Instrumentation Tutorial 8 Answers

Instrumentation (Flinders University)

INSTRUMENTATION

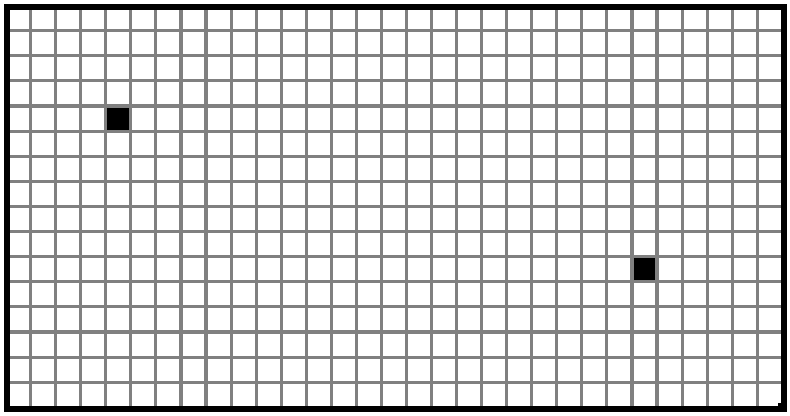
ENGR4732, SEMESTER 2 2014

TUTORIAL 8: MAPPING

QUESTIONS

QUESTION 1 – QUADTREE REPRESENTATION

Create a Quadtree representation of the map in figure 1 and draw the resulting spatial divisions in figure 1 corresponding to the nodes of the tree.



QUESTION 2 – MAP UPDATE

Using equation 1 and the following information find the new map occupancy value.

$P(M_{d,\theta}(x(k))) = 0.5$

d = 0.5, y(k) = 1.8, d_1 = 1.1, s(y(k),θ) = 0.4

$$P(m_{d,\theta}(x(k)) \mid y(k), x(k)) = P(m_{d,\theta}(x(k)))$$
$$+ \begin{cases} -s(y(k),\theta) & d < y(k) - d_1 \\ -s(y(k),\theta) + \frac{s(y(k),\theta)}{d_1}\ (d - y(k) + d_1) & d < y(k) + d_1 \\ s(y(k),\theta) & d < y(k) + d_2 \\ s(y(k),\theta) - \frac{s(y(k),\theta)}{d_3 - d_2}\ (d - y(k) - d_2) & d < y(k) + d_3 \\ 0 & \text{otherwise.} \end{cases}$$

Question 3 – Reflection Counting

Determine the chance of reflection of a node in a map given the following sequence of measurements.

Hit
Hit
Miss
Hit
Hit
Miss
Hit
Miss
Hit
Miss
Hit
Miss
Miss
Hit
Miss
Hit
Hit
Hit
Miss
Hit

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ANSWERS

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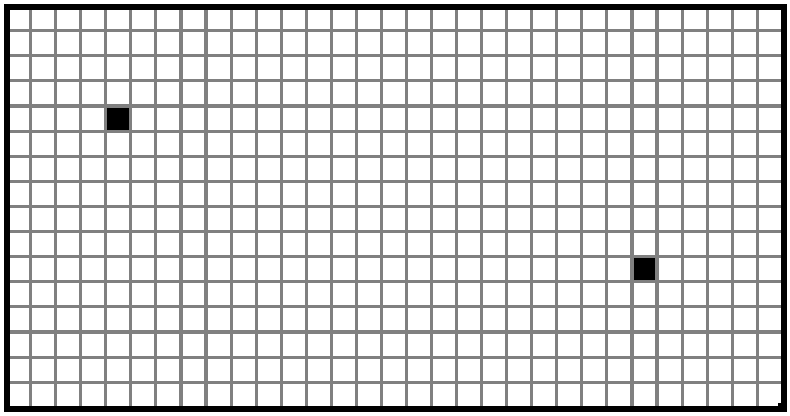
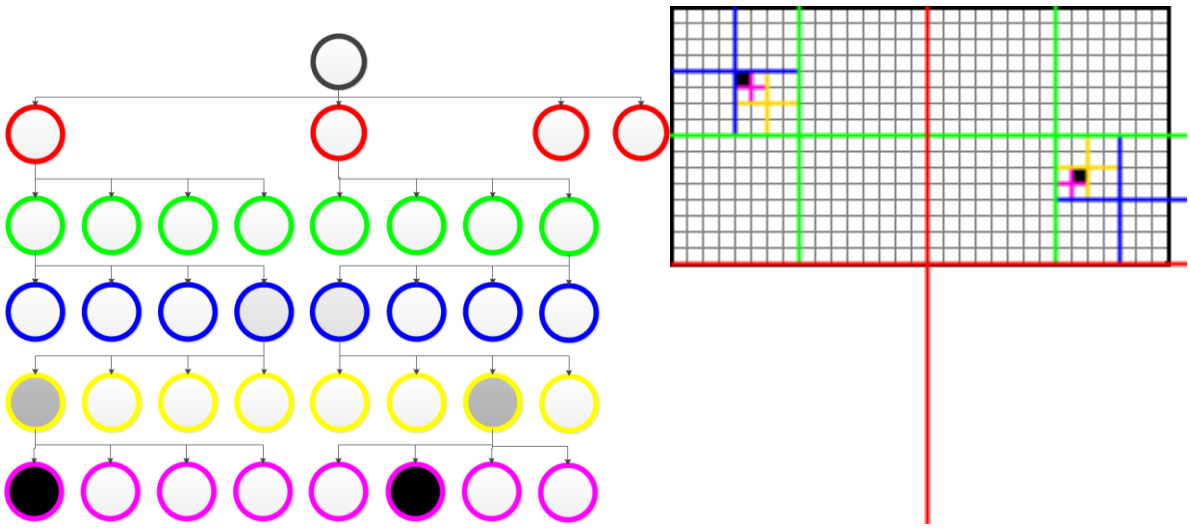


ANSWER



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ANSWER

$$y(k) - d_1 = 1.8 - 1.1 = 0.7$$

$$d < 0.7$$

So first case satisfied therefore

$$P\left(m_{d,\theta}(x(k)) \middle| y(k), x(k)\right) = P\left(m_{d,\theta}(x(k))\right) - s(y(k),\theta) = 0.5 - 0.4 = 0.1$$

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Hit
Miss
Hit

ANSWER

$$\frac{12}{20} = 0.6$$