Motion Model Probability II

pseudo_position (x)	pre-pseudo_position	delta position	P(transition)	bel(x_{t-1})	P(pos
7	1	6	1.49E-06	5.56E-02	8.27
7	2	5	1.34E-04	5.56E-02	7.44
7	3	4	4.43E-03	5.56E-02	2.46
7	4	?	5.40E-02	0.00E+00	0.00
7	5	2	?	0.00E+00	0.00
7	6	1	3.99E-01	0.00E+00	0.00
7	7	0	2.42E-01	?	1.66
7	8	-1	5.40E-02	1.79E-03	

Delta Position

What is difference in position for an x of 7 and a pre-pseudo position of 4?

3

RESET

Show Solution

Transition Probability

Use `norm_pdf` to determine the transition probability for x = 7 and a pre-pseudo_position of 5, assuming a control parameter of 1, and a standard deviation of 1. The transition probability can be determined through `norm_pdf(delta_position, control_parameter, position_stdev)`. Write the answer in scientific notation with an accuracy of two decimal places, for example 3.14E-15.

2.42E-01

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Motion Model Probability II

```
#include <iostream>
#include "help_functions.h"

//Assign 2 to the value term
//This is 7 - 5 = 2
float value = 2;

float parameter = 1.0; //set as control parameter or observation measu
float stdev = 1.0; //position or observation standard deviation

int main() {

    float prob = Helpers::normpdf(value, parameter, stdev);

    std::cout << prob << endl;

    return 0;
}
```

Show Solution

Determine the belief state

In practice we only set our initial belief state, but making the following calculation is helpful in building intuition. What is the belief state bel(x_{t-1}) for the penultimate row of our table above? Write the answer in scientific notation with an accuracy of two decimal places, for example 3.14E-15.

6.86E-03

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Our positon probability is the product of the transition probability and our belief state at t - 1. Rearranging yields:

2.42E-01/1.66E-03 = 6.86E-03

Show Solution

Position Probability

of two decimal places, for example 3.14E-15.

9.66E-05 RESET

Our positon probability is the product of the transition probability and our belief state for our pre-pseudo position.

5.40E-02 * 1.79E-03 = 9.66E-05

Show Solution

We have completed our table of discretized calculation for each ith positon probability value. To determine the final probability returned by the motion model, we must sum the probabilities.

Aggregating Discretized P(position)

Given the table above, what is the final probability returned by our motion model. Enter the answer in scientific notation with an accuracy of two decimal places, for example 3.14E-15.

2.02E-03 RESET

By summing the discrete probabilities from the table, we obtain the total probability, which estimates the probability from a continuous function.

8.27E-08 + 7.44E-06 + 2.46E-04 + 0.00E+00 + 0.00E+00 + 0.00E+00 + 1.66E-03 + 9.66E-05 = 2.02E-03

Show Solution

main.cpp | help_functions.h

```
//==========================================================================
// Name        : help_functions.h
// Version     : 2.0.0
// Copyright   : Udacity
//==========================================================================

#include <iostream>
#include "help_functions.h"

```

Motion Model Probability II

```
float value = 2;//YOUR VALUE HERE


float parameter = 1.0; //set as control parameter or observation measur
float stdev = 1.0; //position or observation standard deviation

int main() {

    float prob = Helpers::normpdf(value, parameter, stdev);

    std::cout << prob << endl;

    return 0;
}
```

RESET QUIZ TEST RUN SUBMIT ANSWER

Recall that the transition probability can be determined through `norm_pdf(delta_position, control_parameter, position_stdev)`

In the next concept we will implement the motion model in C++.

Reference Equations

- **Discretized Motion Model:**

$$\sum_i p(x_t|x_{t-1}^{(i)}, u_t, m) bel(x_{t-1}^{(i)})$$

- **Transition Model:**
- $p(x_t|x_{t-1}^{(i)}, u_t, m)$
- **ith Motion Model Probability:**

$$p(x_t|x_{t-1}^{(i)} u_t, m) * bel(x_{t-1}^{(i)})$$

NEXT