Homework 2

Simulation Engineering

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Simulation of a traffic light system at a pedestrian crosswalk

Car traffic lights class can be in states:

- sigG – green light
- sigY – yellow light
- sigR – red light

It also has timers for all lights:

- greenTime
- yellowTime
- redTime

It also can remember what was it's previous state.

- PreviousState

```
class CarTrafficLights:
    def __init__(self, redTime, yellowTime, greenTime, state, previousState, button):
        self.redTime = redTime
        self.yellowTime = yellowTime
        self.greenTime = greenTime
        self.state = state
        self.previousState = previousState
        self.button = button
```

Init function of car traffic lights class.

It can change lights. It also has logic implemented for a button for pedestrian to change light.

```
def redLight(self):
    if self.state == "sigR":
        self.redTime += 1
    if self.redTime == 61:
        self.previousState = self.state
        self.state = "sigY"
        self.redTime = 0
```

This function changes light from red to yellow.

```
def yellowLight(self):
    if self.previousState == "sigR":
        if self.state == "sigY":
            self.yellowTime += 1
        if self.yellowTime == 6:
            self.previousState = self.state
            self.state = "sigG"
            self.yellowTime = 0
    if self.previousState == "sigG":
        if self.state == "sigY":
            self.yellowTime += 1
        if self.yellowTime == 5:
            self.previousState = self.state
            self.state = "sigR"
            self.yellowTime = 0
```

This function changes light from yellow to red of green based on previous state.

```
def greenLight(self):
    if self.state == "sigG":
        self.greenTime += 1
    if self.button == True:
        if self.greenTime == 60:
            self.button = False
            self.previousState = self.state
            self.state = "sigY"
            self.greenTime = 0
```

This function changes from green light to yellow based on a button state.

Pedestrian crosswalk lights class can be in states:

- sigG – green light
- sigY – yellow light
- sigR – red light

```
class PedestrianCrosswalkLights:
    def __init__(self, state):
        self.state = state
```

Init function of pedestrian crosswalk lights class

```
from car import CarTrafficLights
from pedestrian import PedestrianCrosswalkLights

simulationTime = 1
CTL = CarTrafficLights(0, 0, 0, "sigR", "none", False)
PCL = PedestrianCrosswalkLights("sigG")
while simulationTime < 201:
    CTL.redLight()
    CTL.yellowLight()
    CTL.greenLight()
    if CTL.state == "sigR":
        PCL.state = "sigG"
    if CTL.state == "sigY":
        PCL.state = "sigR"
    if CTL.state == "sigG":
        PCL.state = "sigR"
    print("simulation time:", simulationTime, "current light for cars:", CTL.state, "current light for pedestrians:",
PCL.state)
    if simulationTime == 70:
        CTL.button = True
        print("Button pressed!")
    simulationTime += 1
```

Main function of simulation

```
simulationTime = 1
CTL = CarTrafficLights(0, 0, 0, "sigR", "none", False)
PCL = PedestrianCrosswalkLights("sigG")
```

Here the starting time of simulation and its objects are determined.

```
while simulationTime < 201:
```

Simulation loop

```
CTL.redLight()
CTL.yellowLight()
CTL.greenLight()
```

Calling of functions in object car traffic lights

```
if CTL.state == "sigR":
    PCL.state = "sigG"
if CTL.state == "sigY":
    PCL.state = "sigR"
if CTL.state == "sigG":
    PCL.state = "sigR"
```

Binding the state of car traffic lights with the state of pedestrian crosswalk lights

```
print("simulation time:", simulationTime, "current light for cars:", CTL.state, "current light for pedestrians:", PCL.state)
```

Output of the simulation state to the console.

```
if simulationTime == 70:
    CTL.button = True
    print("Button pressed!")
```

Simulating button press by pedestrian in the 70th second of the simulation.

```
simulationTime += 1
```

Increment of the simulation time.

simulation time: 1 current light for cars: sigR current light for pedestrians: sigG
simulation time: 2 current light for cars: sigR current light for pedestrians: sigG
simulation time: 3 current light for cars: sigR current light for pedestrians: sigG
simulation time: 4 current light for cars: sigR current light for pedestrians: sigG
simulation time: 5 current light for cars: sigR current light for pedestrians: sigG
simulation time: 6 current light for cars: sigR current light for pedestrians: sigG
simulation time: 7 current light for cars: sigR current light for pedestrians: sigG
simulation time: 8 current light for cars: sigR current light for pedestrians: sigG
simulation time: 9 current light for cars: sigR current light for pedestrians: sigG
simulation time: 10 current light for cars: sigR current light for pedestrians: sigG
simulation time: 11 current light for cars: sigR current light for pedestrians: sigG
simulation time: 12 current light for cars: sigR current light for pedestrians: sigG
simulation time: 13 current light for cars: sigR current light for pedestrians: sigG
simulation time: 14 current light for cars: sigR current light for pedestrians: sigG
simulation time: 15 current light for cars: sigR current light for pedestrians: sigG
simulation time: 16 current light for cars: sigR current light for pedestrians: sigG
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simulation time: 19 current light for cars: sigR current light for pedestrians: sigG
simulation time: 20 current light for cars: sigR current light for pedestrians: sigG
simulation time: 21 current light for cars: sigR current light for pedestrians: sigG
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simulation time: 25 current light for cars: sigR current light for pedestrians: sigG
simulation time: 26 current light for cars: sigR current light for pedestrians: sigG
simulation time: 27 current light for cars: sigR current light for pedestrians: sigG
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simulation time: 60 current light for cars: sigR current light for pedestrians: sigG
simulation time: 61 current light for cars: sigY current light for pedestrians: sigR
simulation time: 62 current light for cars: sigY current light for pedestrians: sigR
simulation time: 63 current light for cars: sigY current light for pedestrians: sigR
simulation time: 64 current light for cars: sigY current light for pedestrians: sigR
simulation time: 65 current light for cars: sigY current light for pedestrians: sigR
simulation time: 66 current light for cars: sigG current light for pedestrians: sigR
simulation time: 67 current light for cars: sigG current light for pedestrians: sigR
simulation time: 68 current light for cars: sigG current light for pedestrians: sigR
simulation time: 69 current light for cars: sigG current light for pedestrians: sigR
simulation time: 70 current light for cars: sigG current light for pedestrians: sigR
Button pressed!
simulation time: 71 current light for cars: sigG current light for pedestrians: sigR
simulation time: 72 current light for cars: sigG current light for pedestrians: sigR
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Console output from the simulation.