

## 12.1 (a)

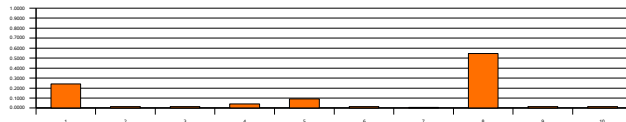
$p(\text{det} \mid \text{landmark})$  0.6  
 $p(\text{det} \mid \text{no landmark})$  0.1  
 $p(\text{not det} \mid \text{no landmark})$  0.9  
 $p(\text{not det} \mid \text{landmark})$  0.4

| Abschnitt | Prior   | (a)    | normalized (a) | (b)    | normalized (b) | ©      | normalized © | (d)    | normalized (d) | (e)    | normalized (e) |
|-----------|---------|--------|----------------|--------|----------------|--------|--------------|--------|----------------|--------|----------------|
| 1         | 0.10000 | 0.0600 | 0.2400         | 0.0400 | 0.0400         | 0.0240 | 0.0667       | 0.4000 | 0.4000         | 0.1600 | 0.2420         |
| 2         | 0.10000 | 0.0100 | 0.0400         | 0.0400 | 0.0400         | 0.0040 | 0.0111       | 0.0111 | 0.0111         | 0.0100 | 0.0151         |
| 3         | 0.10000 | 0.0100 | 0.0400         | 0.0400 | 0.0400         | 0.0040 | 0.0111       | 0.0111 | 0.0111         | 0.0100 | 0.0151         |
| 4         | 0.10000 | 0.0600 | 0.2400         | 0.2400 | 0.2400         | 0.1440 | 0.4000       | 0.0667 | 0.0667         | 0.0267 | 0.0403         |
| 5         | 0.10000 | 0.0100 | 0.0400         | 0.0400 | 0.0400         | 0.0040 | 0.0111       | 0.0667 | 0.0667         | 0.0600 | 0.0908         |
| 6         | 0.10000 | 0.0100 | 0.0400         | 0.0400 | 0.0400         | 0.0040 | 0.0111       | 0.0111 | 0.0111         | 0.0100 | 0.0151         |
| 7         | 0.10000 | 0.0600 | 0.2400         | 0.2400 | 0.2400         | 0.1440 | 0.4000       | 0.0111 | 0.0111         | 0.0044 | 0.0067         |
| 8         | 0.10000 | 0.0100 | 0.0400         | 0.0400 | 0.0400         | 0.0040 | 0.0111       | 0.4000 | 0.4000         | 0.3600 | 0.5445         |
| 9         | 0.10000 | 0.0100 | 0.0400         | 0.0400 | 0.0400         | 0.0040 | 0.0111       | 0.0111 | 0.0111         | 0.0100 | 0.0151         |
| 10        | 0.10000 | 0.0100 | 0.0400         | 0.2400 | 0.2400         | 0.0240 | 0.0667       | 0.0111 | 0.0111         | 0.0100 | 0.0151         |
|           | 1.0000  | 0.2500 | 1.0000         | 1.0000 | 1.0000         | 0.3600 | 1.0000       | 1.0000 | 1.0000         | 0.6611 | 1.0000         |

multiply prior with  $p(\text{det} \mid \dots)$       circular shift      multiply with  $p(\text{det} \mid \dots)$       circular shift      multiply with  $p(\text{no det} \mid \dots)$

prior: equally distributed      normalization: divide by the sum of all probabilities

Posterior (e):



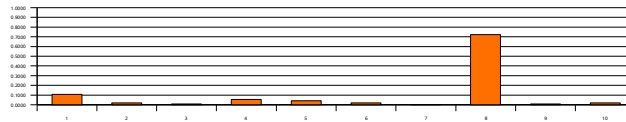
## 12.1 (b)

$p(\text{det} \mid \text{landmark})$  0.6  
 $p(\text{det} \mid \text{no landmark})$  0.1  
 $p(\text{not det} \mid \text{no landmark})$  0.9  
 $p(\text{not det} \mid \text{landmark})$  0.4

