A GUI-based Software Package for the Simulation of Queuing Networks

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06/18/2023

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1. Introduction

Keeping a precise record of queuing simulations can be a tedious task. This GUI-based Software Package for the Simulation of Queuing Networks is a simple web page to run queuing simulations. The benefits of the web application provided is that the users can have access to it anytime they have a stable internet connection and run the simulations with high accuracy.
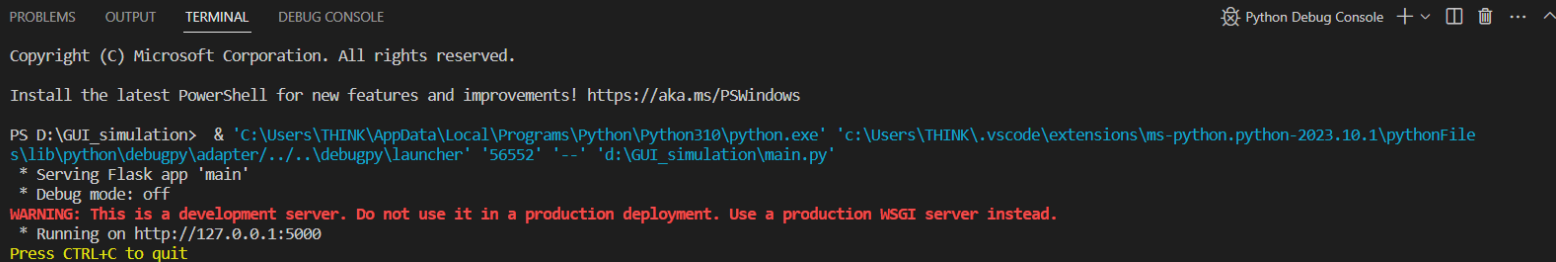
2. Requirements

The minimum requirements running & using this tool are listed below:

- Having a web browser
- Having a supported IDE (please check Installation Manual to see the list)
- Using Python 3.10.0 release (at least)
- Having Python Flask installed

3. How to Create and Run a Simulation?

Please note that the steps listed below are prepared in a way that it assumes the user has already downloaded the application folder following the steps listed in the Installation Manual and already executed it.

After executing the main.py file in the folder downloaded, you will see a local host address provided in the terminal, where the server is running on. Use the local host address (http://127.0.0.1:5000) to move to the web page:

```
PROBLEMS    OUTPUT    TERMINAL    DEBUG CONSOLE                                              Python Debug Console  + ∨  □  🗑  …  ∧

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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS D:\GUI_simulation>  & 'C:\Users\THINK\AppData\Local\Programs\Python\Python310\python.exe' 'c:\Users\THINK\.vscode\extensions\ms-python.python-2023.10.1\pythonFile
s\lib\python\debugpy\adapter/../..\debugpy\launcher' '56552' '--' 'd:\GUI_simulation\main.py'
 * Serving Flask app 'main'
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
```

3.1   Creating a Simulation

You will be directed to the Main page after clicking the local host address but even if you are in another page, click the 'Create Simulation' and go to that page to create a simulation.
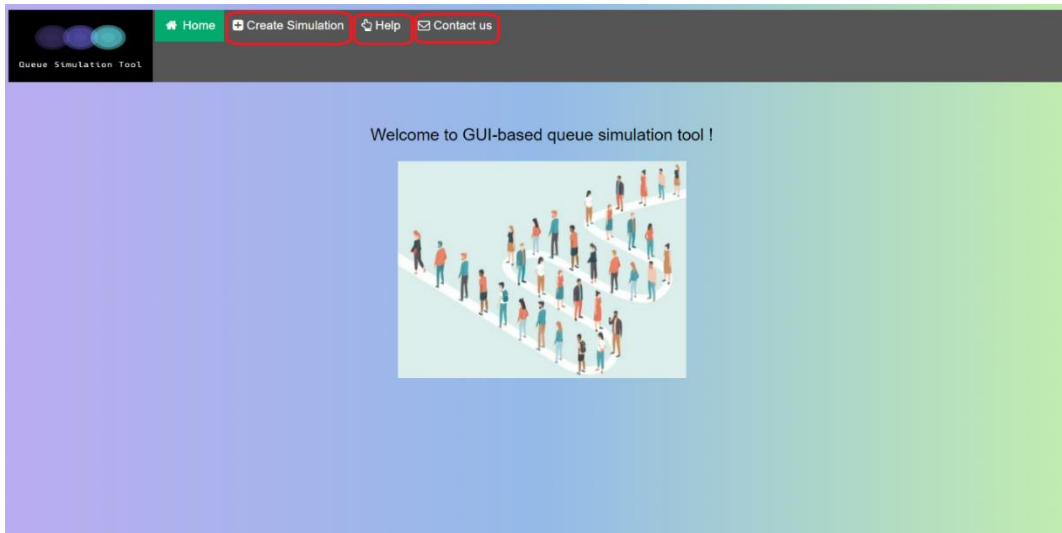

