COMP 204: A bus line simulation project

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Computer Simulations

A computer simulation attempts to recreate virtually a system of interest and its evolution.

- We can simulate the progression of a flu virus in a population
- Evolution of an ecosystem subject to climate change
- Weather systems
- etc.

Purposes: Study how the system evolves over time; evaluate the impact of changes in conditions, etc.

A bus line simulation

Goal: Simulate a bus line, with buses running along it, people waiting at bus stops, and

- with buses running along it,
- people waiting at bus stops,
- people boarding
- disembarking the bus

Component of a simulation system - Parameters

Parameters of the simulation (don't change during the simulation):

1. A list an ordered of bus stations: `names_of_stations={stationID:stationName}`
2. Capacity of each bus: `bus_capacity=5`
3. Frequency of bus departures: `start_frequency=2`
4. Simulation duration: 20 minutes

Component of a simulation system - State

A description of the state of the system at any given time:

1. Position of each bus: `bus_positions={busID:stationID}`
2. List of people on board of each bus, with their intended destination:
   `bus_content = {busID:[customer_destinations]}`.
3. List of people waiting at each bus stop, with their intended destination:
   `waiting_at_stop = {stationID:[customer_destinations]}`
   Assumption: No new people show up at station after the start of the simulation.
4. Time: `range(0,simulation_duration)`

Component of a simulation system - Update rules

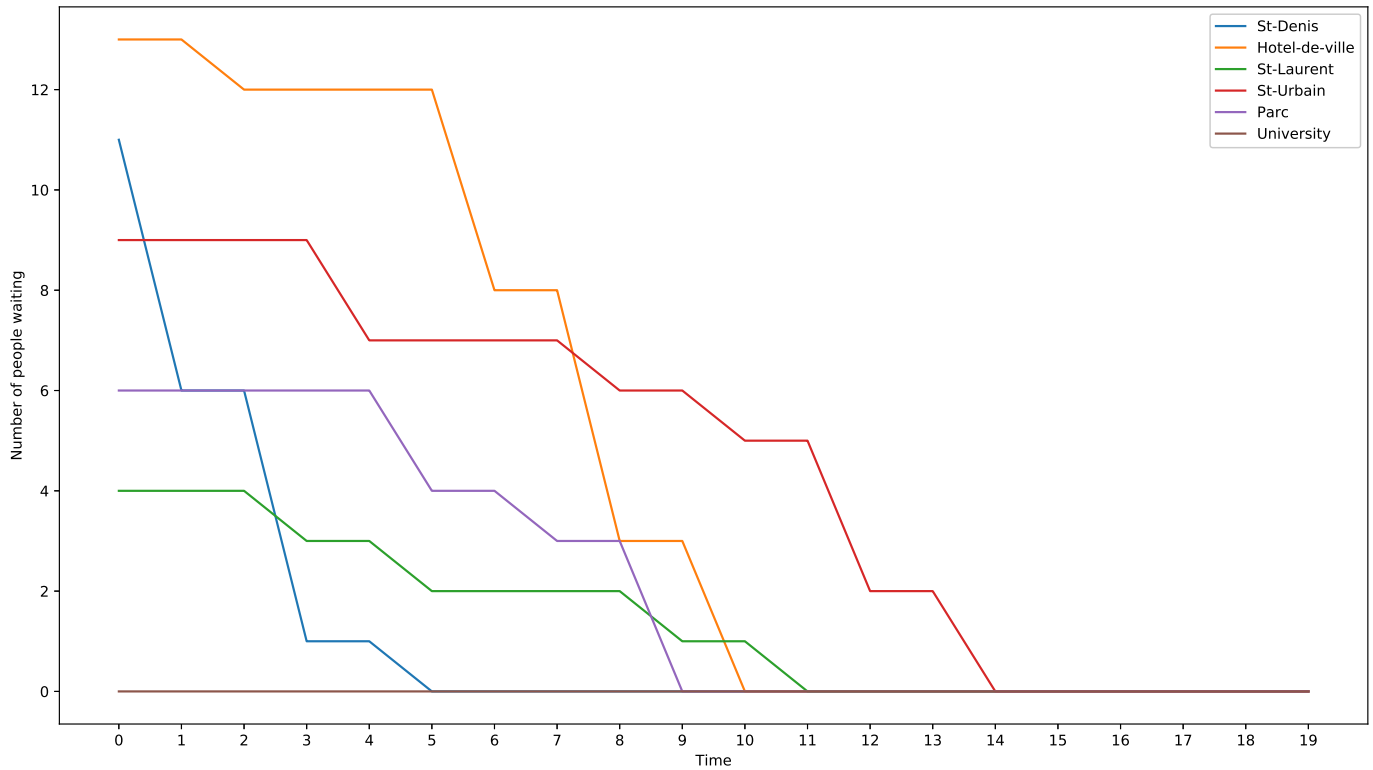
A set of rules describing how the system evolves from one time step t to the next time step $t + 1$:

