Software Architectures

Practical Assignment 1 Report

Leandro Silva, 93446
Margarida Martins, 93169

Control Center Process

The control center process (CCP) allows the user to control the experiment through its GUI (figure 1).

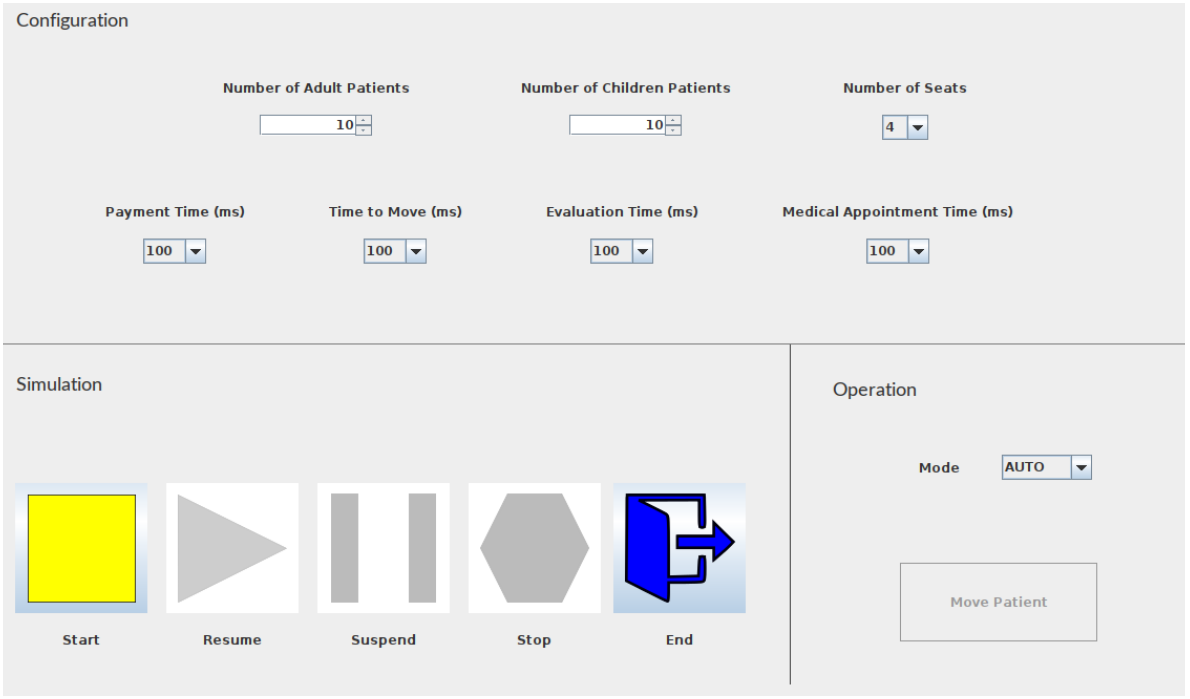

Figure 1 - Control Center GUI

The process first establishes a socket connection with the HCP in order to be able to send messages. Afterwards, the GUI is launched.

In the configuration panel the user can change some parameters of the simulation, he is only able to do this before starting a simulation.

In the simulation panel the user can start, suspend, resume, stop and exit the simulation. When the user clicks on the start button the CCP will send a message with all the configuration parameters so that the HCP has all the information to start the simulation. The suspend and stop buttons are enabled.
Clicking on the suspend button the CCP will send a *"SUS"* message and enable the resume button.
Clicking on the resume button the CCP will send a *"RUN"* message and enable the suspend button.

Clicking on the stop button, the CCP will send a *"STO"* message and enable the start button. When the end button is clicked, a dialogue box pops up requesting the confirmation that the program should exit. If the user confirms, the CCP will first send an *"END"* message so that the HCP can also terminate, and secondly it will exit and the process finishes.

In the operation panel, the user can change the simulation mode, manual or automatic. If the mode is manual, the user can also request a patient movement with the next button. The mode of the simulation can be changed at any time. When it happens, the CCP messages the HCP. The HCP is also notified every time the user presses the next button.

Health Center Process

The HCP starts by creating a socket server that can accept multiple clients, the CCP. This allows the HCP to receive CCP messages.

When the HCP receives the message to start the simulation it will start all the threads necessary: one call center, one cashier, four nurses, four doctors and a configured number of patients. Each of these threads have an instance of one or more monitors (one for each hall) depending on their function. In the picture below, we can see a summary of how the threads and monitors interact.

