

Logika Fuzzy untuk Pengontrol Motor DC pada Robot Screwless Modular Assembleable Robotic System (SMARS) dengan sensor ultrasonik berbasis Arduino Uno

Kelompok 2 :

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A. Membership Function Input & Output

```
In [1]: # Membership Function Input & Output

%matplotlib inline

import numpy as np
import skfuzzy as fuzz
from skfuzzy import control as ctrl

ultrasonic = ctrl.Antecedent(np.arange(10, 36, 1), 'ultrasonic')
motordc = ctrl.Consequent(np.arange(0, 256, 1), 'motordc')

print(ultrasonic)

ultrasonic['dekat'] = fuzz.trapmf(ultrasonic.universe, [10,15,20,25])
ultrasonic['medium'] = fuzz.trapmf(ultrasonic.universe, [15,20,25,30])
ultrasonic['jauh'] = fuzz.trapmf(ultrasonic.universe, [20,25,30,35])

motordc ['sangat lambat'] = fuzz.trapmf(motordc.universe, [0,0,25,55])
motordc ['lambat'] = fuzz.trapmf(motordc.universe, [25,55,85,115])
motordc ['medium'] = fuzz.trapmf(motordc.universe, [85,115,145,175])
motordc ['cepat'] = fuzz.trapmf(motordc.universe, [145,175,205,235])
motordc ['sangat cepat'] = fuzz.trapmf(motordc.universe, [205,235,255,255])

ultrasonic.view()
motordc.view()
```

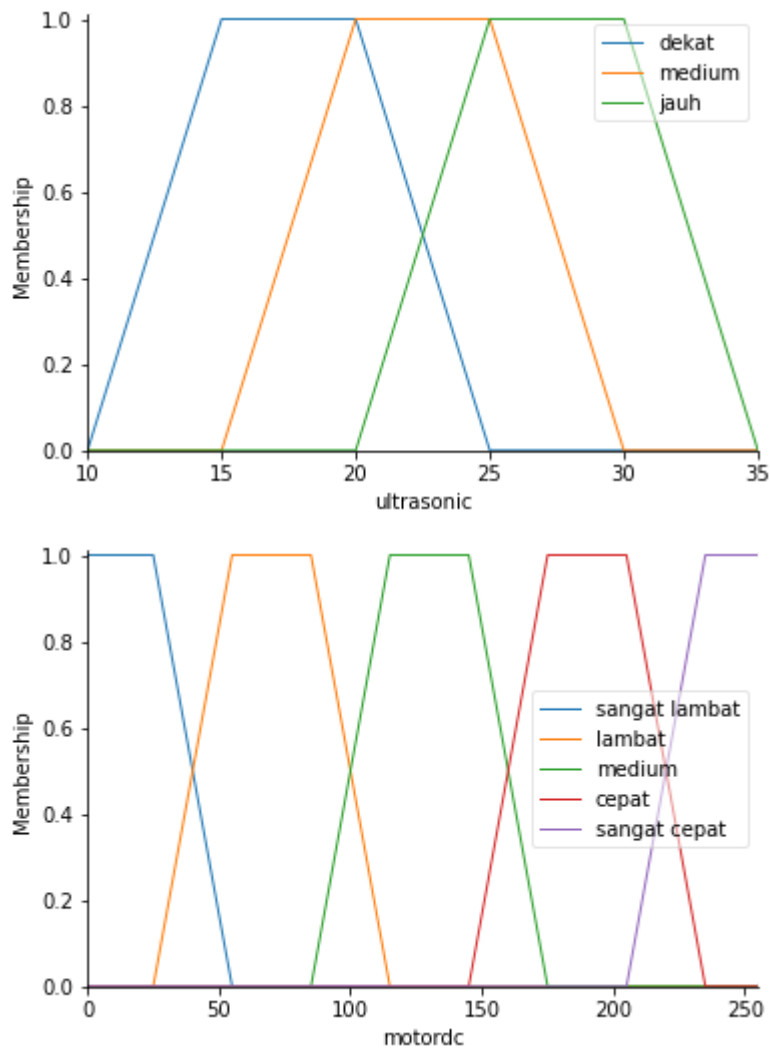
Antecedent: ultrasonic

C:\Users\Lenovo\.conda\envs\skc\lib\site-packages\skfuzzy\control\fuzzyvariable.py:122: UserWarning: Matplotlib is currently using module://ipykernel.pylab.backend_inline, which is a non-GUI backend, so cannot show the figure.