Click the simulation type you want to execute from the four options available in the page provided below. Then, a page to enter the corresponding parameters will be opened.
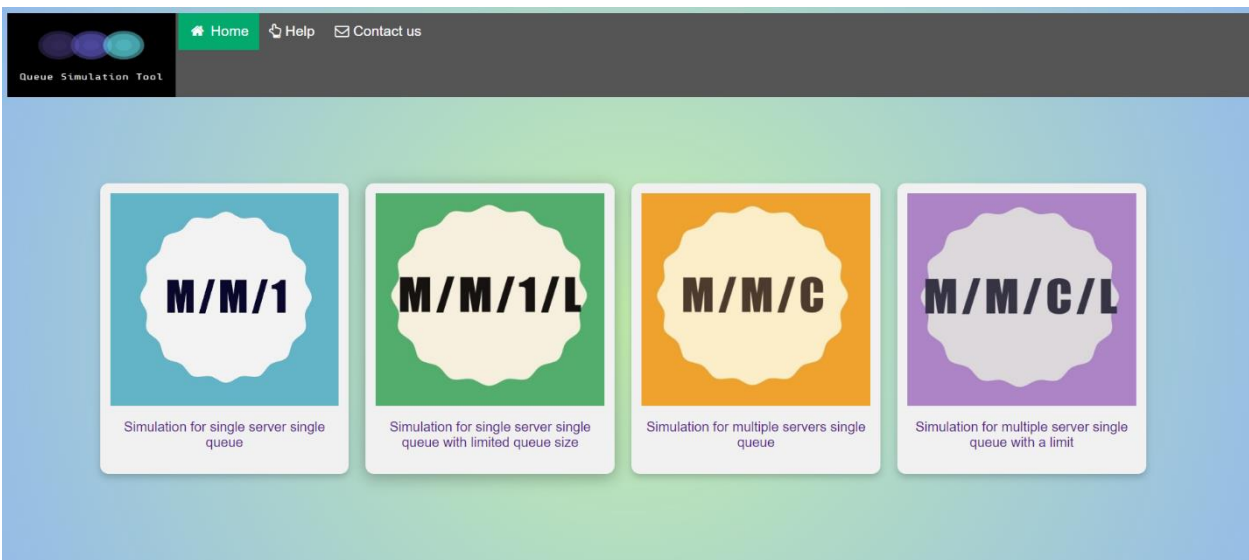
3.2   Entering Parameters

