Fuzzy Logic

Use Case

Bagian Fuzzy
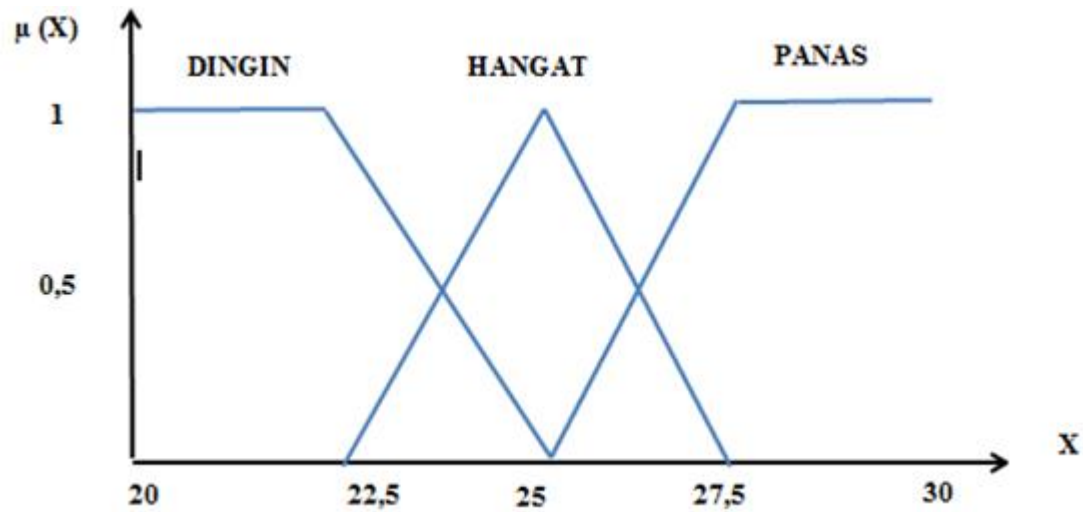## Fuzzy Mamdani – And – Min

- Fuzzifikasi
- Rule Evaluation
- Defuzzifikasi
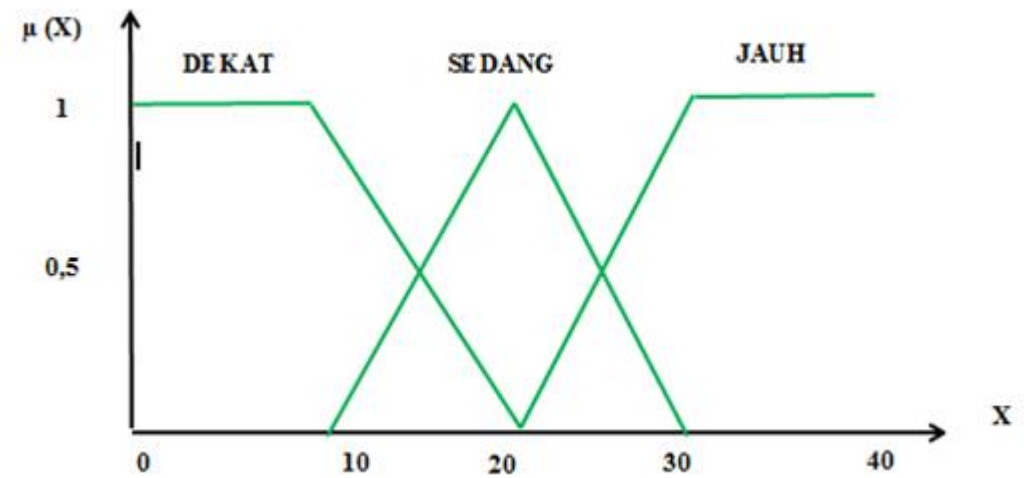
Fuzzifikasi

