

Да кажем че обекта който ще управляваме е електрическа пещ.

Имаме данни за температурата и меним мощността на нагревателя в граници 0-100%.

Искаме температурата да е SP.

Входни данни са стойност на температурата и първата и производна.

Първото което се прави е фъзификация на данните, т.е. изчисляване на мембер функциите, който ще са следните:

За температурата:

VeryCool

Cool

Exactly

Hot

VeryHot

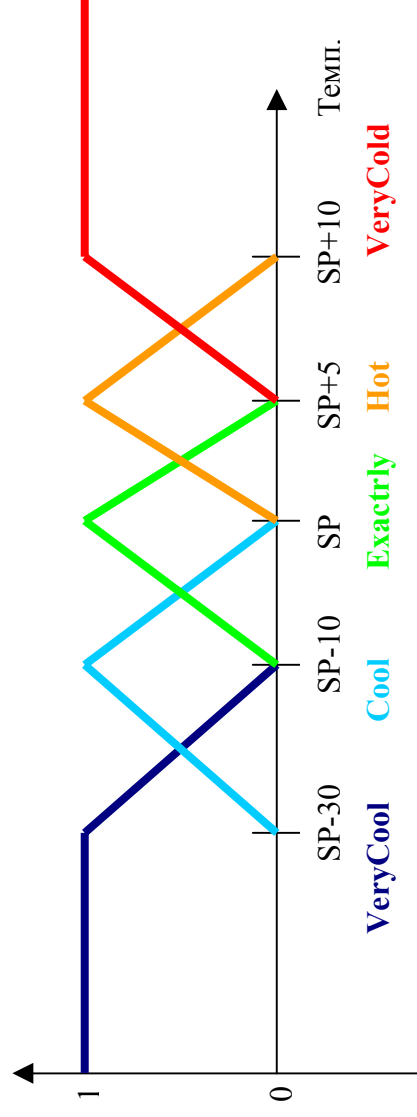
За първата и производна:

Rising

NoChange

Falling

Функциите ги избираме да са триъгълни. Всяка функция има стойност от 0 до 1.



Изчисляват се мембер функциите на за температурата. Същото се прави и за първа производна. Няма да влизам в подробности и да чертая графика пак.

Трябва да обърнем внимание и на управляващите правила и на изхода. Да кажем за мощността на нагревателя имам пет възможности за промяна който ще опиша в правилата по късно:

pBigIncrement – увеличение на мощността с 30%;

pIncrement – увеличение с 10%;

pNoChange – няма промяна на мощността;

pDecrement – намаление с 10%;

pBigDecrement – намаление с 30%;

Та сега за правилата на контролиране. Ще ги направя следните

If VeryCool(T) and Falling(dT) then PowerChange is pBigIncrement;

If VeryCool(T) and NoChange(dT) then PowerChange is pBigIncrement;

If VeryCool(T) and Rising(dT) then PowerChange is pIncrement;

If Cool(T) and Falling(dT) then PowerChange is pBigIncrement;

If Cool(T) and NoChange(dT) then PowerChange is pIncrement;

If Cool (T) and Rising(dT) then PowerChange is pNoChange;

If Exactly(T) and Falling(dT) then PowerChange is pIncrement;

If Exactly(T) and NoChange(dT) then PowerChange is NoChange;

If Exactly(T) and Rising(dT) then PowerChange is pDecrement;

If Hot(T) and Falling(dT) then PowerChange is NoChange;

If Hot(T) and NoChange(dT) then PowerChange is pDecrement;

If Hot(T) and Rising(dT) then PowerChange is pBigDecrement;

If VeryHot(T) and Falling(dT) then PowerChange is pDecrement;

If VeryHot(T) and NoChange(dT) then PowerChange is pBigDecrement;

If VeryHot(T) and Rising(dT) then PowerChange is pBigDecrement;

Това са правилата за контрол над температурата. Въпроса е как да се определи точната стойност на PowerChange от тях.

Трябват ни 5 масива:

mBigIncrement

mIncrement
mNoChange
mDecrement
mBigDecrement

Размерността на всеки масив е толкова колкото съответното pBigIncrement, pIncrement и т.н.т. се среща в правилата.

Стойността на всеки елемент от масива се определя според съответното правило по следния начин:

Вземаме например първото правило:

If VeryCool(T) and Falling(dT) then PowerChange is pBigIncrement;

Значи за първи елемент от mBigIncrement имаме:

mBigIncrement[1] = Min(VeryCool(T), Falling(dT));

За следващата стойност:

mBigIncrement[2] = Min(VeryCool(T), NoChange(dT));

И така за всички елементи от масивите.

