智能系统控制 实验三

隶属函数

实验报告

顾骏杰 19122753

一、实验目的

了解隶属函数的特点与 MATLAB 仿真实现。

二、实验环境

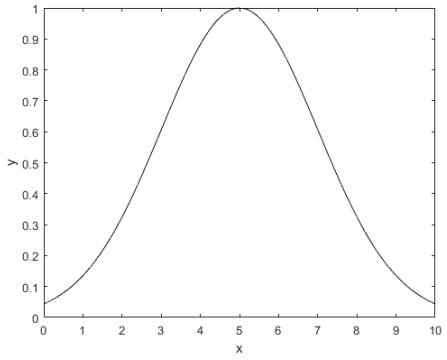
实验环境：MATLAB R2018b

三、实验步骤

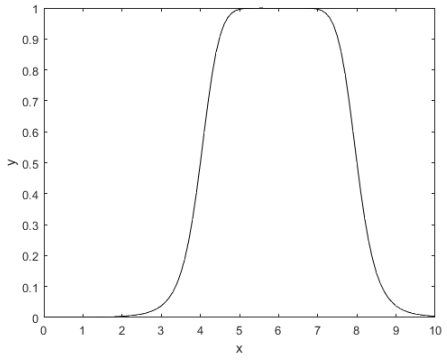
1、对隶属函数进行仿真：

```
% Membership function
clear all;
close all;
M = 6;
if M == 1
% Guassian membership function
    x=0: 0.1: 10;
    y=gaussmf(x, [2 5]) ;
    plot (x, y, 'k') ;
    xlabel('x'); ylabel('y');
elseif M==2
% General Bell membership function
    x=0 : 0.1: 10;
    y=gbellmf (x, [2 4 6]);
    plot (x, y, 'k ');
    xlabel ('x'); ylabel ('y') ;
elseif M==3
% S membership function
    x=0: 0.1 : 10;
    y= sigmf (x, [2 4]);
    plot (x, y, 'k');
    xlabel ('x');ylabel ('y');
elseif M==4
% Trapezoid membership function
    x=0 : 0.1 : 10;
    y=trapmf (x, [1 5 7 8]) ;
    plot (x, y, 'k') ;
    xlabel ('x'); ylabel ('y');
elseif M==5
% Triangle membership function
    x=0 : 0.1 : 10;
```

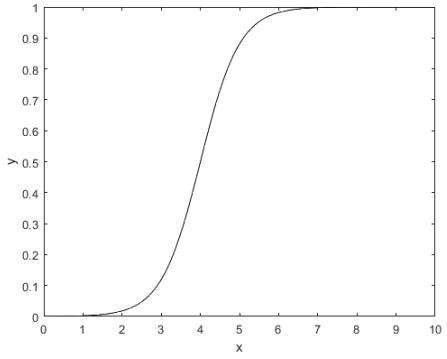
```
    y=trimf (x, [3 6 8]) ;
    plot (x, y, 'k');
    xlabel ('x') ;ylabel ('y');
elseif M==6
% Z membership function
    x=0 : 0.1 : 10;
    y=zmf(x, [3 7]);
    plot (x, y, 'k');
    xlabel ('x') ;ylabel ('y');
end
```



