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UAS KECERDASAN BUATAN

PERHITUNGAN MANUAL MENENTUKAN KECEPATAN PUTARAN MESIN CUCI DENGAN MENGGUNAKAN METODE FUZZY TSUKAMOTO

Terdapat 3 variabel, yaitu: 2 variabel input, variabel pakaian, dan variabel kekotoran, sedangkan untuk output terdapat 1 variabel, yaitu: putaran.

- Variabel Pakaian memiliki 3 nilai linguistik, yaitu: sedikit, sedang dan banyak
- Variabel Kekotoran memiliki 4 nilai linguistik, yaitu: rendah, sedang, tinggi, sangat tinggi
  Sedangkan variabel produksi barang memiliki 2 nilai linguistik, yaitu: lambat dan cepat

Pakaian terendah = 40
Pakaian sedang = 60
Pakaian tertinggi = 80

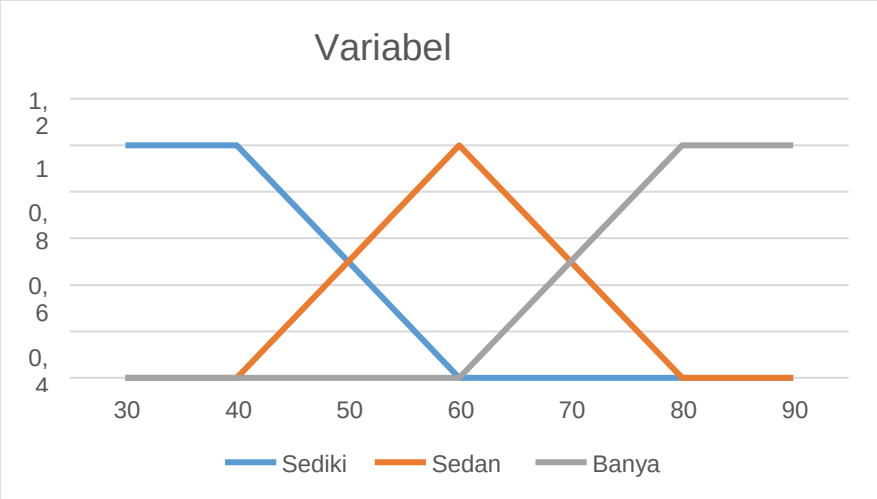
Kekotoran terendah = 40
Kekotoran sedang = 50
Kekotoran tinggi = 60
Kekotoran terttinggi = 70

Contoh Soal:

Hitunglah kecepatan putaran mesin cuci dengan metode tsukamoto, Jika banyaknya pakaian adalah 65 dan tingkat kekotoran adalah 56.

Jawab:

1. **Fuzifikasi**
   1. Variabel Pakaian



a. $\mu_{Rendah}(x) = \begin{cases} 0 ; x \geq 60 \\ \frac{60-x}{60-40} ; 40 \leq x \leq 60 \\ 1 ; x \leq 40 \end{cases}$

$\mu_{Rendah}(65) = 0$

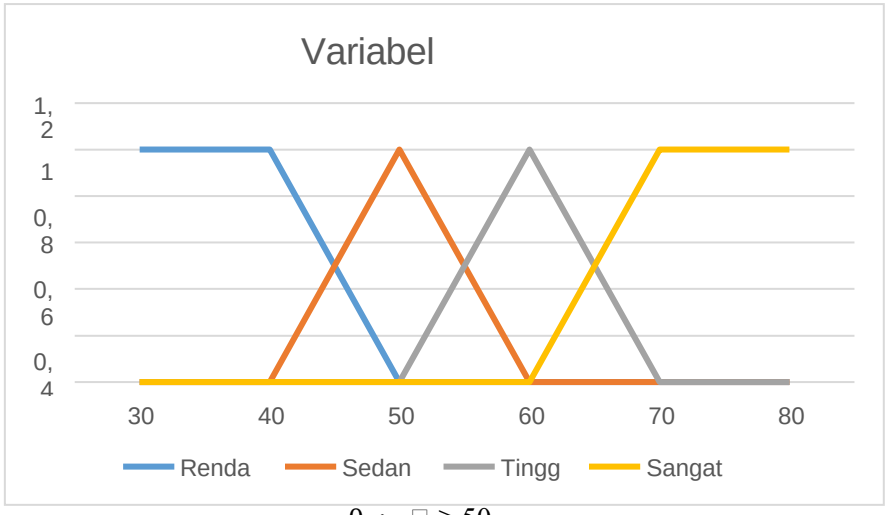
b. $\mu_{Sedang}(x) = \begin{cases} 0 ; x \leq 40 \text{ atau } x \geq 80 \\ \frac{x-40}{60-40} ; 40 \leq x \leq 60 \\ \frac{80-x}{80-60} ; 60 \leq x \leq 80 \end{cases}$

