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#!/usr/bin/env python

# MachRepl.py

# Introductory SimPy example: Two machines, which sometimes break down.
# Up time is exponentially distributed with mean 1.0, and repair time is
# exponentially distributed with mean 0.5. There are two repairpersons,
# so the two machines can be repaired simultaneously if they are down
# at the same time.

# Output is long-run proportion of up time. Should get value of about
# 0.66.

import SimPy.Simulation
import random

class G: # global variables
    Rnd = random.Random(12345)

class MachineClass(SimPy.Simulation.Process):
    UpRate = 1/1.0 # reciprocal of mean up time
    RepairRate = 1/0.5 # reciprocal of mean repair time
    TotalUpTime = 0.0 # total up time for all machines
    NextID = 0 # next available ID number for MachineClass objects
    def __init__(self):
        SimPy.Simulation.Process.__init__(self) # required
        self.UpTime = 0.0 # amount of work this machine has done
        self.StartupTime = 0.0 # time the current up period started
        self.ID = MachineClass.NextID # ID for this MachineClass object
        MachineClass.NextID += 1
    def Run(self):
        while 1:
            # record current time, now(), so can see how long machine is up
            self.StartupTime = SimPy.Simulation.now()
            # hold for exponentially distributed up time
            UpTime = G.Rnd.expovariate(MachineClass.UpRate)
            yield SimPy.Simulation.hold,self,UpTime
            # update up time total
            MachineClass.TotalUpTime += SimPy.Simulation.now() - self.StartupTime
            RepairTime = G.Rnd.expovariate(MachineClass.RepairRate)
            # hold for exponentially distributed repair time
            yield SimPy.Simulation.hold,self,RepairTime

def main():
    SimPy.Simulation.initialize() # required
    # set up the two machine processes
    for I in range(2):
        # create a MachineClass object
        M = MachineClass()
        # register thread M, executing M's Run() method,
        SimPy.Simulation.activate(M,M.Run())
    # run until simulated time 10000
    MaxSimtime = 10000.0
    SimPy.Simulation.simulate(until=MaxSimtime)
    print "the percentage of up time was", \
        MachineClass.TotalUpTime/(2*MaxSimtime)

if __name__ == '__main__': main()
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