

File mf4b

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function mf = input_mf(x, dimension, size)
% Input parameters: x is an array, dimension is a string and size is an integer.
% Dimension can be angle, angular_velocity, cart_position, cart_velocity.
% Size may be 1 thru 5.

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% Project : Fuzzy Logic Controller for the Inverted Pendulum Problem
% Soft Computing
% Instructors: Kai Goebel / Bill Cheetham

% MF

% This function calculates the input membership functions for the 5^4
% fuzzy logic controller.

x = x(:);

% angle - triangular MF parameters:
% 1 = large negative
% 2 = small negative
% 3 = zero
% 4 = small positive
% 5 = large positive
angle = zeros(5,3);
angle(1,:) = [ -.5  -.2  -.1  ];
angle(2,:) = [ -.2  -.1   0  ];
angle(3,:) = [ -.1   0   .1  ];
angle(4,:) = [  0   .1   .2  ];
angle(5,:) = [ .1   .2   .5  ];

% angular_velocity - triangular MF parameters:
% 1 = large negative
% 2 = small negative
% 3 = zero
% 4 = small positive
% 5 = large positive
angular_velocity = zeros(5,3);
angular_velocity(1,:) = [-10 -5 -1];
angular_velocity(2,:) = [ -5 -1  0];
angular_velocity(3,:) = [ -1  0  1];
angular_velocity(4,:) = [  0  1  5];
angular_velocity(5,:) = [  1  5 10];

% cart_position - triangular MF parameters:
% 1 = large negative
% 2 = small negative
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% 3 = zero
% 4 = small positive
% 5 = large positive
cart_position = zeros(5,3);
cart_position(1,:) = [ -10  -5  -2  ];
cart_position(2,:) = [  -5  -2   0  ];
cart_position(3,:) = [  -2   0   2  ];
cart_position(4,:) = [   0   2   5  ];
cart_position(5,:) = [   2   5  10  ];

% cart_velocity - triangular MF parameters:
% 1 = large negative
% 2 = small negative
% 3 = zero
% 4 = small positive
% 5 = large positive
cart_velocity = zeros(5,3);
cart_velocity(1,:) = [-10 -5 -3];
cart_velocity(2,:) = [ -5 -3  0];
cart_velocity(3,:) = [ -3  0  3];
cart_velocity(4,:) = [  0  3  5];
cart_velocity(5,:) = [  3  5 10];

% Choose which MF parameters to use based on the dimension and
% size parameters passed in.

if strcmp(dimension,'angle'),
    mf = triangle_mf(x,angle(size,:));

elseif strcmp(dimension, 'angular_velocity'),
    mf = triangle_mf(x,angular_velocity(size,:));

elseif strcmp(dimension,'cart_position'),
    mf = triangle_mf(x,cart_position(size,:));

elseif strcmp(dimension, 'cart_velocity'),
    mf = triangle_mf(x,cart_velocity(size,:));

else
    error('Unknown Dimension. ');
end

```