Input
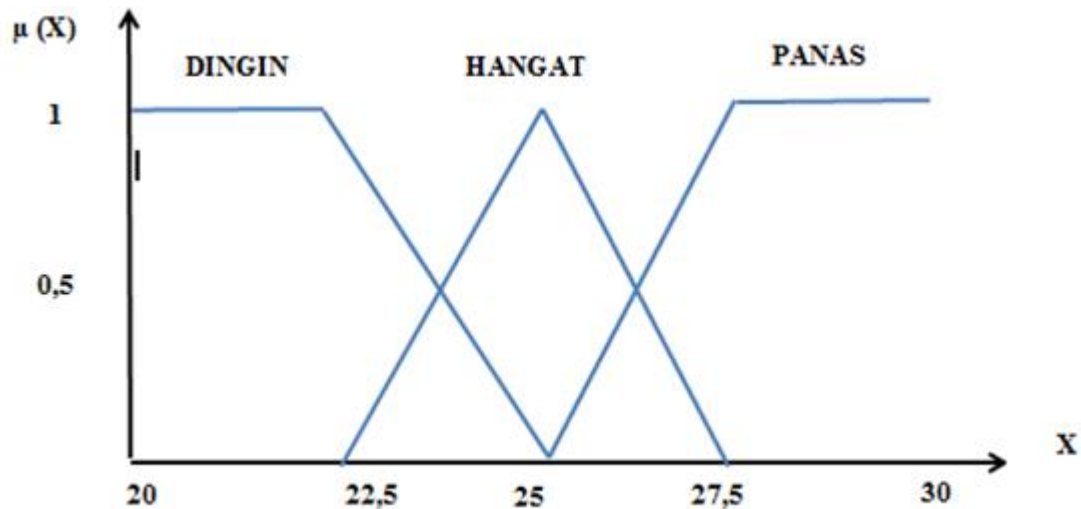
SUHU

JARAK

Fuzzifikasi – MF (Keanggotaan)

SUHU

SUHU

Dingin
Jika suhu <= 22.5
        suhuDingin = 1
Jika suhu > 22.5 & suhu <= 25
        suhuDingin = (25 – suhu) / (25 – 22.5)
Jika suhu > 25
        suhuDingin = 0

Hangat
Jika suhu <= 22.5
        suhuHangat = 0
Jika suhu > 22.5 & suhu <= 25
        suhuHangat = (suhu – 22.5) / (25 – 22.5)
Jika suhu > 25 & suhu <= 27.5
        suhuHangat = (27.5 – suhu) / (27.5 – 25)
Jika suhu > 27.5
        suhuHangat = 0

Panas
Jika suhu <= 25
        suhuPanas = 0
Jika suhu > 25 & suhu <= 27.5
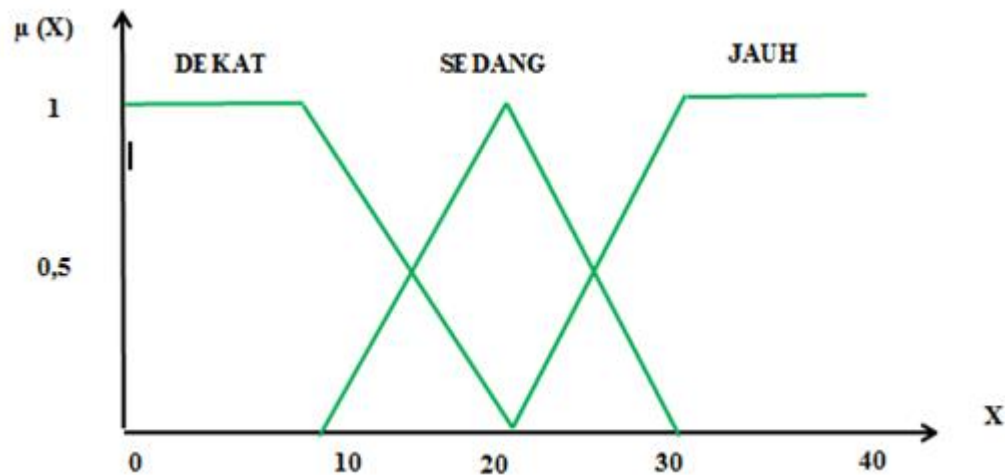   suhuPanas = (suhu – 25) / (27.5 – 25)
Jika suhu > 27.5
        suhuPanas = 1

