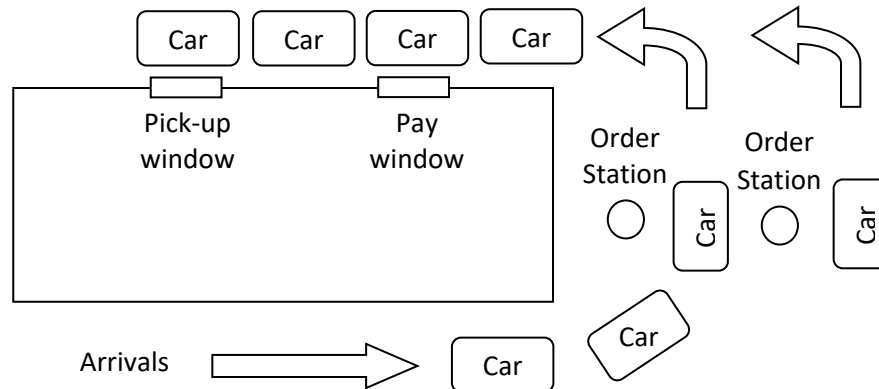


CS 4830/6830
Project 2

For your second programming assignment, you will study how to model and simulate input distributions. Since you already have experience simulating a simple queuing system, we will use the McDonald's Restaurant across the street from Wright State as our source of data. The restaurant has a single order station, a payment window, and a pick-up window.

This restaurant has the following layout:



Your tasks are to:

Construct a model of the current operation of the restaurant. You need to model the arrival pattern to the order station, the time it takes to place an order, the time it takes to pay, and finally, the time to pick up food and exit.

To accomplish this task, you will need to collect data by observing the real system. The best strategy is to collect data for a short time interval (~30 minutes) at some time between 11:00 AM - 1:00 PM Monday-Friday. You should measure the time between successive arrivals of customers to the order station. The second thing you need to measure is the time it takes to pay for the food. Finally, determine the time it takes to pick up the food.

Once you have collected the data, select distributions to characterize the arrival, order, payment, and pick-up pattern of this system. Make sure to justify your choice of distribution by conducting goodness of fit tests of the distributions to the real data.

Finally, test your model to determine if it is a behaviorally valid representation of the McDonald's restaurant during a busy period of operation by comparing the output of your simulation to the real data.

It is difficult for one person to accurately measure data so for this project you may work as teams of two. Each team is responsible for collecting at least one sample of data for each of the components of the system (arrival, order, payment, and pickup). A copy of the data must be delivered (placed in the dropbox) to the instructor on the date listed in the dropbox. All data sets will be made available to all teams on Pilot.

Provide five files. One file should contain the metadata describing your data collection. The remaining four files should contain the data for the service areas (arrival, order, payment, and pickup) of the restaurant.

The metadata file should be named metaData.txt and contain the following information:

Team member names

Date the data was collected

Time the data was collected (start time-end time)

Additional notes describing how you measured the system's behavior including anomalies observed.

The remaining files will contain timing information for the four service areas. All times should be recorded as an absolute clock time (11:48:20 representing time 11 hours, 48 minutes, and 20 seconds) not a relative time (i.e. do not record the number of seconds between arrivals or the number of seconds it takes a customer to perform an activity). Do not include AM/PM designations.

The arrival data should be stored in a file named arrival.xlsx or arrival.csv and contain the following information:

Arrival Time ← column header
11:48:20 ← time of a car's arrival
11:48:30
11:48:55
11:49:00
etc.

The order, payment, and pickup stations should have files named order.xlsx or order.csv, payment.xlsx or payment.csv, and pickup.xlsx or pickup.csv respectively. The format of each file is as follows:

| Start | Stop | ← column headers |
|----------|----------|---|
| 11:49:20 | 11:50:35 | ← start and stop (i.e. finish time) time for the action |
| 11:49:50 | 12:00:45 | |
| 12:02:00 | 12:03:35 | |
| 12:04:52 | 12:06:27 | |
| etc. | | |

Each team should provide 30 minutes of arrival data and 30 minutes of activity for each of the stations (order, payment, and pickup). These data collection times may overlap i.e. you can collect arrival, order, payment, and pickup data for a single 30-minute interval. If you prefer, you can collect data for a couple of activities at a time (i.e. observe arrivals and order stations for 30 minutes and then observe payment and pickup stations for a different 30-minute interval).

When collecting data, please order something (i.e. a cup of coffee) if you plan to sit in the parking lot during your data collection. Alternatively, stay on the public sidewalk when collecting your data, if you do

not want to order any food. Make sure you do not interfere in any way with the operation of the restaurant.

On the assignment due date, each team should submit a report discussing the results of their simulation. The report should focus on the analysis of the measured data, choice of distributions/parameters, and validation tests. Also, discuss your confidence in your recommendations using proper statistical techniques.