THE UNIVERSITY OF TENNESSEE KNOXVILLE

CASE STUDY

Modeling and Simulation

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Case Study: Modeling and Simulation of A Single Server System (#1)

Goal:: *To learn the following methods/techniques:*

- Process Modeling Library: source, queue, delay, sink, select output, time measure start/end, service, etc.
- Presentation and Analysis Libraries.
- Define variables and display its value.
- Collect statistics such as Time in System (TIS), Average Waiting Time in Queue (AWTQ), Time Average Number of parts in Queue (TANQ), Working in Process (WIP), utilization, etc. Use Time Measure Start/End to collect TIS/AWTQ and display a histogram. Use Statistics to collect discrete/continuous performance measures.
- Make plots such as histogram plot, time plot, etc.
- Basic animation: status of the machine, queue, delay, etc. through Space Markups.
- Define Agent (Entity) Type and attributes. Collect TIS through this method.
- Show individual TIS/WTQ plots.
- Collect histogram data manually.

Problem Statement: Simulate a single machine system in which a drilling machine processes incoming parts that arrive to the system at the rate of 2 per minutes. The processing time follows a triangular distribution with minimum 1, maximum 6, and mode 3.

Phase 1: Build a bare bone model and run the model. Configure a simulation run and run settings including time and randomness.

Phase 2: Collect basic statistics such as WIP, TIS, AWTQ, Queue length, TANQ. Display results via Presentation toolbox.

Phase 3: Add time plots for WIP, TIS, etc. Add histogram plots for WIP, TIS, WTQ, etc.

Phase 4: Add basic animation including queue, process/delay, busy/idle of the machine etc. *Discussion*: will animation change the model output?

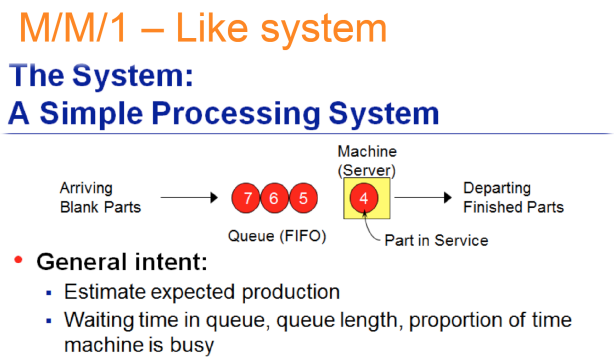

Figure 1: "M/M/1 System": Simple Processing

Phase 5: After the drilling process, an inspection station is added where an inspector checks on the parts. Historical data shows that about 92% of the parts passed the inspection while 8% failed. The failed parts will be sent back to the waiting area along with other incoming parts to be processed by the machine. However, the processing time takes about 8 to 12 minutes for these parts because this is considered as "re-work". What's impact to the system performance compared to previous models? What if we have 5 parallel machines while the arrival rate is 1 per minute?