$\mu_{Sedang}(65) = \frac{80-65}{80-60} = 0,75$

c. $\mu_{Tinggi}(x) = \begin{cases} 0 ; x \leq 60 \\ \frac{x-60}{80-60} ; 60 \leq x \leq 80 \\ 1 ; x \geq 80 \end{cases}$

$\mu_{Tinggi}(65) = \frac{65-60}{80-60} = 0,25$

2. Variabel Kekotoran



a. $\mu_{Bersih}h(x) = \begin{cases} 0 ; x \geq 50 \\ \frac{50-x}{50-40} ; 40 \leq x \leq 50 \\ 1 ; x \leq 40 \end{cases}$

$\mu_{Bersih}h(56) = 0$

$$\text{b. } \mu_{\text{Lamba}}(x) = \begin{cases} 0 \ ; & x \le 40 \text{ atau } x \ge 60 \\ \frac{x-40}{50-40} \ ; & 40 \le x \le 50 \\ \frac{60-x}{60-50} \ ; & 50 \le x \le 60 \end{cases}$$

$$\mu_{\text{Lamba}}(56) = \frac{60-56}{60-50} = 0.4$$

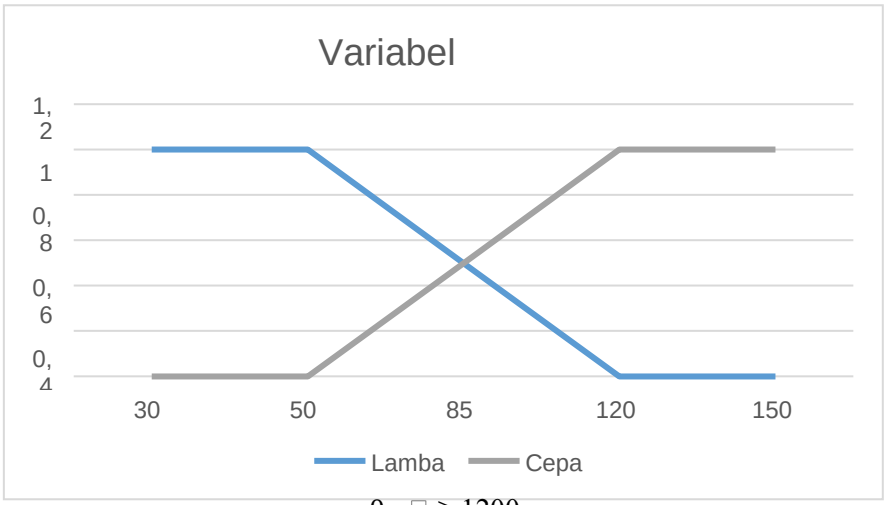
$$\text{c. } \mu_{\text{Cepa}}(x) = \begin{cases} 0 \ ; & x \le 50 \text{ atau } x \ge 70 \\ \frac{x-50}{60-50} \ ; & 50 \le x \le 60 \\ \frac{70-x}{70-60} \ ; & 60 \le x \le 70 \end{cases}$$

$$\mu_{\text{Cepa}}(56) = \frac{56-50}{60-50} = 0.6$$

$$\text{d. } \mu_{\text{Lamba\_Cepa}}(x) = \begin{cases} 0 \ ; & x \le 60 \\ \frac{x-60}{70-60} \ ; & 60 \le x \le 70 \\ 1 \ ; & x \ge 70 \end{cases}$$

$$\mu_{\text{Lamba\_Cepa}}(56) = 0$$

3. Variabel Putaran



$$\text{a. } \mu_{\text{Turun}}(x) = \begin{cases} 0 \ ; & x \ge 1200 \\ \frac{1200-x}{1200-500} \ ; & 500 \le x \le 1200 \\ 1 \ ; & x \le 500 \end{cases}$$

b. $\square\square\square\square\square(\square) = \begin{cases} 0 ; \square \leq 500 \\ \frac{\square - 500}{1200 - 500} ; 500 \leq \square \leq 1200 \\ 1 ; \square \leq 500 \end{cases}$