The popped up page after selecting the simulation type will look like below. Drag and drop the items you want from the Toolbox which is provided on the left side of the page (Toolbox is same for all type of simulations). Make sure to drag at least one server and one queue as illustrated in the figure below, otherwise the simulation will fail.
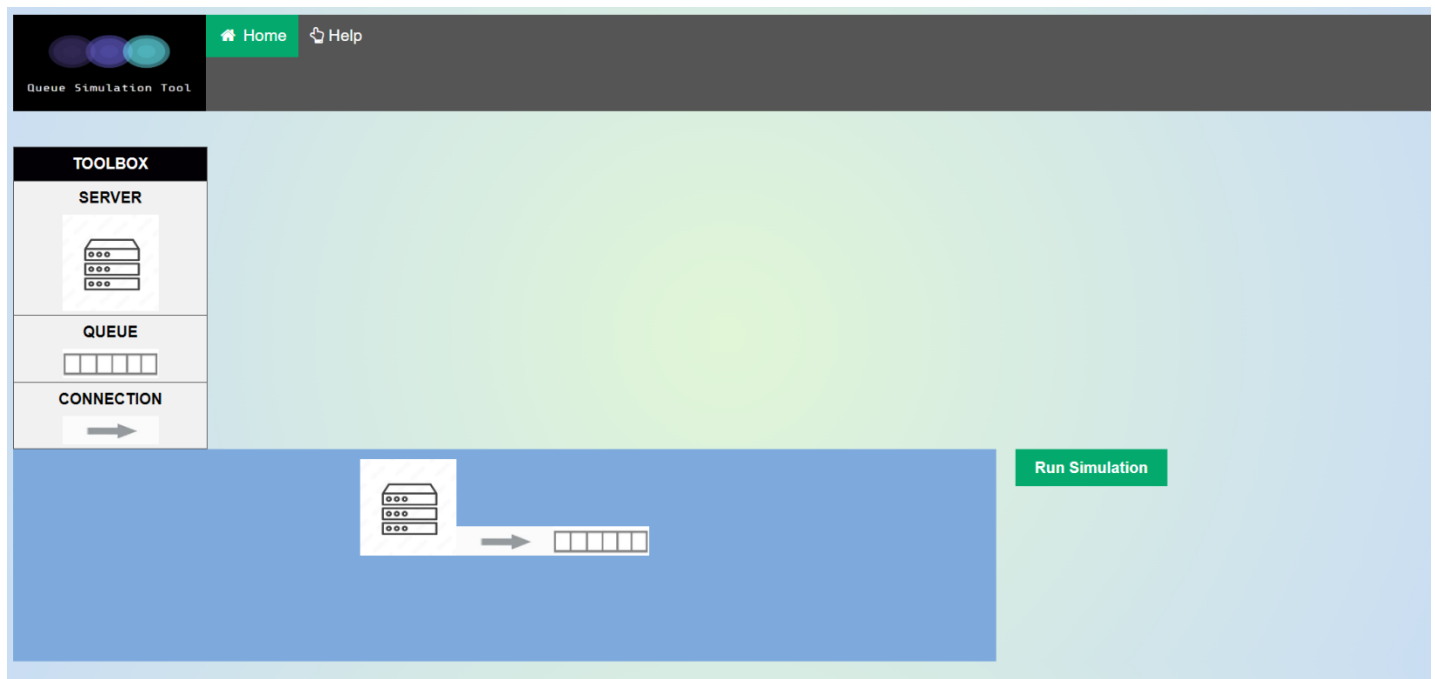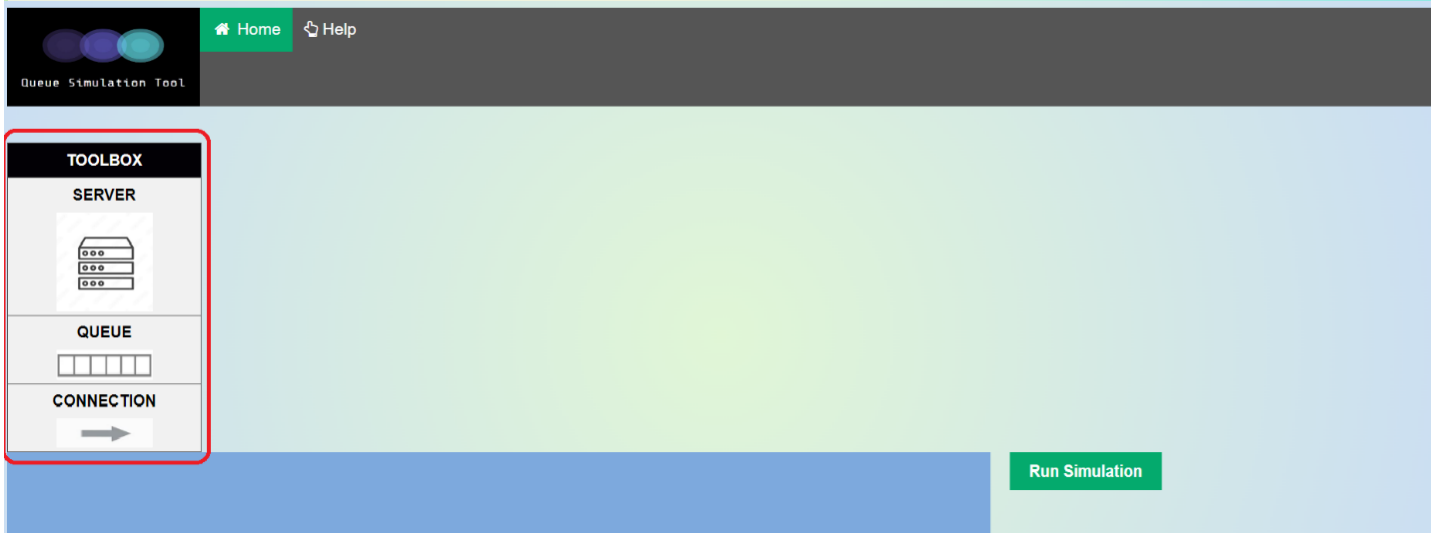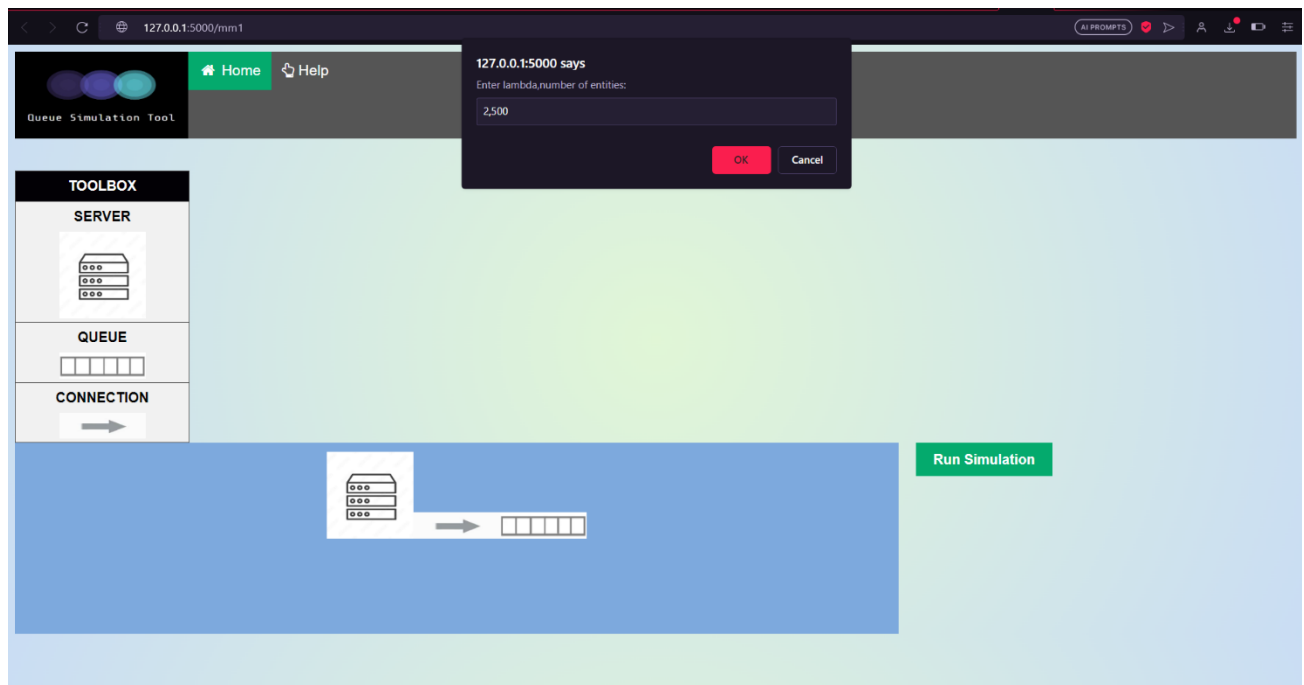
