

Math6004 - Simulation - Assignment 1

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1 Part A - Report n and Estimates Obtained

For any run of the simulation, we found the following estimates:

Metric	Sample Mean	Half Confidence-Interval Width
Steady State On-Time Fraction	0.84763	0.007
R1 Average Waiting Time	0.712	0.052
R2 Average Waiting Time	2.269	0.183
R3 Average Waiting Time	12.795	1.145
U1 Average Waiting Time	0.102	0.004
U2 Average Waiting Time	0.169	0.008
U3 Average Waiting Time	0.347	0.02

These fit our expected values where urgent patients would have a lower waiting time than routine, as well as the higher ETSR's (Class 1 being the largest ETSR class) having a lower mean waiting time.

1 Part B - Model Explanation

1.1 Blocks in Main

1.1.1 Two sources

Patient type	Arrival Rate	Actions on Exit
Routine	2.19	Sets isUrgent as False and ETSR as $F^{-1}(N(70, 15))$
Urgent	3.69	Sets isUrgent as True and ETSR as $F^{-1}(exp(0.02))$

1.1.2 Priority Queue

We use a priority queue which uses the following formula for comparing agent 1 (**X**) with agent 2 (**Y**); true is we choose agent **X** over agent **Y**:

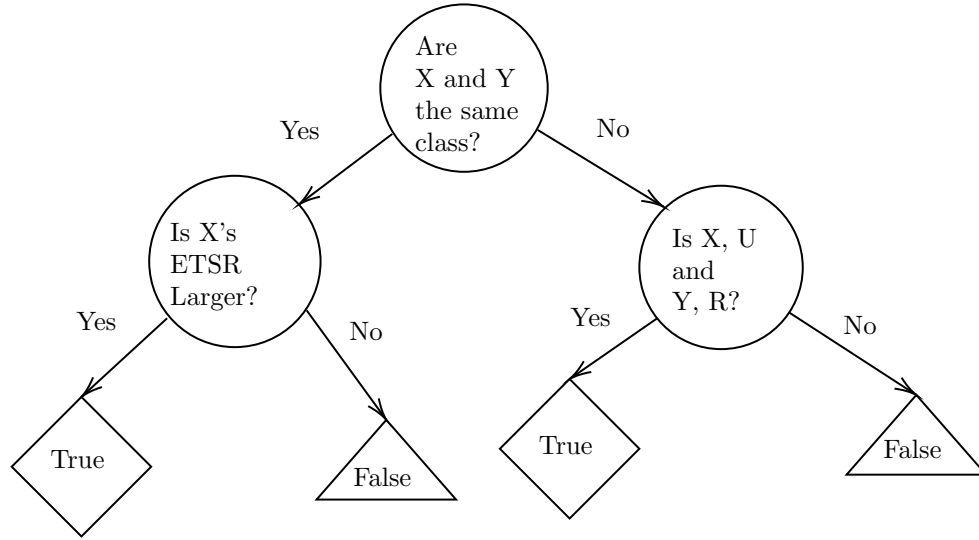


Figure 1: The agent comparison decision tree

1.2 Bi-Patient Interface

Bi-Patient is a general agent type for patients which includes variables, and *getters* and *setters* for the variables.

We call the setters in the two sources, and the getters in the queue.

Variable Name	Type	Description
priority	int	2 if the patient is Urgent; 1 if the patient is Routine.
ETSR	double	the value of a random variable; explained in 1.1.1
arrivalTime	double	The arrival time (in days) of the agent.
urgencyClass	int	Enum for what histogram the patient gets added to.

1.3 Calculating KPI

7 histograms were used, each one being modified in the queue's **action on exit**. The histograms were,

- R1 - Contains waiting times for R1 patients
- R2 - Contains waiting times for R2 patients
- R3 - Contains waiting times for R3 patients
- U1 - Contains waiting times for U1 patients
- U2 - Contains waiting times for U2 patients
- U3 - Contains waiting times for U3 patients
- onTimeHist - Contains onTime flags represented as an integer; it's mean and half width confidence are represented by outputs.

The waiting times were computed with the formula,

$$\text{Waiting Time} = \text{time}() - \text{agent.arrivalTime}$$

The onTime flag was calculated like, so

$$\text{On Time} = \text{Waiting Time} \leq 90 ? 1 : 0$$

1.4 Warm-Up and Simulation End

We propose that the current day is stored in a value called *currentDay*, which gets updated in the queue,

$$\text{currentDay} = (\text{int}) \text{time}()$$

This value is used in the Sources and the Queue to define the warm up period as,

$$\text{currentDay} \geq 200$$

and the simulation's end as,

$$\text{currentDay} \geq 2200$$