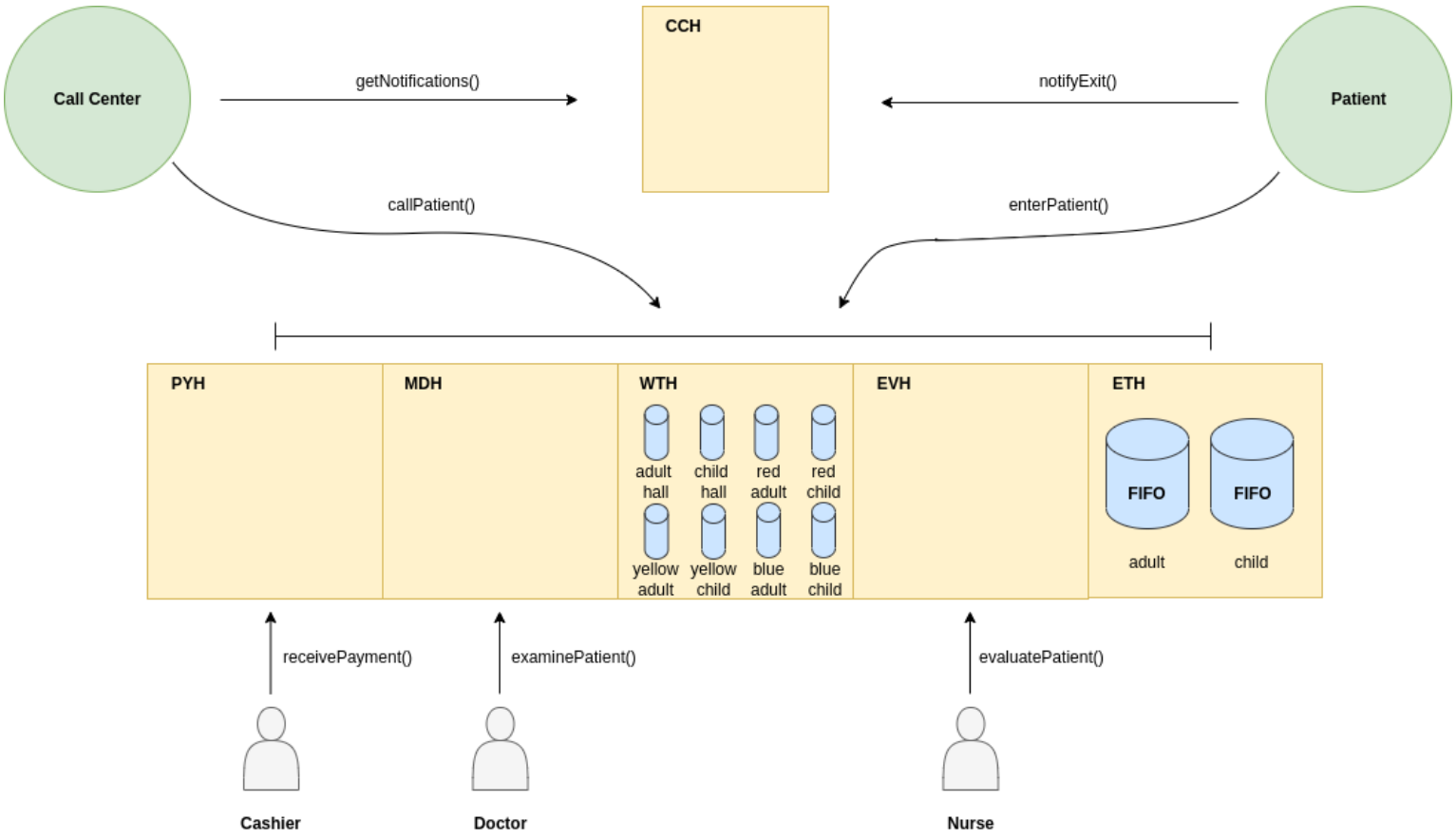

Figure 2 - HCP system workflow

A patient can be an adult or a child, and is identified by a patient number (NN) which can change in certain halls.

When a patient starts, it will immediately try to enter the Entrance Hall (ETH). The monitor of the ETH has two different FIFOS one for adult patients and another for children, a patient thread is waiting until there is a space in the respective FIFO. After it enters, the thread will have to wait again until the call center calls the patient (signalling the waiting thread).

The patient will then move to the Evaluation Hall (EVH). When the patient arrives and enters an evaluation room, it sends a notification to the CCH monitor so that the call center can know that the patient left the ETH (and a seat is free there). The nurses are already assigned to each room. Once a patient enters the room, it is immediately evaluated, that is, it is given an DoS, and then it can leave immediately to the Waiting Hall (WTH).

After the EVH, the patient enters without restrictions in the Waiting Hall (WTH). In there, its NN is changed for the first time, and this must be used alongside the DoS given in the EVH to get the prioritized patient that should move on to one of the WTH rooms. The order of the priority policy is: patients with higher DoS and then patients with higher NN. To respond to these requirements, this monitor was implemented with two FIFOS for the WTH arrival room, and 4 FIFOS for the rooms 1 and 2 in the WTH, where the room 1 is allowed only for children, and the room 2 only for adults. The first two permits to distinguish adults from children, so that it is possible to know beforehand which room will receive each patient and if there are rightful patients to be called. Then, the next four FIFOS permits to distinguish the patients according to their DoS. This way, it is possible to call the patients in DoS order to the Medical Hall (MDH).

In the MDH, there is an arrival room constituted with two seats, one for an adult and other for a child, and then there are four rooms where the medical appointment is performed. The rooms 1 and 2 are for children only, and the rooms 3 and 4 are for adults. To implement this monitor, there was no need to use any kinds of FIFOS, since the single number of seats did not justify it. Instead, flags were used to represent when a seat was occupied and to permit a patient to move on when the CC made a call. To distinguish adults from children, as the logic was the same, we encapsulated the process in an object and reused it for both children and adults.

The payment hall is the last hall before the patient thread finishes. Here the patient thread will be waiting until the cashier signals it after payment time has passed. The patient thread leaves immediately since it does not need to wait for a call from the CC.

The call center can control the passage of patients with two different modes: automatic and manual. In the automatic mode the call center is constantly calling patients whenever possible. On the contrary, in the manual mode the patients are only called when a *“NEXT”* message arrives from the CCP. This is achieved by awaiting the call center thread immediately after calling one patient and only signaling it again when another message arrives.

The HCP is also responsible for stopping, resuming and killing entity threads. The killing of a patient thread is done using the Thread.interrupt() method. The other threads are killed by setting a flag variable which will make them leave their continuous loops and finish.
The stop and resuming is done through the use of the wait() and notify() methods.

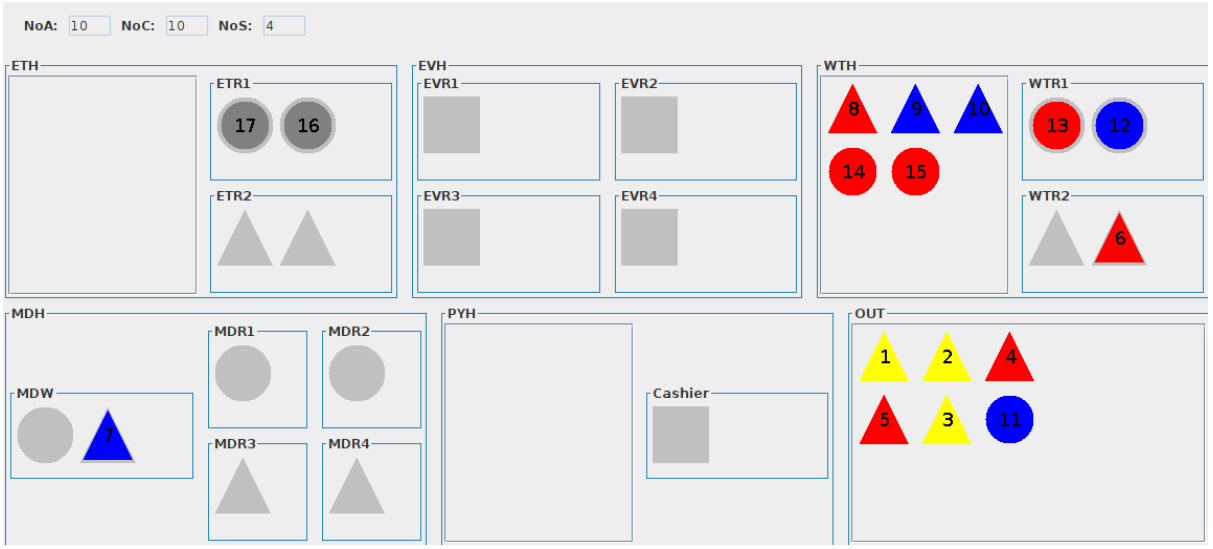

Figure 3 - Health Center GUI

In Figure 2, it is possible to see an example of the Health Center GUI, which is graphically representing the state of the simulation. Each outer panel represents a hall, and the inner panels represent the existent rooms inside the halls. Some rooms may have a limited number of seats, which are shown as the figures in light gray. In these seats, other figures may fit within them, which represent the patients. These patients are labelled with their NN and are initially coloured with a dark gray colour, but when they receive their degree of severity (DoS) in the Evaluation Hall, they are coloured according to their DoS. The shapes also have meaning. Triangles are meant to represent adults, while circles represent children. Likewise, triangular seats inform that only adults can use them, while circular seats are only used by children. The seats with a square shape, shown in the Evaluation Hall and cashier room, are designated to represent seats where both adults and children are allowed.

Requirements implementation

All the requirements were implemented as expected.

Student contribution

Each student contributed 50% for the project.