fig.show()

C:\Users\Lenovo\.conda\envs\skc\lib\site-packages\skfuzzy\control\fuzzyvariable.py:122: UserWarning: Matplotlib is currently using module://ipykernel.pylab.backend_inline, which is a non-GUI backend, so cannot show the figure.

fig.show()



B. Rule Base

```
In [2]: # Rule base

rule1 = ctrl1.Rule(ultrasonic['dekat'] , motordc['sangat lambat'])
rule2 = ctrl1.Rule(ultrasonic['dekat'] & ultrasonic['medium'], motordc['lambat'])
rule3 = ctrl1.Rule(ultrasonic['medium'] , motordc['medium'])
rule4 = ctrl1.Rule(ultrasonic['medium'] & ultrasonic['jauh'], motordc['cepat'])
rule5 = ctrl1.Rule(ultrasonic['jauh'] , motordc['sangat cepat'])

#rule1.view()
#rule2.view()
#rule3.view()
#rule4.view()
```

C. Calculation

```
In [15]: # Output calculation

motordc_control = ctrl1.ControlSystem([rule1, rule2, rule3, rule4, rule5])
besar_kecepatan = ctrl1.ControlSystemSimulation(motordc_control)
```

```

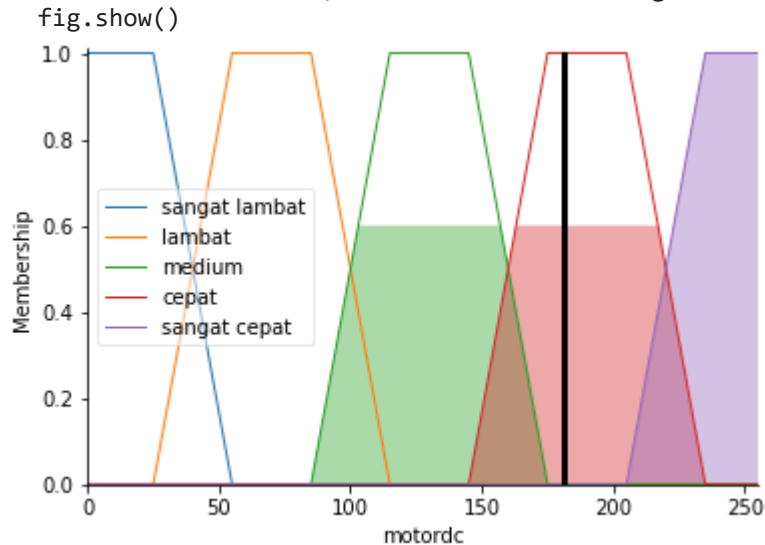
besar_kecepatan.input['ultrasonic'] = 27# 10 - 35
besar_kecepatan.compute() # 0 - 255

print(besar_kecepatan.output['motordc'])
motordc.view(sim=besar_kecepatan)

```

180.91165413533832

C:\Users\Lenovo\.conda\envs\skc\lib\site-packages\skfuzzy\control\fuzzyvariable.py:122:
UserWarning: Matplotlib is currently using module://ipykernel.pylab.backend_inline, which is a non-GUI backend, so cannot show the figure.



Perhitungan manual

- Nilai indeks input adalah 27 maka;
- $35 - 27/17,5 = 8/17,5$ dan $27 - 17,5/17,5 = 9,5/17,5$
- indeks maximum didapatkan $9,5/17,5 = \text{cepat}$
- $9,5/17,5 = Z - 125/50$ dan $9,5/17,5 = 255 - Z/70$, maka didapatkan
- $Z = 97,86$ dan $Z = 217$ dari nilai inilah maka didapatkan nilai variabel output PWM, yakni:
- $Z = 97,86 + 217 / 2 = 157,43$