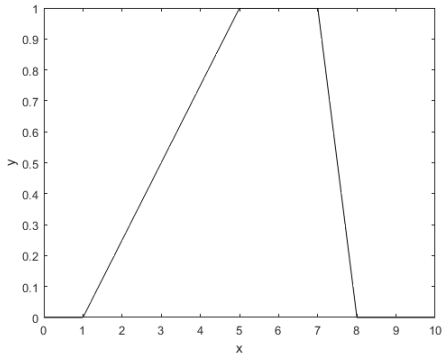
高斯型隶属函数



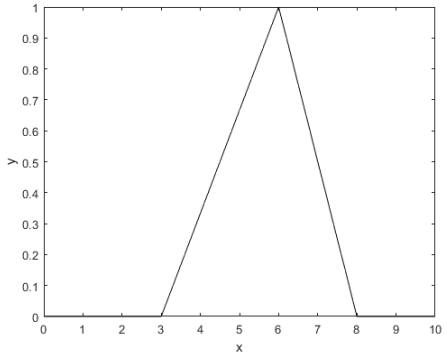
广义钟形隶属函数



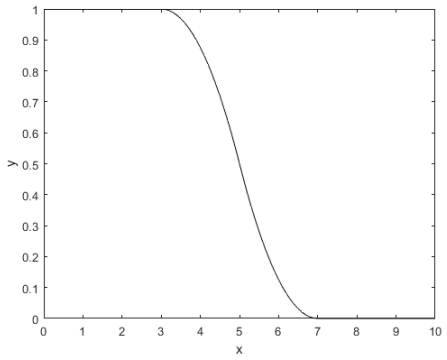
S 形隶属函数



梯形隶属函数



三角形隶属函数



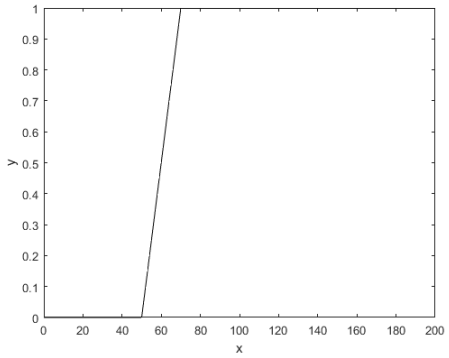
Z 形隶属函数

2、已知年龄的论域为[0,200]，且“年老 O”与“年轻 Y”两个模糊集合的隶属函数分别为

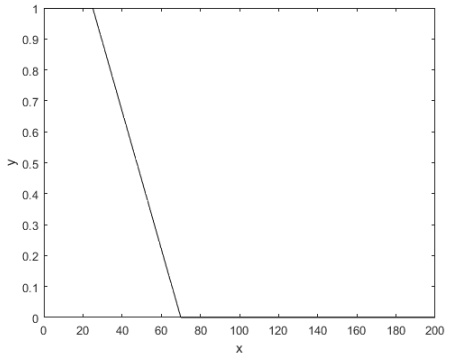
$$\mu_O(a)=\begin{cases}0 & 0\le a\le 50\\ \dfrac{a-50}{20} & 50\le a\le 70\\ 1 & 70\le a\end{cases}$$

$$\mu_Y(a)=\begin{cases}1 & 0\le a\le 25\\ \dfrac{70-a}{25} & 25\le a\le 70\\ 0 & 70\le a\end{cases}$$

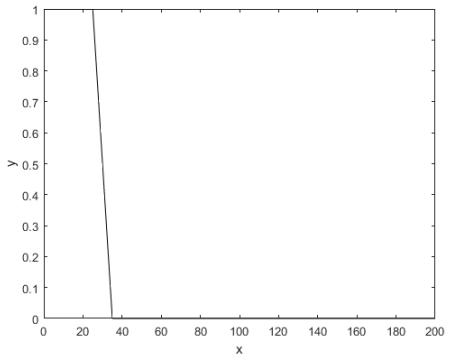
试设计“很年轻 W”，“不老也不年轻 V”两个模糊集合的隶属函数，并用 MATLAB 实现上述四个隶属函数的仿真。



年老 O

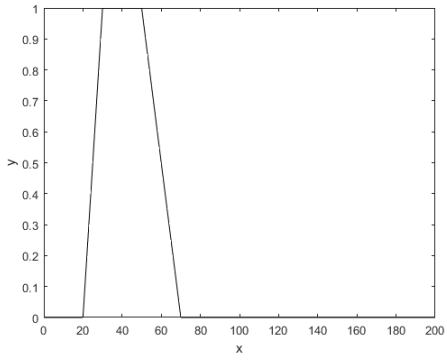


年轻 Y



很年轻 W

$$\mu_W(a)=\begin{cases}1 & 0\le a\le 25\\ \dfrac{35-a}{10} & 25\le a\le 35\\ 0 & 35\le a\end{cases}$$



不老也不年轻 V

$$\mu_W(a)=\begin{cases}0 & a\le 20\\ \frac{a-20}{10} & 20\le a\le 30\\ 1 & 30\le a\le 50\\ \frac{70-a}{20} & 50\le a\le 70\\ 0 & 70\le a\end{cases}$$

MATLAB 代码：

```
clear all;
close all;
M = 3;
if M == 1 % O
    x = 0 : 1 : 200;
    y = trapmf(x, [50 70 200 200]);
    plot(x, y, 'k');
    xlabel('x'); ylabel('y');
elseif M == 2 % Y
    x = 0 : 1: 200;
    y = trapmf(x, [0 0 25 70]);
    plot(x, y, 'k ');
    xlabel('x'); ylabel('y');
elseif M == 3 % W
    x = 0: 1 : 200;
    y = trapmf(x, [0 0 25 35]);
    plot(x, y, 'k');
    xlabel('x'); ylabel('y');
elseif M == 4 % V
    x = 0 : 1 : 200;
    y = trapmf(x, [20 30 50 70]) ;
    plot(x, y, 'k') ;
    xlabel('x'); ylabel('y');
end
```