Fuzzifikasi – MF (Keanggotaan)

JARAK

JARAK

Dekat
Jika jarak <= 10
    jarakDekat = 1
Jika jarak > 10 & suhu <= 20
    jarakDekat = (20 – jarak) / (20 – 10)
Jika jarak > 20
    jarakDekat = 0

Sedang
Jika jarak <= 10
    jarakSedang = 0
Jika jarak > 10 & suhu <= 20
    jarakSedang = (jarak – 10) / (20 – 10)
Jika jarak > 20 & suhu <= 30
    jarakSedang = (30 – jarak) / (30 – 20)
Jika jarak > 30
    jarakSedang = 0

Jauh
Jika jarak <= 20
    jarakJauh = 0
jika jarak > 20 & jarak <= 30
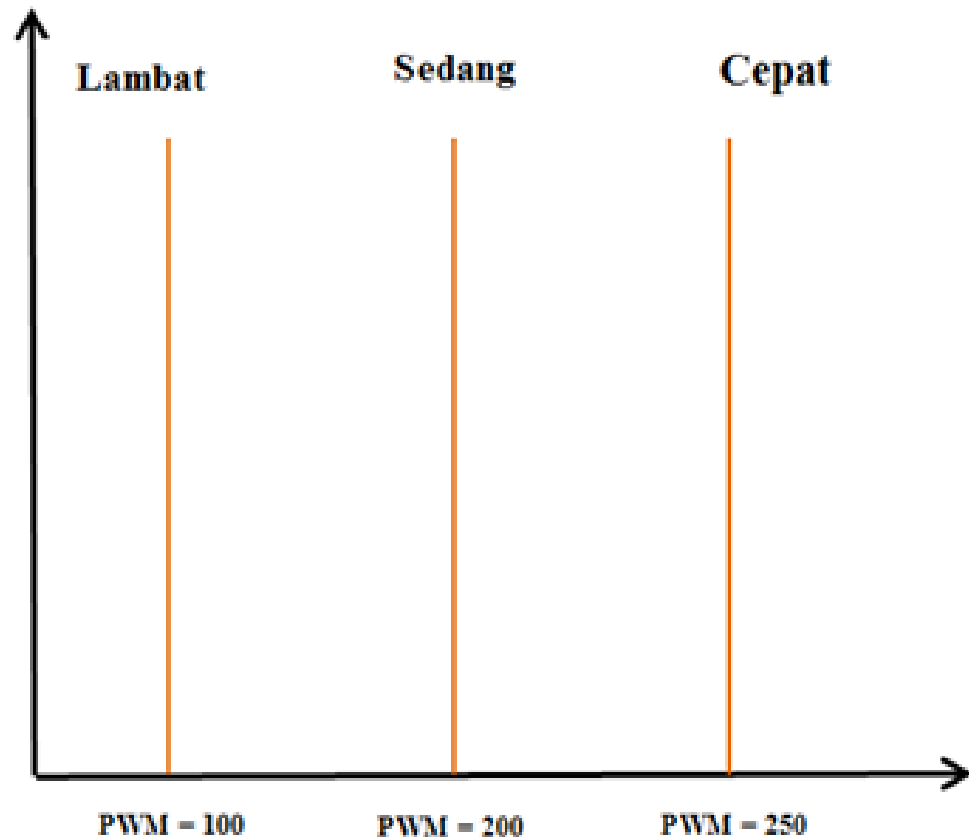   jarakjauh = (jarak - 20)/(30-20)
jika jarak > 30
    jarakjauh=1

Fuzzifikasi

Output
PWM (Kipas Angin)

PWM
pwmLambat = 100
pwmSedang = 200
pwmCepat = 250

Rule Evaluation

Suhu(i) / Jarak(j)	Dingin	Hangat	Panas
Dekat	Lambat	Lambat	Cepat
Sedang	Lambat	Sedang	Cepat
Jauh	Lambat	Cepat	Cepat

