Homework 1

DATA604 Simulation and Modeling

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February 2, 2016

1.1

Name several entities, attributes, activities, events, and state variables for the following systems.

(a) A cafeteria

Entities

- Serving Line
- Food Servers
- Tables

Attributes

- Number of Food Servers
- Number of seats per table
- Rate of serving for Food Servers
- Time range for eating the meal

Activities

- Waiting in line
- Being served by a Food Server
- Waiting for a table to eat
- Eating at a table

Events

- Arrival of new person in serving line to be served
- Person leaving serving line
- Person waiting for seat at table to eat
- Person finishing eating and leaving table

State Variables

- Number of people eating at tables
- Number of people waiting in line to be served

(b) A grocery store

Entities

- Checkout lanes

Attributes

- Max number of items allowed in checkout lane
- Rate of checkout for cashier

Activities

- Customer shopping in the grocery store
- Customer checking out (paying for goods)

Events

- Arrival of customer at grocery store
- Arrival of customer at checkout lane
- Customer completing checkout
- Customer departing store without purchasing anything

State Variables

- Number of customers in grocery store
- Number of customers in checkout lane lines

(c) A laundromat

Entities

- Washing machines
- Drying machines

Attributes

- Washing machine run time
- Drying machine run time
- Ratio of washing machine to drying machine capacity

Activities

- Washing clothes
- Drying clothes
- Loading washing machine
- Transfering from washing to drying machine
- Unloading from drying machine

Events

- Washing maching cycle starts
- Washing machine cycle stops
- Dryer cycle starts
- Dryer cycle stops

State Variables

- Number of busy washing machines
- Number of busy dryers

(d) A fast-food restaurant

Entities

- Cashiers
- Back-cooks (i.e. burger flippers)
- Fryers

Attributes

- Burgers per burger flipper
- Orders of frys per Fryer
- Cashier busy or not

Activities

- Cooking a burger
- Making french frys
- Cashier taking order, accepting payment

Events

- Order in
- Order ready for pickup
- French fries done cooking

State Variables

- Number of orders pending
- Number of burgers being cooked
- Orders of french frys cooked/ready for serving
- Number of bugers being ready for serving

(e) A hospital emergency room

Entities

- Doctors
- Beds
- Patients
- Admitting staff

Attributes

- Patients per Doctor

Activities

- Patient admitted
- Doctor take care of patient
- Patient discharged

Events

- Patient arrives
- Patient admitted
- Doctor discharges patient

State Variables

- Beds empty
- Patients awaiting addmission
- Paitents awaiting discharge

(f) A taxicab company with 10 taxis

Entities

- Taxis
- Dispatcher
- Customers

Attributes

- Taxi has customer
- Taxi enroute to customer
- Customer waiting for taxi

Activities

- Enroute to customer
- Transporting customer

Events

- Picking up custommer
- Dropping off customer

State Variables

- Taxis with customers
- Customers waiting for available taxi

(g) An automobile assembly line

Entities

- Parts
- Assembly machines
- Workers

Attributes

- Parts inventory
- Assembly machine rate of production
- Worker rate of production

Activities

- Machine assembling car
- Worker assembling car
- Staging parts for use by Machine or Worker

Events

- Car assembly started
- Car assembly completed
- Parts depleted
- Car assembly by machine X completed
- Car assembly by worker Y completed

State Variables

- Cars on assembly line
- Parts inventory level
- Workers out sick/vacation
- Machines broken down