Следващото което се прави е определянето на 5 стойности:

fBigIncrement

fIncrement

fNoChange

fDecrement

fBigDecrement

Всяка стойност се определя от съответния масив по следния начин:

fBigIncrement:= Power(mBigIncrement[1],2) + Power(mBigIncrement[2],2))+...

fBigIncrement:=Sqrt(fBigIncrement);

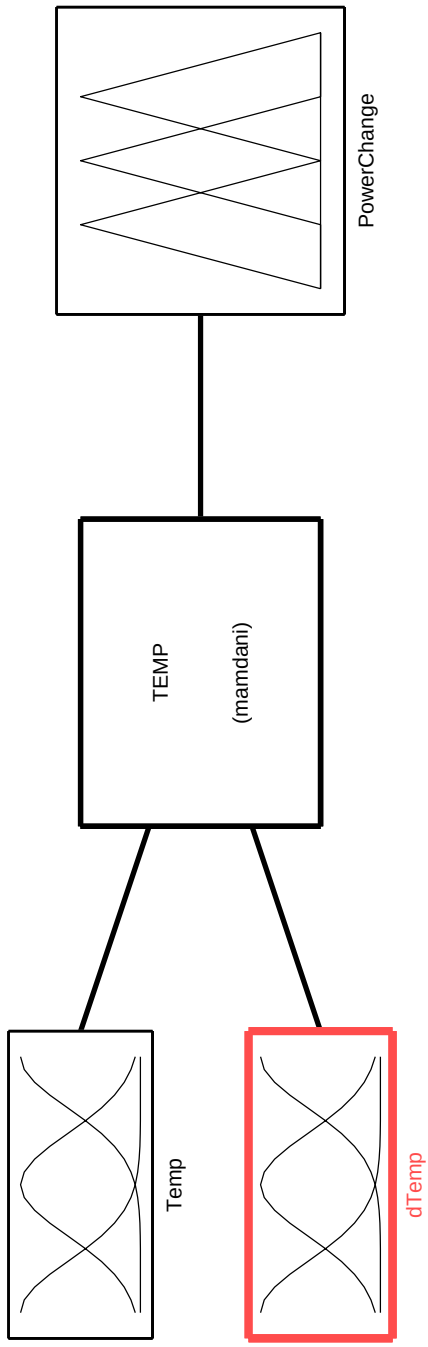
Т.е. всяка стойност е квадратен корен от сбора на квадратите на съответния масив.

И накрая намираме стойността на PowerChange по следната формула:

$$PowerChange\ e = \frac{(fBigIncrement\ ent * 30 + fIncrement * 10 + fNoChange * 0 + fDecrement * (-10) + fBigDecrement\ ent * (-30))}{(fBigIncrement\ ent + fIncrement + fNoChange + fDecrement + fBigDecrement\ ent)}$$

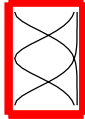
fNoChange*0 съм го вмъкнал за яснота.

Не знам до колко е разбираемо написано, но ако някой нещо не му е ясно да пита.

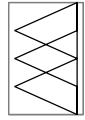


FIS Name:	TEMP	FIS Type:	mamdani
And method	min	Current Variable	
Or method	max	Name	dTemp
Implication	min	Type	input
Aggregation	max	Range	[0 100]
Defuzzification	centroid		
		Help	Close
Ready			