If you selected a simulation type with multiple servers such as M/M/C or M/M/C/L, you need to drag multiple servers in a specific format which is illustrated in the figure below:
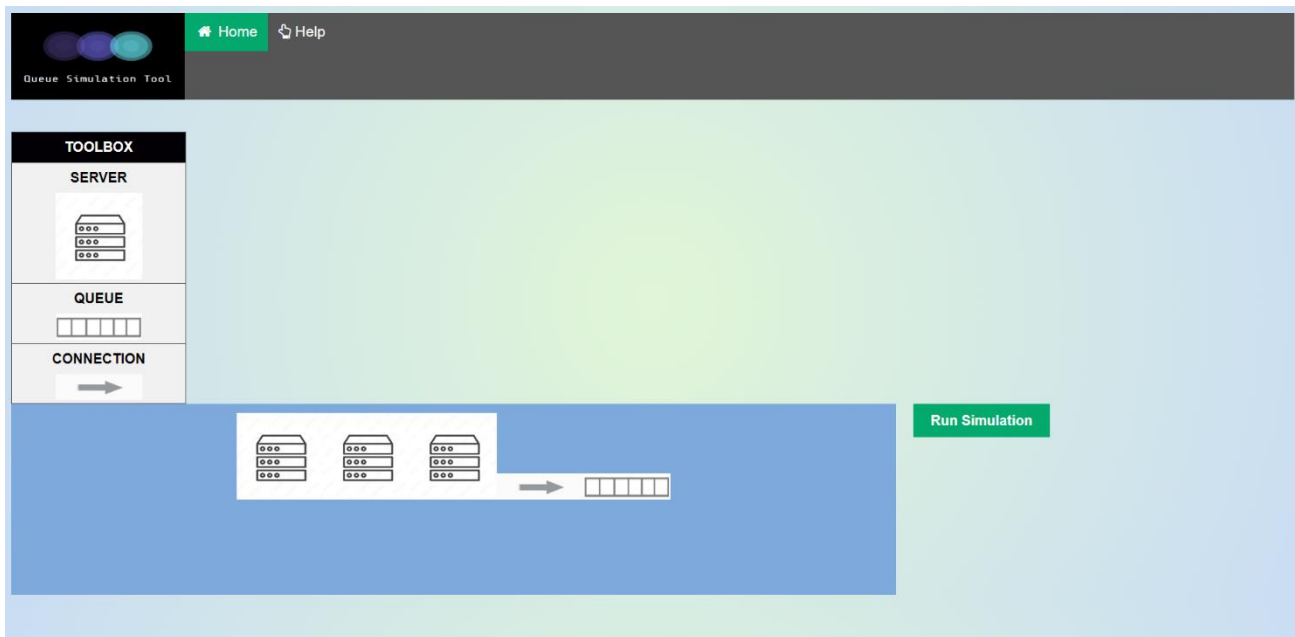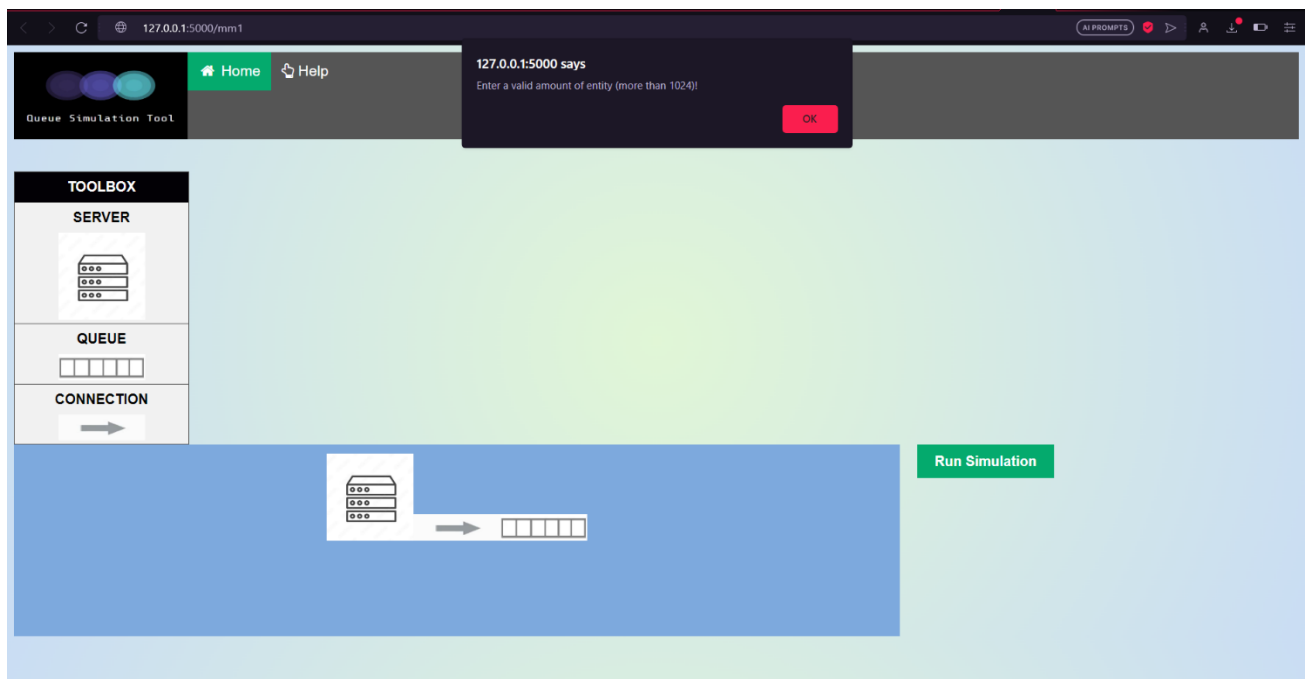

After dragging the server(s) and the queue to the canvas, click on each item to enter the desired value for it. A comment window will pop up after clicking the items. Make sure to enter valid numbers.
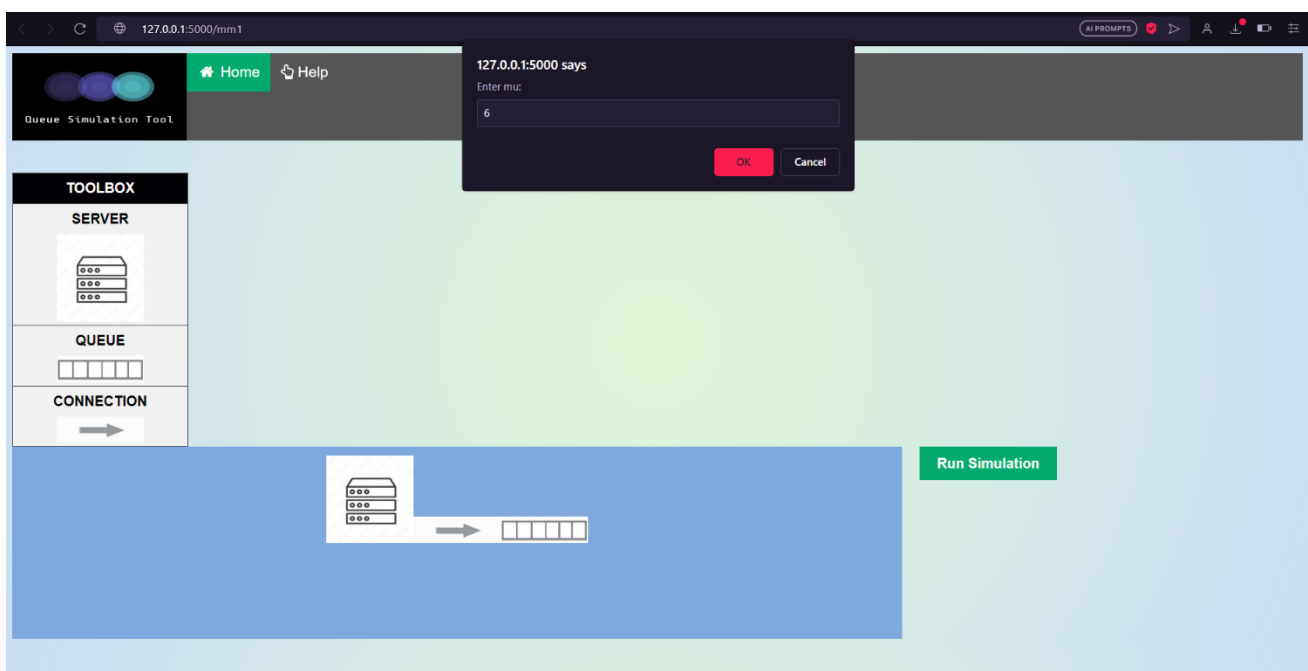
In case of an invalid value enter, a notification message will appear explaining the issue and you should reenter the data. A sample error message is illustrated below:

3.3. Running the Simulation

After entering the values in the correct format and range, simply click the 'Run Simulation' button to execute the simulation and plot the graph to see the change of MQL (Mean Queue Length) values with the number of entities in the system.
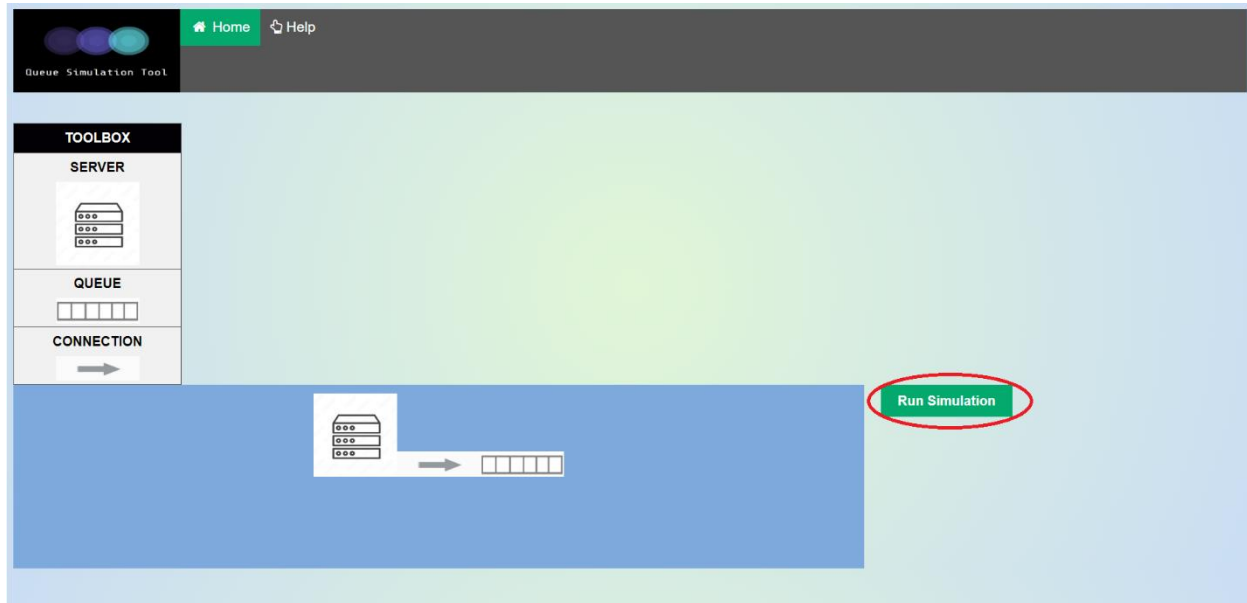
A sample line graph plotted with the simulation results would look like below (it will stop at the entity that the graph converges, so there is no problem