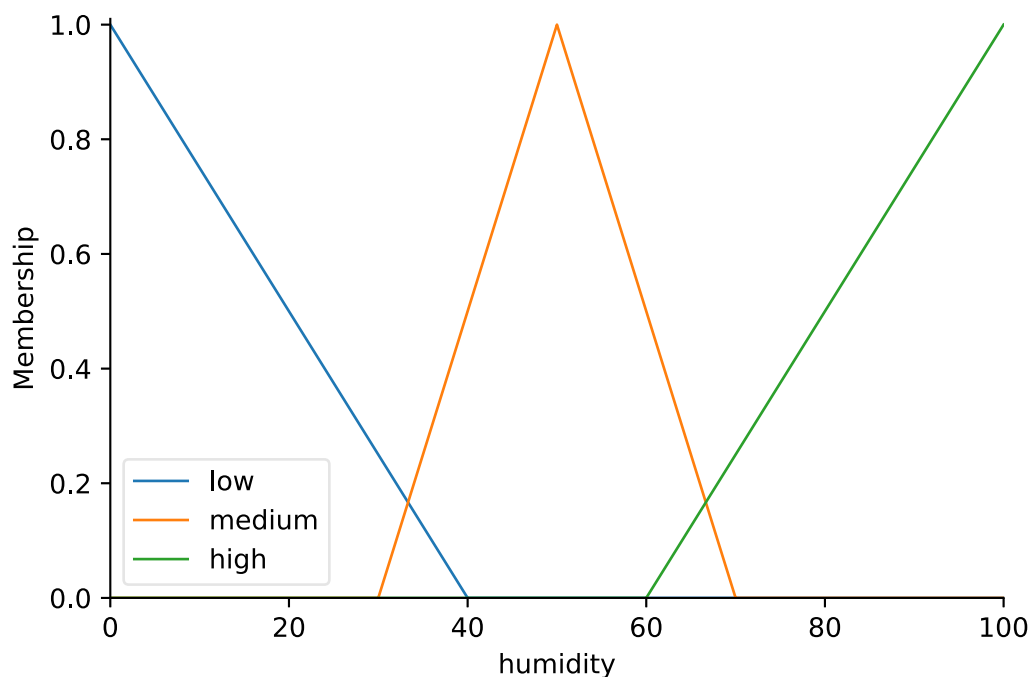**ภาคผนวกโปรแกรม**
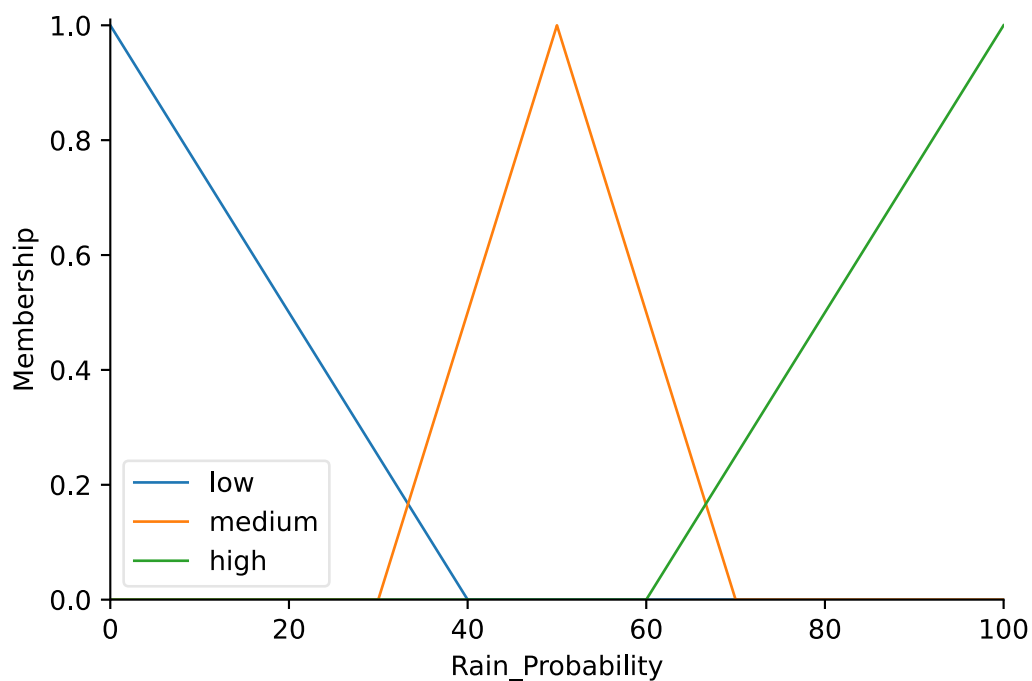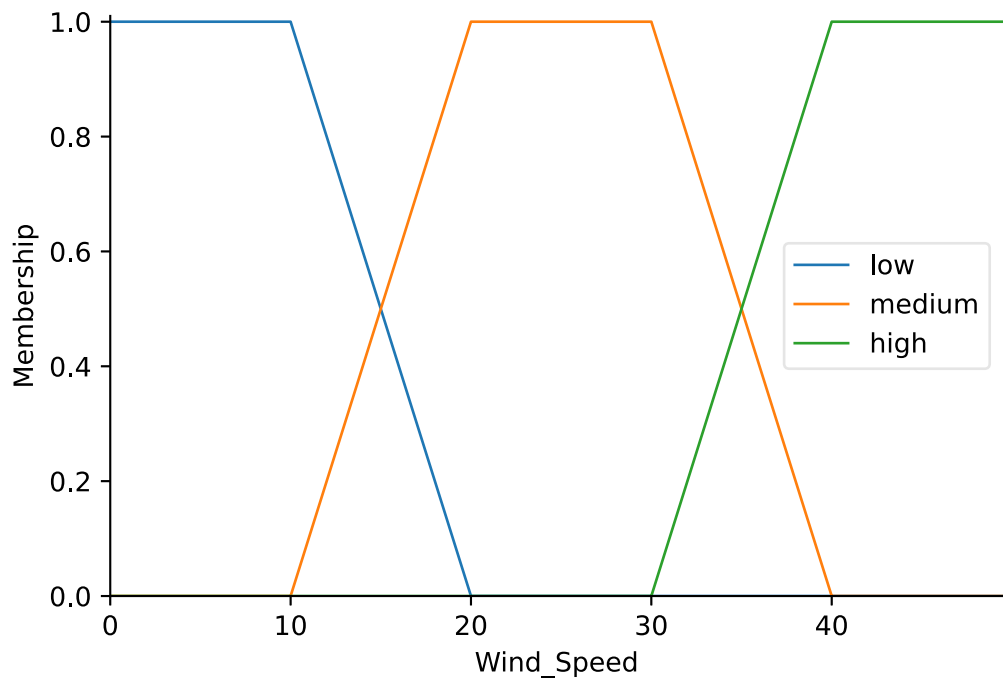
```
In [1]:    # import library
           import numpy as np
           import matplotlib.pyplot as plt
           import skfuzzy as fuzz
           from skfuzzy import control as ctrl
```

```
In [2]:    # define fuzzi universe
           humid = ctrl.Antecedent(np.arange(0,101,1), 'humidity')
           wSpeed = ctrl.Antecedent(np.arange(0,50,0.5), 'Wind_Speed')
           rainy = ctrl.Consequent(np.arange(0,101,1), 'Rain_Probability')
```

```
In [3]:    #define fuzzi membership function
           #triangle function
           humid['low'] = fuzz.trimf(humid.universe, [0,0,40])
           humid['medium'] = fuzz.trimf(humid.universe, [30,50,70])
           humid['high'] = fuzz.trimf(humid.universe, [60,100,100])
           #trapezoid funcyion
           wSpeed['low'] = fuzz.trapmf(wSpeed.universe, [0,0,10,20])
           wSpeed['medium'] = fuzz.trapmf(wSpeed.universe, [10,20,30,40])
           wSpeed['high'] = fuzz.trapmf(wSpeed.universe, [30,40,50,50])
           #triangle function
           rainy['low'] = fuzz.trimf(rainy.universe, [0,0,40])
           rainy['medium'] = fuzz.trimf(rainy.universe, [30,50,70])
           rainy['high'] = fuzz.trimf(rainy.universe, [60,100,100])
```

```
In [4]:    #view fuzzi membership function
           humid.view()
           wSpeed.view()
           rainy.view()
           plt.show()
```

```
#define fuzzi rule
rule1 = ctrl.Rule(antecedent=((humid['low'] & wSpeed['low']) |
                              (humid['low'] & wSpeed['medium']) |
                              (humid['medium'] & wSpeed['low'])),
                consequent=rainy['low'], label='low')

rule2 = ctrl.Rule(antecedent=((humid['low'] & wSpeed['high']) |
                              (humid['medium'] & wSpeed['medium']) |
                              (humid['high'] & wSpeed['low'])),
                consequent=rainy['medium'], label='medium')

rule3 = ctrl.Rule(antecedent=((humid['medium'] & wSpeed['high']) |
                              (humid['high'] & wSpeed['medium']) |
                              (humid['high'] & wSpeed['high'])),
                consequent=rainy['high'], label='high')
```
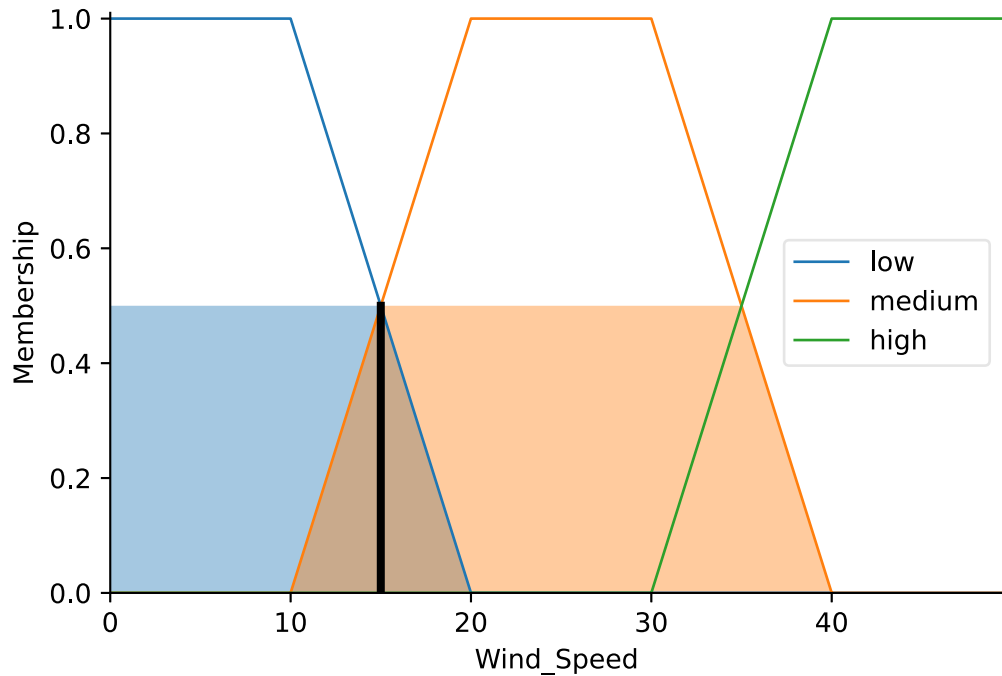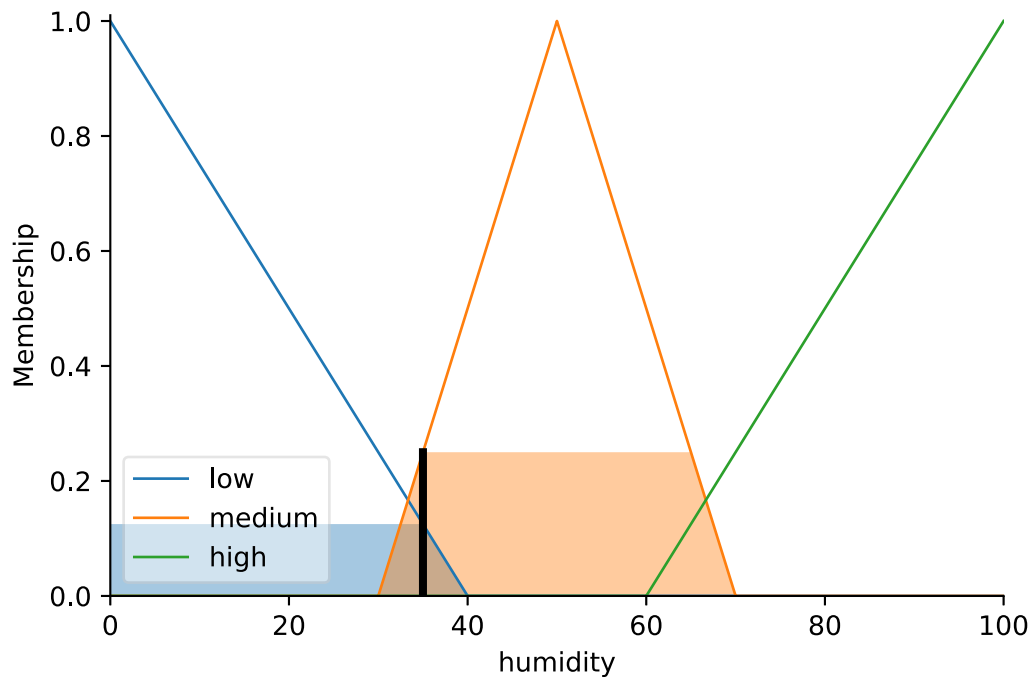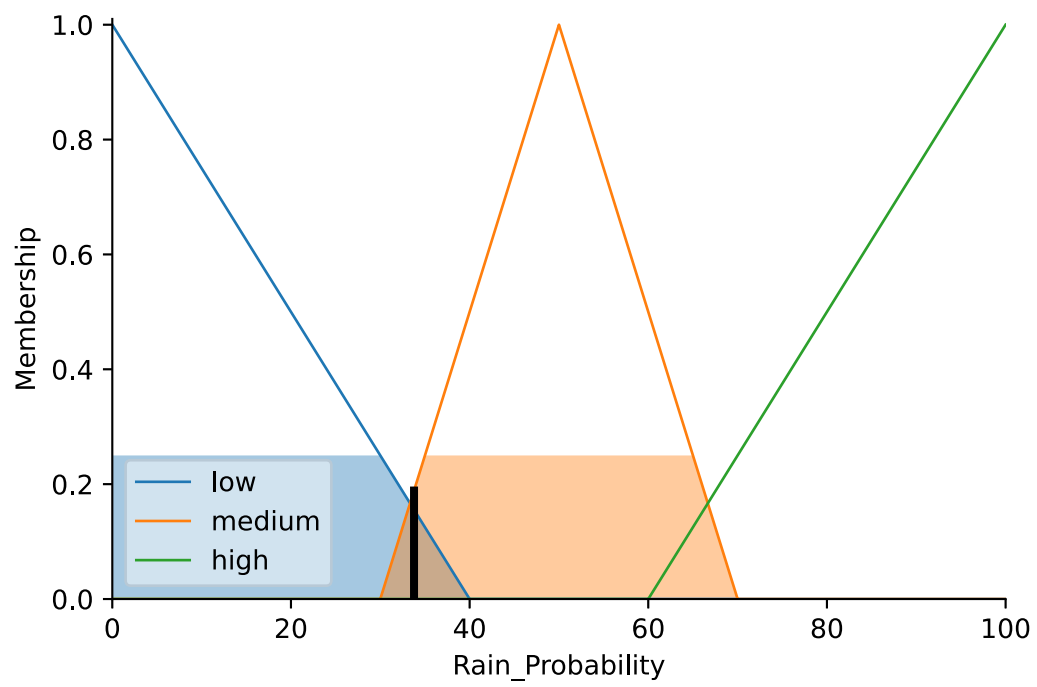
```
# add rules to conctrol system
rainy_prediction_ctrl = ctrl.ControlSystem([rule1,rule2,rule3])
rainyProbability = ctrl.ControlSystemSimulation(rainy_prediction_ctrl)
```

```
In [7]:  rainyProbability.input['humidity'] = 35
         rainyProbability.input['Wind_Speed'] = 15
         rainyProbability.compute()
```

```
In [8]:  humid.view(sim=rainyProbability)
         wSpeed.view(sim=rainyProbability)
         rainy.view(sim=rainyProbability)
         plt.show()
```

`print(rainyProbability.output['Rain_Probability'])`

33.7776111944028