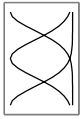
FIS Variables



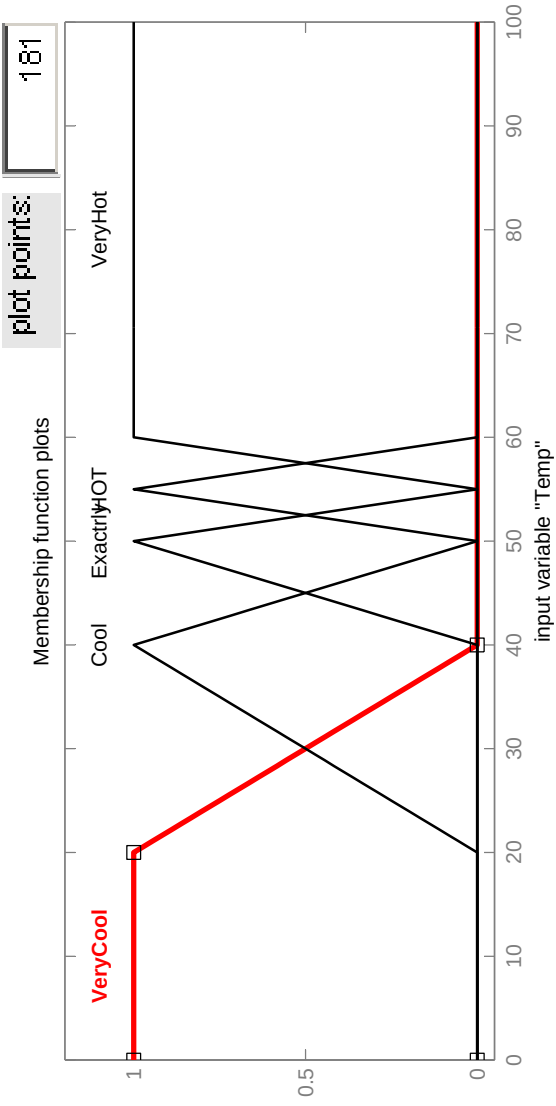
Temp



PowerChange



dTemp



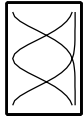
Current Variable			
Name	Temp		
Type	input		
Range		[0 100]	
Display Range		[0 100]	

Current Membership Function (click on MF to select)			
Name	VeryCool		
Type	trapmf		
Params		[0 0 20 40]	

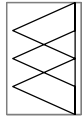
Help Close

Ready

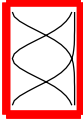
FIS Variables



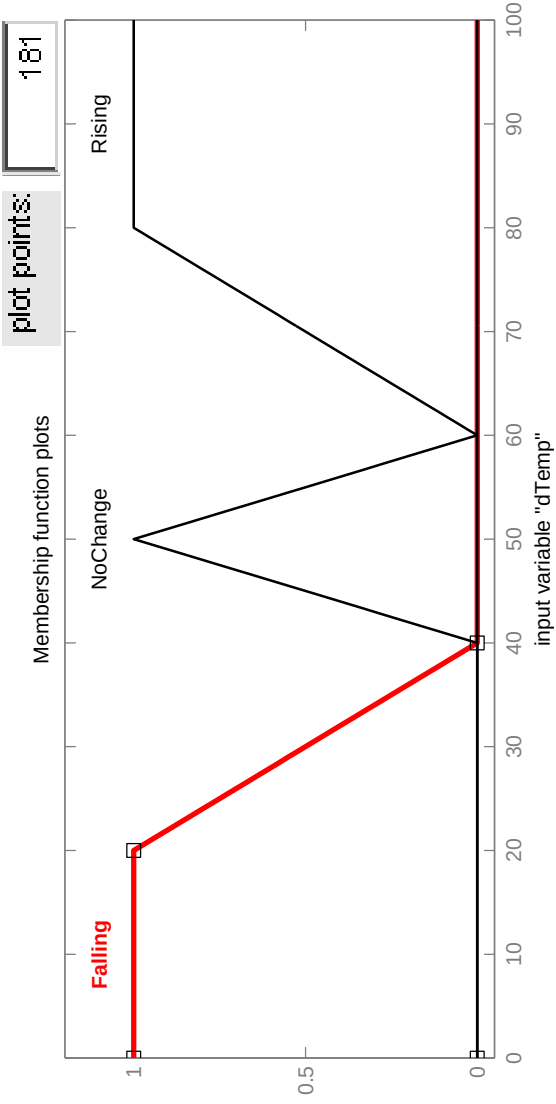
Temp



PowerChange



dTemp



Current Variable			
Name	dTemp		
Type	input		
Range	[0 100]		
Display Range	[0 100]		

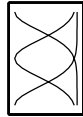
Current Membership Function (click on MF to select)			
Name	Falling		
Type	trapmf		
Params	[0 0 20 40]		

Help

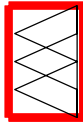
Close

Selected variable "dTemp"