- If a bus is at station S other than the last station, it moves to station $S + 1$.
- if $t + 1$ is a multiple of `start_frequency`, a new bus shows up at station 0.
- People who want to get off discharge their bus
- The empty spots on the bus get filled by the first people in the line at that stop, up to capacity

See busSym.py

Goal 1 - track queues at each station

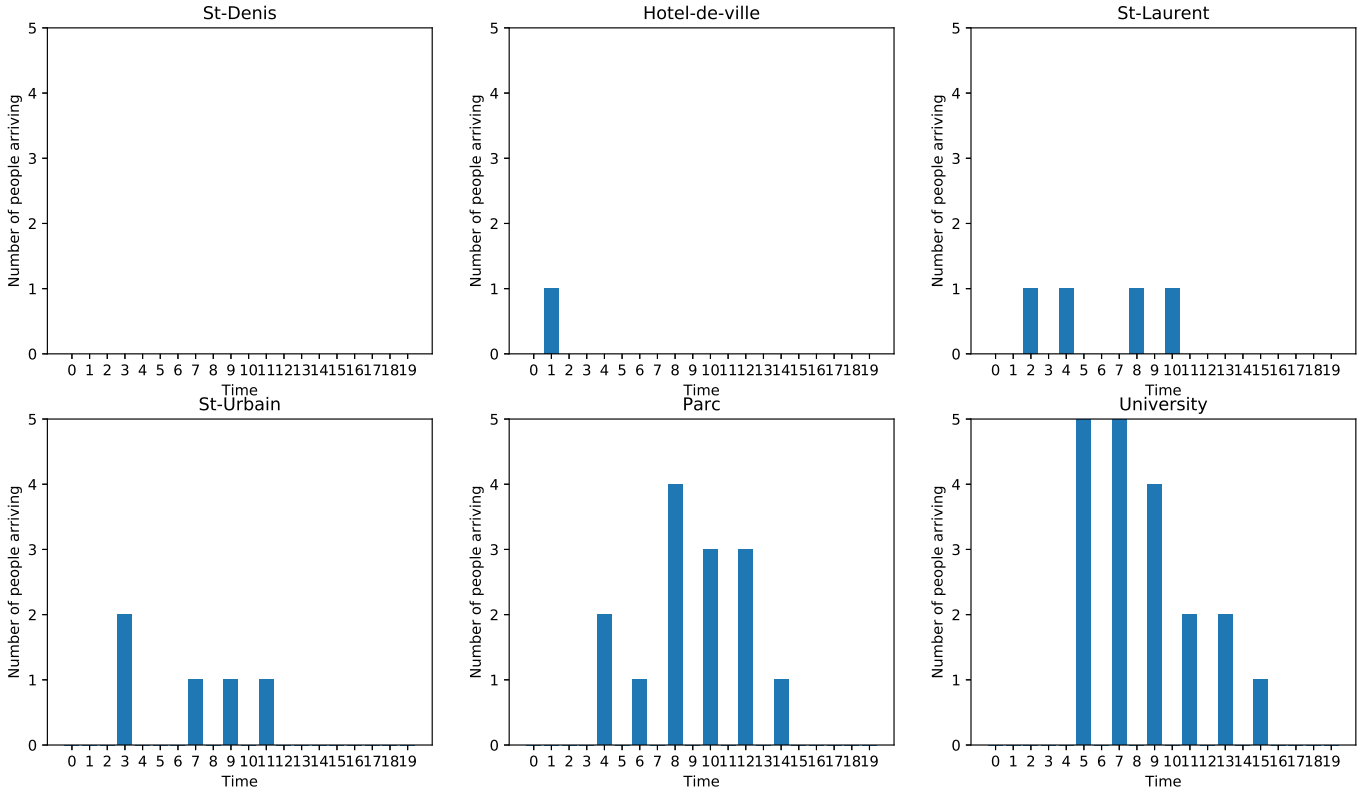
Plot (as a line plot) the number people in line at each station, as a function of time.



See busSym_with_stats.py.

Goal 2 - track arrivals at each station

For each station, plot (as a bar plot) the number of people arriving at each time.



See busSym_with_stats.py.