2. Inferensi

Rumus z jika kecepatan putaran lambat = $\square = \square\square\square\square - \square * (\square\square\square\square - \square\square\square\square)$
Rumus z jika kecepatan putaran cepat $\square = \square(\square\square\square\square - \square\square\square\square) + \square\square\square\square$

1. If Pakaian sedikit and Kekotoran rendah then Kecepatan putaran lambat
   $\square 1 = \square\square\square\square\square\square\square\square[\square] \cap \square\square\square\square\square\square h[\square]$
   $\square 1 = \square\square\square(\square\square\square\square\square\square\square\square[65] ; \square\square\square\square\square\square h[56])$
   $\square 1 = \min(0; 0)$
   $\square 1 = 0$

   $\square 1 = \square\square\square\square - \square 1 * (\square\square\square\square - \square\square\square\square)$
   $\square 1 = 1200 - 0$
   $\square 1 = 1200$

2. If Pakaian sedikit and Kekotoran setengah then Kecepatan putaran lambat
   $\square 2 = \square\square\square\square\square\square\square\square[\square] \cap \square\square\square\square\square\square\square\square h[\square]$
   $\square 2 = \square\square\square(\square\square\square\square\square\square\square\square[65] ; \square\square\square\square\square\square\square\square h[56])$
   $\square 2 = \square\square\square(0; 0{,}4)$
   $\square 2 = 0$

   $\square 2 = \square\square\square\square - \square 2 * (\square\square\square\square - \square\square\square\square)$
   $\square 2 = 1200 - 0$
   $\square 2 = 1200$

3. If Pakaian sedikit and Kekotoran tinggi then Kecepatan putaran lambat
   $\square 3 = \square\square\square\square\square\square\square\square[\square] \cap \square\square\square\square\square\square\square[\square]$
   $\square 3 = \square\square\square(\square\square\square\square\square\square\square\square[65] ; \square\square\square\square\square\square\square[56])$
   $\square 3 = \square\square\square(0; 0{,}6)$
   $\square 3 = 0$

   $\square 3 = \square\square\square\square - \square 3 * (\square\square\square\square - \square\square\square\square)$
   $\square 3 = 1200 - 0$
   $\square 3 = 1200$

4. If Pakaian sedikit and Kekotoran sangat tinggi then Kecepatan putaran cepat
   $\square 4 = \square\square\square\square\square\square\square\square[\square] \cap \square\square\square\square\square\square\square\_\square\square\square\square\square[\square]$
   $\square 4 = \square\square\square(\square\square\square\square\square\square\square\square[65] ; \square\square\square\square\square\square\square\_\square\square\square\square\square[56])$
   $\square 4 = \square\square\square(0; 0)$
   $\square 4 = 0$

□4 = □4(□□□□ − □□□□) + □□□□
□4 = 0(1200– 500) + 500
□4 = 500

5. If Pakaian sedang and Kekotoran rendah then Kecepatan putaran lambat
□5 = □□□□□□□□[□] ∩ □□□□□□□*h* [□]
□5 = □□□ (□□□□□□□□[65] ; □□□□□□□*h* [56])
□5 = □□□(0.75; 0)
□5 = 0

□5 = □□□□ − □5 ∗ (□□□□ − □□□□)
□5 = 1200 − 0
□5 = 1200

6. If Pakaian sedang and Kekotoran setengah then Kecepatan putaran lambat
□6 = □□□□□□□□[□] ∩ □□□□□□□□ [□]
□6 = □□□ (□□□□□□□□[65] ; □□□□□□□□ [56])
□6 = □□□(0.75; 0.4)
□6 = 0.4

□6 = □□□□ − □6 ∗ (□□□□ − □□□□)
□6 = 1200 − 0.4(1200 − 500)
□6 = 920

7. If Pakaian sedang and Kekotoran tinggi then Kecepatan putaran cepat
□7 = □□□□□□□□[□] ∩ □□□□□□□□ [□]
□7 = □□□ (□□□□□□□□[65] ; □□□□□□□□ [56])
□7 = □□□(0.75; 0.6)
□7 = 0.6