| Abschnitt | Prior   | (a)    | normalized (a) | (b)    | normalized (b) | ©      | normalized © | (d)    | normalized (d) | (e)    | normalized (e) |
|-----------|---------|--------|----------------|--------|----------------|--------|--------------|--------|----------------|--------|----------------|
| 1         | 0.15000 | 0.0900 | 0.3273         | 0.0182 | 0.0182         | 0.0109 | 0.0333       | 0.2000 | 0.2000         | 0.0800 | 0.1071         |
| 2         | 0.05000 | 0.0050 | 0.0182         | 0.0545 | 0.0545         | 0.0055 | 0.0167       | 0.0167 | 0.0167         | 0.0150 | 0.0201         |
| 3         | 0.15000 | 0.0150 | 0.0545         | 0.0182 | 0.0182         | 0.0018 | 0.0056       | 0.0056 | 0.0056         | 0.0050 | 0.0067         |
| 4         | 0.05000 | 0.0300 | 0.1091         | 0.3273 | 0.3273         | 0.1964 | 0.6000       | 0.1000 | 0.1000         | 0.0400 | 0.0535         |
| 5         | 0.15000 | 0.0150 | 0.0545         | 0.0182 | 0.0182         | 0.0018 | 0.0056       | 0.0333 | 0.0333         | 0.0300 | 0.0401         |
| 6         | 0.05000 | 0.0050 | 0.0182         | 0.0545 | 0.0545         | 0.0055 | 0.0167       | 0.0167 | 0.0167         | 0.0150 | 0.0201         |
| 7         | 0.15000 | 0.0900 | 0.3273         | 0.1091 | 0.1091         | 0.0655 | 0.2000       | 0.0056 | 0.0056         | 0.0022 | 0.0030         |
| 8         | 0.05000 | 0.0050 | 0.0182         | 0.0545 | 0.0545         | 0.0055 | 0.0167       | 0.6000 | 0.6000         | 0.5400 | 0.7227         |
| 9         | 0.15000 | 0.0150 | 0.0545         | 0.0182 | 0.0182         | 0.0018 | 0.0056       | 0.0056 | 0.0056         | 0.0050 | 0.0067         |
| 10        | 0.05000 | 0.0050 | 0.0182         | 0.3273 | 0.3273         | 0.0327 | 0.1000       | 0.0167 | 0.0167         | 0.0150 | 0.0201         |
|           | 1.0000  | 0.2750 | 1.0000         | 1.0000 | 1.0000         | 0.3273 | 1.0000       | 1.0000 | 1.0000         | 0.7472 | 1.0000         |

only the prior is changed in this part

Posterior (e):



## 12.1 ©

$p(\text{det} \mid \text{landmark})$  0.6  
 $p(\text{det} \mid \text{no landmark})$  0.1  
 $p(\text{not det} \mid \text{no landmark})$  0.9  
 $p(\text{not det} \mid \text{landmark})$  0.4

| Abschnitt | Prior   | (a)    | normalized (a) | (b)    | normalized (b) | ©      | normalized © | (d)    | normalized (d) | (e)    | normalized (e) |
|-----------|---------|--------|----------------|--------|----------------|--------|--------------|--------|----------------|--------|----------------|
| 1         | 0.15000 | 0.0900 | 0.3273         | 0.1145 | 0.1145         | 0.0687 | 0.2270       | 0.1109 | 0.1109         | 0.0443 | 0.0567         |
| 2         | 0.05000 | 0.0050 | 0.0182         | 0.0400 | 0.0400         | 0.0040 | 0.0132       | 0.0672 | 0.0672         | 0.0605 | 0.0774         |
| 3         | 0.15000 | 0.0150 | 0.0545         | 0.0600 | 0.0600         | 0.0060 | 0.0198       | 0.0253 | 0.0253         | 0.0228 | 0.0291         |
| 4         | 0.05000 | 0.0300 | 0.1091         | 0.2036 | 0.2036         | 0.1222 | 0.4036       | 0.0690 | 0.0690         | 0.0276 | 0.0353         |
| 5         | 0.15000 | 0.0150 | 0.0545         | 0.1145 | 0.1145         | 0.0115 | 0.0378       | 0.1577 | 0.1577         | 0.1419 | 0.1815         |
| 6         | 0.05000 | 0.0050 | 0.0182         | 0.0491 | 0.0491         | 0.0049 | 0.0162       | 0.0780 | 0.0780         | 0.0702 | 0.0898         |
| 7         | 0.15000 | 0.0900 | 0.3273         | 0.0873 | 0.0873         | 0.0524 | 0.1730       | 0.0562 | 0.0562         | 0.0225 | 0.0288         |
| 8         | 0.05000 | 0.0050 | 0.0182         | 0.0673 | 0.0673         | 0.0067 | 0.0222       | 0.2519 | 0.2519         | 0.2267 | 0.2899         |
| 9         | 0.15000 | 0.0150 | 0.0545         | 0.0600 | 0.0600         | 0.0060 | 0.0198       | 0.1454 | 0.1454         | 0.1309 | 0.1674         |
| 10        | 0.05000 | 0.0050 | 0.0182         | 0.2036 | 0.2036         | 0.0204 | 0.0673       | 0.0384 | 0.0384         | 0.0345 | 0.0442         |
|           | 1.0000  | 0.2750 | 1.0000         | 1.0000 | 1.0000         | 0.3027 | 1.0000       | 1.0000 | 1.0000         | 0.7820 | 1.0000         |

the motions are no perfect circular shifts anymore, but weighted sums (state: x, action command: a)  
 $p(x) = 0.6 * p(x+a) + 0.3 * p(x+a+1) + 0.1 * p(x+a-1)$   
 (adjusting the indices when lower than 1 and higher than 10, of course)

Posterior (e):

