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Project Summary

Simulation

The purpose of this project was to simulate a clinic with a varying number of doctors, patients, one receptionist, and one nurse per doctor. Each of these people were represented by a thread (or multiple threads for multiple people). There was a max of three doctors and a max of thirty patients. A patient will enter the simulation (clinic) and waits to register with the receptionist. Once registered, the receptionist lets an available nurse know the patient is ready to see the doctor. The notified nurse will then lead the patient to a randomly assigned office room, where the patient will wait on an available doctor. Once an available doctor enters the office room, they will listen to the patient's symptoms then offer advice. Afterwards, the patient will leave, ending the particular patient thread.

Difficulties

The main difficulty I had with this project was understanding the difference between releasing and acquiring a thread. There were many times where I attempted acquiring a thread before releasing a required thread, which froze the simulation.

What Was Learned

This project helped expand my understanding semaphores and their purpose. Semaphores are used to control access to a resource that has multiple instances. In our case, an example would be the doctor threads potentially being overloaded by too many patients. We need to wait on the available doctor resource before we can 'tend' to the patient resource, which requires the use of coordination.

Results

Below is an example of simulation output run with three doctors and three patients:

Run with 3 doctors, 3 nurses, 3 patients

Patient 0 enters waiting room, waits for Receptionist.

Receptionist registers patient 0.

Patient 0 leaves receptionist and sits in waiting room.

Patient 1 enters waiting room, waits for Receptionist.

Nurse 0 takes patient 0 to doctor's office.

Receptionist registers patient 1.

Patient 0 enters doctor 0's office.

Patient 1 leaves receptionist and sits in waiting room.
Doctor 0 listens to symptoms from patient 0.
Patient 2 enters waiting room, waits for Receptionist.
Patient 0 receives advice from doctor 0.
Receptionist registers patient 2.
Patient 0 leaves.
Patient 2 leaves receptionist and sits in waiting room.
Nurse 0 takes patient 1 to doctor's office.
Nurse 2 takes patient 2 to doctor's office.
Patient 1 enters doctor 0's office.
Patient 2 enters doctor 2's office.
Doctor 0 listens to symptoms from patient 1.
Doctor 2 listens to symptoms from patient 2.
Patient 1 receives advice from doctor 0.
Patient 1 leaves.
Patient 2 receives advice from doctor 2.
Patient 2 leaves.