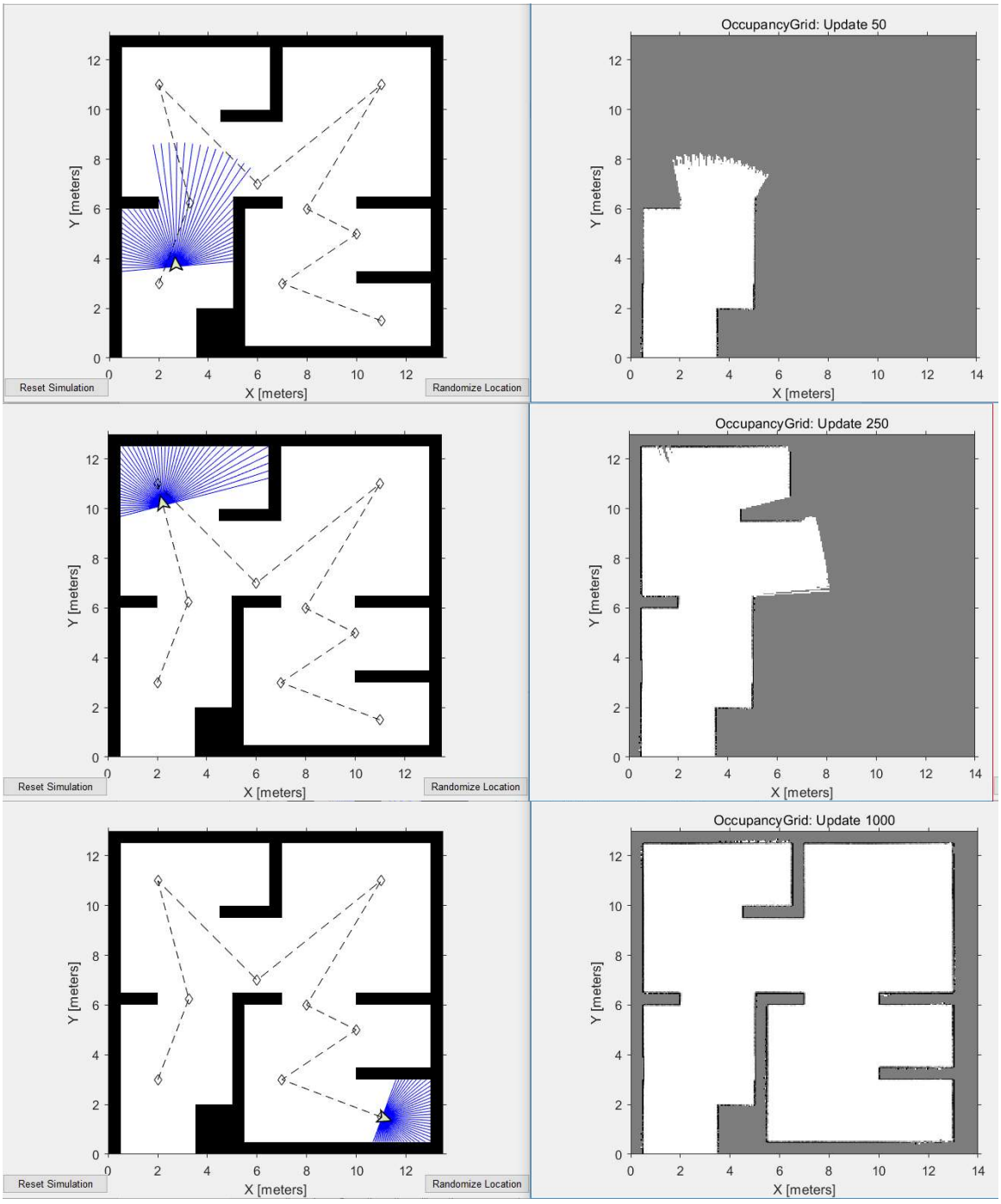
the right upper landmark pose(4) should be $(x + a, y + a)$

$$\mathrm{p}(\mathrm{x}_0 = \mathrm{x}\,, \mathrm{y}_0 = \mathrm{y}) = \prod_i G(\, dist(pose(i), Q) - r_i \mid \mu = 0, \sigma = \sigma_i\,)$$

problem 2



problem 3


OccupancyGrid: Update 50
OccupancyGrid: Update 250
OccupancyGrid: Update 1000
Reset Simulation
Randomize Location
X [meters]
Y [meters]

Problem 4

For the left lower single landmark, A

$$\mathrm{p}(\mathrm{x}_0 = \mathrm{x}\,, \mathrm{y}_0 = \mathrm{y}) = G(\,dist_A - r_A \mid \mu = 0, \sigma = \sigma_{A\_dist}\,) \times G(\,\Delta\theta_A \mid \mu = 0, \sigma = \sigma_{A\_theta}\,)$$

$$where\ dist_A\ means\ distance\ between\ landmark\ A\ and\ robot\ position\ Q,$$
$$\Delta\theta = atan2(y - y_Q, x - x_Q) - atan2(y_A - y_Q, x_A - x_Q) = atan2(y - y_Q, x - x_Q) - \theta_2$$

Other landmarks are the same idea

Results is shown as below: