Doris Xue
16/9/16

State Machine

Traffic light is a simple state machine who using a variable to keep track of the current state, and a number of different if statements to inspect the current state, and take the actions as we change to a different state.

It use states 0,1,2,3 to stand for different lighting situation. It will plus one every time. And once state equal 3 it will be assign to zero.

S = {0,1,2,3}

Input of this state machine is the time taken for each state.

I = {1000 (1s), 2000 (2s), 3000 (3s), 1000 (1s)}

O = {orange.fillcolor ('orange') green.fillcolor ('darkgray'), red.fillcolor ('red') orange.fi llcolor ('darkgray'), green.fillcolor ('green') red.fillcolor ('darkgray'), orange.fillcolor('orange')}

n (s , i) = { s = 1 if s = 0 , i = 1000,
s = 2 if s = 1 , i = 2000,
s = 3 if s = 2 , i = 3000,
s = 0 if s = 3 , i = 1000.}

O (s , i) = { orange.fillcolor ('orange') green.fillcolor ('darkgray') if s = 0,
red.fillcolor ('red') orange.fi llcolor ('darkgray') if s = 1,
green.fillcolor ('green') red.fillcolor ('darkgray') if s = 2,
orange.fillcolor('orange') if s = 3.}

We also can use a table to represent the evolution of state machine.

time	0	1	2	4	…
input	io	i1	i2	i3	…
state	So	S1	S2	S3	…
output	O1	O2	O3	O4	…

table 1.1

Each column of this table give the current input, state, output of this state machine. It shows that every current state of depends on last input and state. Thus, If we concerns the actual working situation of traffic light, It will change to table 1.2.

time	0	1	2	4	…
input	1s	2s	3s	1s	…
state	0	1	2	3	…
output	orange.fillcolor(‘orange’)green.fillcolor (‘darkgray’)	red.fillcolor (‘red’) orange.fillcolor(‘darkgray’)	green.fillcolor (‘green') red.fillcolor (‘darkgray’)	orange .fillcolor(‘orange')	…

Every time it changes the state number every time. When state number equal 0,1,2, It’s state number will plus one every time. When state number equal 3, It will return to 0 to form a loop, that makes it keeping working.

my code about traffic light:

```
import turtle          # Tess becomes a traffic light.

turtle.setup(400,500)
wn = turtle.Screen()
wn.title("Tess becomes a traffic light!")
wn.bgcolor("lightgreen")
tess = turtle.Turtle()
tess.speed(0)
red = turtle.Turtle()
green = turtle.Turtle()
orange = turtle.Turtle()

def draw_housing():
    """ Draw a nice housing to hold the traffic lights """
    tess.pensize(3)
    tess.color("black", "darkgrey")
    tess.begin_fill()
    tess.forward(80)
    tess.left(90)
    tess.forward(200)
    tess.circle(40, 180)
    tess.forward(200)
    tess.left(90)
    tess.end_fill()

draw_housing()
```

```
def turtles(tur, color, length):

    tur.speed(0)
    tur.forward(40)
    tur.left(90)
    tur.forward(50)
    tur.shape("circle")
    tur.shapesize(3)
    tur.fillcolor(color)
    tur.forward(length)



turtles(green, 'darkgrey', 0)
turtles(orange, 'darkgrey', 70)
turtles(red, 'darkgrey', 140)
state_num = 0
wn.listen()                    # Listen for events
# red and green light will last for 3 seconds, while orange light will last for 2 second.
def advance_state_machine():
    global state_num
    if state_num == 0:       # Transition from state 0 to state 1
        orange.fillcolor('orange')
        green.fillcolor('darkgray')
        wn.ontimer(advance_state_machine, '1000')
        state_num = 1
    elif state_num == 1:     # Transition from state 1 to state 2
        red.fillcolor('red')
        orange.fillcolor('darkgray')
        wn.ontimer(advance_state_machine, '2000')
        state_num = 2
    elif state_num == 2:                  # Transition from state 2 to state 0
        green.fillcolor('green')
        red.fillcolor('darkgray')
        wn.ontimer(advance_state_machine, '3000')
        state_num = 3
    else:
        orange.fillcolor('orange')
        wn.ontimer(advance_state_machine, '1000')
        state_num = 0
wn.ontimer(advance_state_machine, 0)
green.showturtle()
wn.mainloop()
```