Rule Base

1. Jika Suhu Dingin dan Jarak Dekat, maka Kipas Angin Lambat
2. Jika suhu Dingin dan Jarak Sedang, kipas angin lambat
3. Jika suhu dingin dan jarak jauh, maka kipas angin lambat

4. Jika suhu hangat dan jarak dekat, kipas angin lambat
5. Jika suhu hangat dan jarak sedang, kipas angin sedang
6. Jika suhu hangat dan jarak jauh, kipas angin cepat

7. jika suhu panas dan jarak jauh, kipas cepat
8. jika suhu panas dan jarak sedang ,kipas cepat
9. jika suhu panas dan jarak dekat ,kipas cepat

Rule Evaluation

Rule Base

Suhu(i) / Jarak(j)	Dingin	Hangat	Panas
Dekat	Lambat	Lambat	Cepat
Sedang	Lambat	Sedang	Cepat
Jauh	Lambat	Cepat	Cepat

Contoh MIN
rule00
= (min(suhuDingin, jarakDekat)
= (min(0.2, 0.3))
= 0.2

1. rule00 = (min(suhuDingin, jarakDekat)
2. rule01 = (min(suhuDingin, jarakSedang)
3. rule02 = (min(suhuDingin, jarakJauh)

4. rule10 = (min(suhuHangat, jarakDekat)
5. rule11 = (min(suhuHangat, jarakSedang)
6. rule12 = (min(suhuHangat, jarakJauh)

7. rule20 = (min(suhuPanas, jarakDekat)
8. rule21 = (min(suhuPanas, jarakSedang)
9. rule22 = (min(suhuPanas, jarakJauh)

De-Fuzzifikasi

PWM
pwmLambat = 100
pwmSedang = 200
pwmCepat = 250

$$COA(A) = \frac{\sum\limits_{x} \mu_A(x) \times x}{\sum\limits_{x} \mu_A(x)}$$

$$COA(A) = \frac{\int \mu_A(x) x \, dx}{\int \mu_A(x) \, dx}$$

PWM0 = (rule00 * pwmLambat) + (rule01 * pwmLambat) + (rule02 * pwmLambat)

PWM1 = (rule10 * pwmLambat) + (rule11 * pwmSedang) + (rule12 * pwmCepat)

PWM2 = (rule20 * pwmCepat) + (rule21 * pwmCepat) + (rule22 * pwmCepat)

PWMTot = PWM0 + PWM1 + PWM2

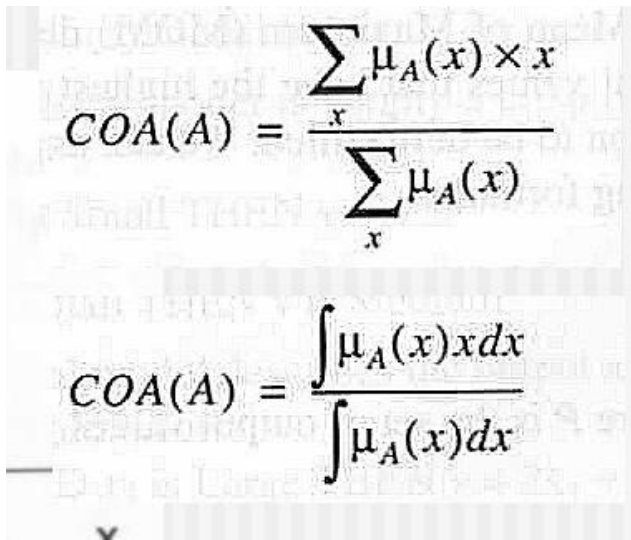DEF0 = (rule00) + (rule01) + (rule02)

DEF1 = (rule10) + (rule11) + (rule12)

DEF2 = (rule20) + (rule21) + (rule22)

DEFTot = DEF0 + DEF1 + DEF2

OutPWM = PWMTot / DEFTot