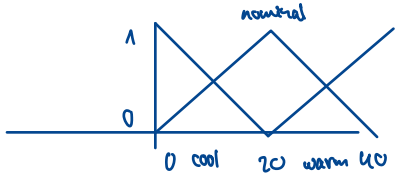
FUZZY LOGIC

① Temperature



$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{y - y_1}{x - x_1}$$

Cool	$y_1 = 1 , x_1 = 0$ $y_2 = 0 , x_2 = 20$	$\frac{0-1}{20-0} = \frac{\mu - 1}{x_T - 0} \Rightarrow \mu_{cool} = 1 - \frac{x_T}{20}$
Nominal	$y_1 = 0 \quad x_1 = 0$ $y_2 = 1 \quad x_2 = 20$	$\frac{1-0}{20-0} = \frac{\mu - 0}{x_T - 0} \Rightarrow \mu_{nominal} = \frac{x_T}{20}$
	$y_1 = 1 \quad x_1 = 20$ $y_2 = 0 \quad x_2 = 40$	$\frac{0-1}{40-20} = \frac{\mu - 1}{x_T - 20} \Rightarrow \mu_{nominal} = 2 - \frac{x_T}{20}$
Warm	$y_1 = 0 \quad x_1 = 20$ $y_2 = 1 \quad x_2 = 40$	$\frac{1-0}{40-20} = \frac{\mu - 0}{x_T - 20} \Rightarrow \mu_{warm} = -1 + \frac{x_T}{20}$

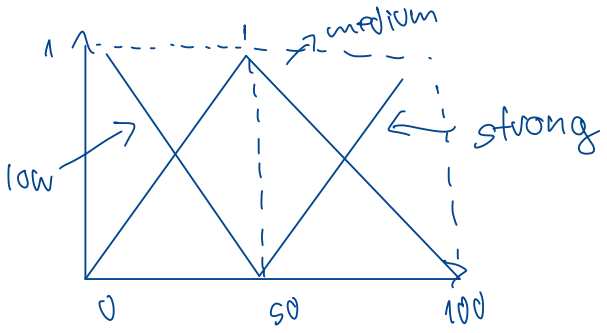
$$\mu_{cool} = 1 + \frac{x_T}{20} \qquad x_T \in [0, 20]$$

$$\mu_{nominal} = \begin{cases} \frac{x_T}{20} & x_T \in [0, 20] \\ 2 - \frac{x_T}{20} & x_T \in [20, 40] \end{cases}$$

$$\mu_{warm} = -1 + \frac{x_T}{20} \qquad x_T \in [20, 40]$$

② Pressure

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{y - y_1}{x - x_1}$$



Low	$y_1 = 1 \quad x_1 = 0$ $y_2 = 0 \quad x_2 = 50$	$\frac{0-1}{50-0} = \frac{\mu - 1}{x_p - 0} \Rightarrow \mu_{low} = 1 - \frac{x_p}{50}$
Medium	$y_1 = 0 \quad x_1 = 0$ $y_2 = 1 \quad x_2 = 50$	$\frac{1-0}{50-0} = \frac{\mu - 0}{x_p - 0} \Rightarrow \mu_{medium} = \frac{x_p}{50}$
	$y_1 = 1 \quad x_1 = 50$ $y_2 = 0 \quad x_2 = 100$	$\frac{0-1}{100-50} = \frac{\mu - 1}{x_p - 50} \Rightarrow \mu_{medium} = 2 - \frac{x_p}{50}$
Strong	$y_1 = 0 \quad x_1 = 50$ $y_2 = 1 \quad x_2 = 100$	$\frac{1-0}{100-50} = \frac{\mu - 0}{x_p - 50} \Rightarrow \mu_{strong} = -1 + \frac{x_p}{50}$

$$\mu_{low} = 1 - \frac{x_p}{50} \qquad x_p \in [0, 50]$$

$$\mu_{medium} = \begin{cases} \frac{x_p}{50} & x_p \in [0, 50] \\ 2 - \frac{x_p}{50} & x_p \in [50, 100] \end{cases}$$

$$\mu_{strong} = -1 + \frac{x_p}{50} \qquad x_p \in [50, 100]$$