□7 = □7(□□□□ − □□□□) + □□□□
□7 = 0.6(1200 – 500) + 500
□7 = 920

8. If Pakaian sedang and Kekotoran sangat tinggi then Kecepatan putaran cepat
□8 = □□□□□□□□[□] ∩ □□□□□□□□_□□□□□□[□]
□8 = □□□ (□□□□□□□□[65] ; □□□□□□□□_□□□□□□[56])
□8 = □□□(0.75; 0)
□8 = 0

□8 = □8(□□□□ − □□□□) + □□□□
□8 = 0(1200 – 500) + 500
□8 = 500

9. If Pakaian banyak and Kekotoran rendah then Kecepatan putaran lambat

□9 = □□□□□□□[□] ∩ □□□□□□*h* [□]
□9 = □□□ (□□□□□□□[65] ; □□□□□□*h* [56])
□9 = □□□(0.25; 0)
□9 = 0

□9 = □□□□ − □9 ∗ (□□□□ − □□□□)
□9 = 1200 − 0(1200 − 500)
□9 = 1200

10. If Pakaian banyak and Kekotoran setengah then Kecepatan putaran cepat

□10 = □□□□□□□[□] ∩ □□□□□□□□*h* [□]
□10 = □□□ (□□□□□□□[65] ; □□□□□□□□*h* [56])
□10 = □□□(0.25; 0.4)

□10 = 0,25
□10 = □10(□□□□ − □□□□) + □□□□
□10 = 0.25(1200 – 500) + 500
□10 = 675

11. If Pakaian banyak and Kekotoran tinggi then Kecepatan putaran cepat

□11 = □□□□□□□[□] ∩ □□□□□□□ [□]
□11 = □□□ (□□□□□□□[65] ; □□□□□□□ [56])
□11 = □□□(0.25; 0.6)
□11 = 0,25

□11 = □11(□□□□ − □□□□) + □□□□
□11 = 0.25(1200 – 500) + 500
□11 = 675

12. If Pakaian banyak and Kekotoran sangat tinggi then Kecepatan putaran cepat

□12 = □□□□□□□[□] ∩ □□□□□□□_□□□□□□ [□]
□12 = □□□ (□□□□□□□[65] ; □□□□□□□_□□□□□□ [56])
□12 = □□□(0.25; 0.0)
□12 = 0

□12 = □12(□□□□ − □□□□) + □□□□
□12 = 0(1200 – 500) + 500
□12 = 500

3. Defuzzifikasi

$$z = \frac{\begin{array}{c}\square\,\square * \square\,\square + \square\,\square * \square\,\square + \square\,\square * \square\square + \square\,\square * \square\,\square + \square\square * \square\,\square + \square\,\square * \square\,\square + \square\,\square * \square\square \\ + \square\,\square * \square\,\square \\ + \square\,\square * \square\,\square + \square\,\square * \square\,\square + \square\,\square\square * \square\,\square\square + \square\,\square\square * \square\,\square\square + \square\,\square\square * \square\,\square\square\end{array}}{\square\,\square + \square\,\square + \square\,\square + \square\,4 + \square\,\square + \square\,\square + \square\,\square + \square\,\square + \square\,\square + \square\,\square\square + \square\,\square\square + \square\,\square\square}$$

$$z = \frac{\begin{array}{c}(\square * \square\square\square\square) + (\square * \square\square\square\square) + (\square * \square\square\square\square) + (\square * \square\square\square) + (\square \\ * \square\square\square\square) \\ + (\square.\square * \square\square\square.\square) + (\square.\square * \square\square\square.\square) + (\square * \square\square\square) + (\square * \\ \square\square\square\square) \\ + (\square.\square\square * \square\square\square.\square) + (\square.\square\square * \square\square\square.\square) + (\square * \square\square\square)\end{array}}{\begin{array}{c}\square + \square + \square + \square + \square + \square.\square + \square.\square + \square + \square + \square.\square\square + \square.\square\square + \square \\ \square\square\square\square.\square\end{array}}$$

$$z = \frac{\square\square\square\square.\square}{\square.\square} = \square\square\square.\square\square\square$$

Kesimpulan

Jika banyaknya pakaian adalah **65** dan tingkat kekotoran adalah **56** maka kecepatan putaran mesin cuci adalah $\square\square\square.\square\square\square$