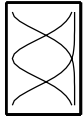
FIS Variables



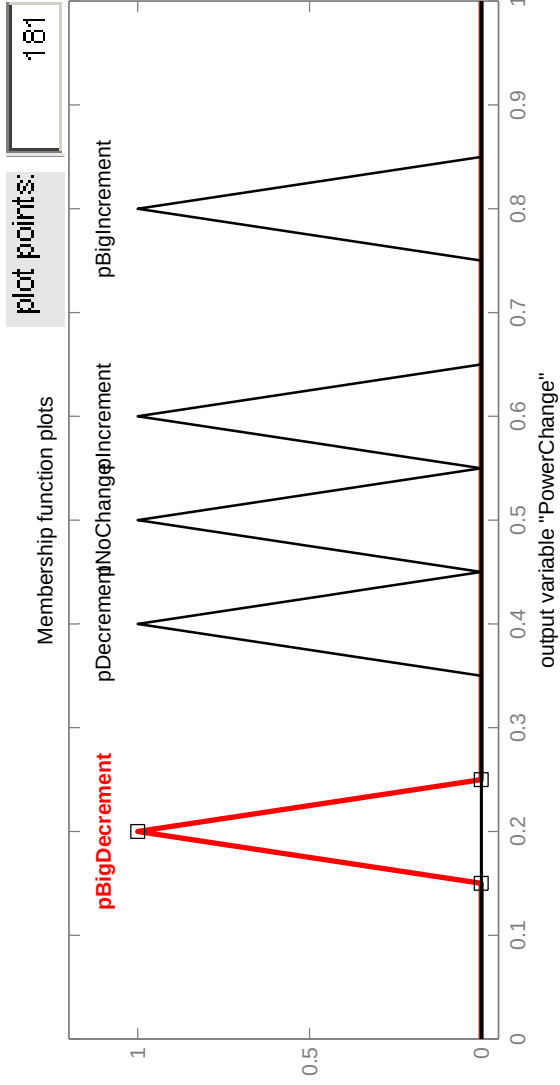
Temp



PowerChange



dTemp



Current Membership Function (click on MF to select)			
Name	pBigDecrement		
Type	trimf		
Params	[0.15 0.2 0.25]		
Help		Close	

Current Variable			
Name	PowerChange		
Type	output		
Range	[0 1]		
Display Range	[0 1]		

Selected variable "PowerChange"

1. If (Temp is VeryCool) and (dTemp is Falling) then (PowerChange is pBigIncrement) (1)

2. If (Temp is VeryCool) and (dTemp is NoChange) then (PowerChange is pBigIncrement) (1)

3. If (Temp is VeryCool) and (dTemp is Rising) then (PowerChange is pBigIncrement) (1)

4. If (Temp is Cool) and (dTemp is Falling) then (PowerChange is pBigIncrement) (1)

5. If (Temp is Cool) and (dTemp is NoChange) then (PowerChange is pBigIncrement) (1)

6. If (Temp is Cool) and (dTemp is Rising) then (PowerChange is pBigIncrement) (1)

7. If (Temp is Exactly) and (dTemp is Falling) then (PowerChange is pNoChange) (1)

8. If (Temp is Exactly) and (dTemp is NoChange) then (PowerChange is pNoChange) (1)

9. If (Temp is Exactly) and (dTemp is Rising) then (PowerChange is pDecrement) (1)

10. If (Temp is HOT) and (dTemp is Falling) then (PowerChange is pNoChange) (1)

11. If (Temp is HOT) and (dTemp is NoChange) then (PowerChange is pDecrement) (1)

12. If (Temp is HOT) and (dTemp is Rising) then (PowerChange is pBigDecrement) (1)

13. If (Temp is VeryHot) and (dTemp is Falling) then (PowerChange is pDecrement) (1)

14. If (Temp is VeryHot) and (dTemp is NoChange) then (PowerChange is pBigDecrement) (1)

15. If (Temp is VeryHot) and (dTemp is Rising) then (PowerChange is pBigDecrement) (1)

Temp is

VeryCool

Exactly

VeryHot

Cool

HOT

none

☐ not

dTemp is

Falling

NoChange

Rising

none

☐ not

and

TempChange is

pBigDecremen

pNoChange

pBigIncrement

pIncment

pDecrement

none

☐ not

Connection

☐ or

☒ and

Weight:

1

Delete rule

Add rule

Change rule

<<

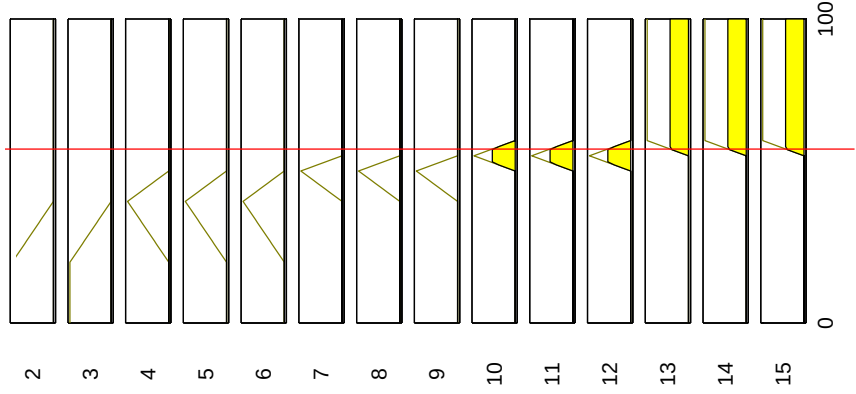
>>

FIS Name: TEMP

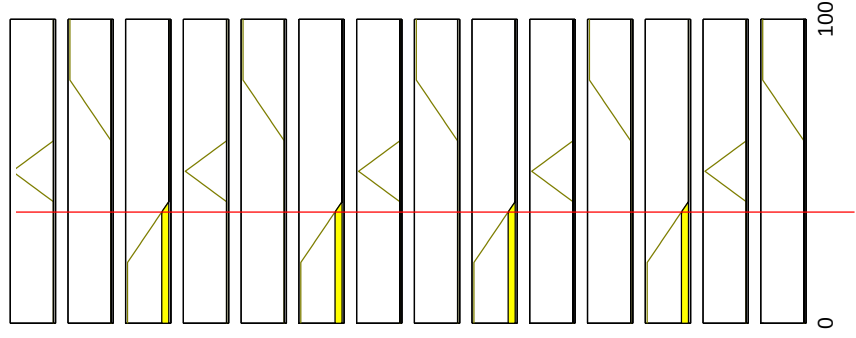
Help

Close

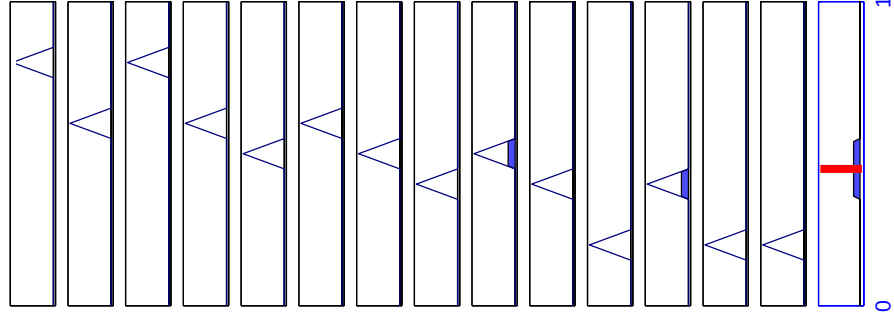
Temp = 57.2



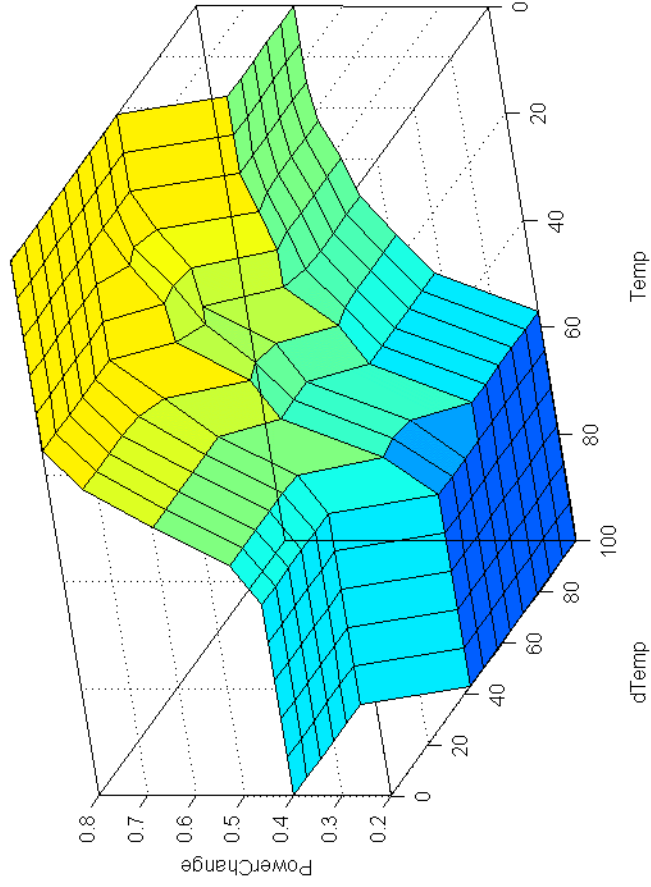
dTemp = 36.6



PowerChange = 0.45



Input: [57 24 36 62]	Plot points: 101	Move: left right down up
Opened system TEMP, 15 rules		Help Close



X (input):

Temp



Y (input):

dTemp



Z (output):

PowerChan...



X grids:

15

Y grids:

15



Evaluate

Ref. Input:

Help

Close

Ready