if it stops earlier than reaching the last number of entity you entered) and you can download and save the graph if you like:
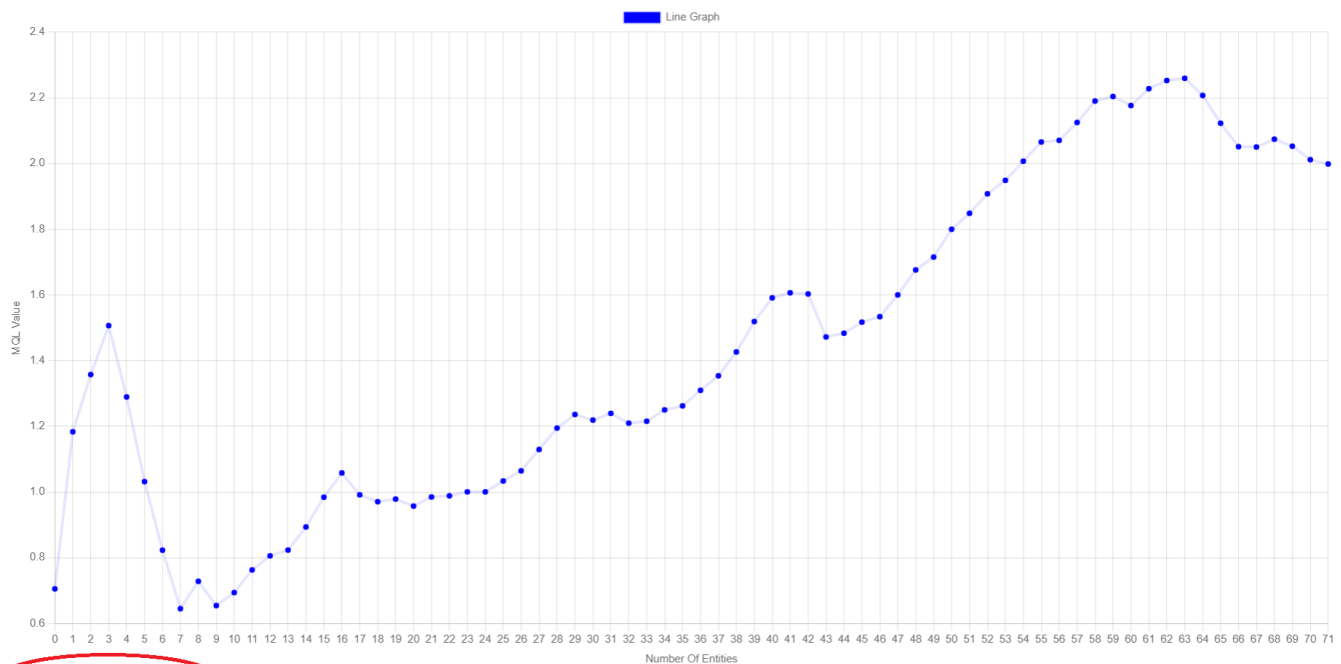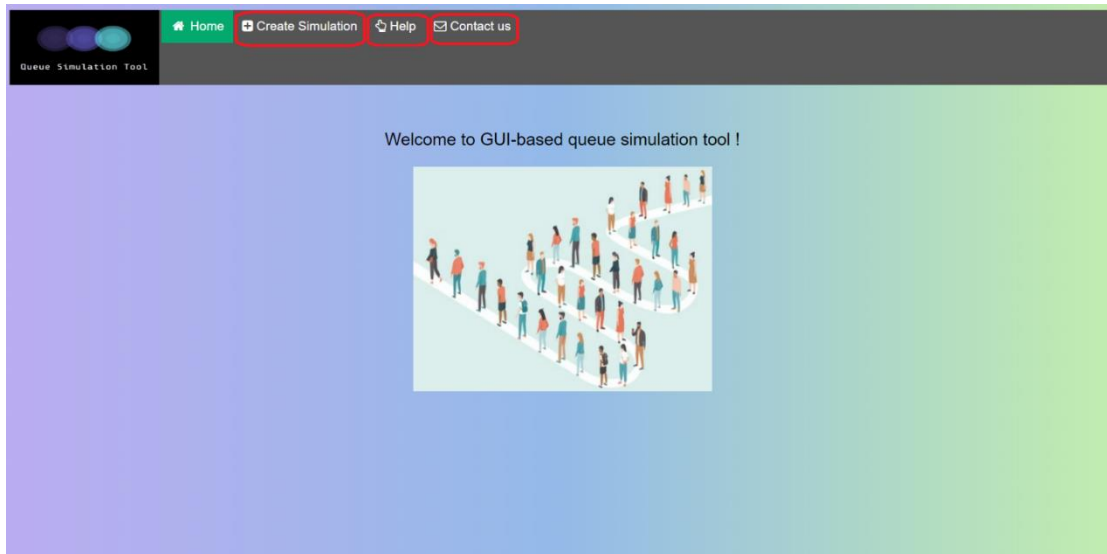
4. Available Pages in the Application

4.1   Home Page

Click 'Home' to go to the home page of the simulation from any of the available pages. You can access any of the provided tabs above in the home page by clicking on them (Help, Contact, Create Simulation)
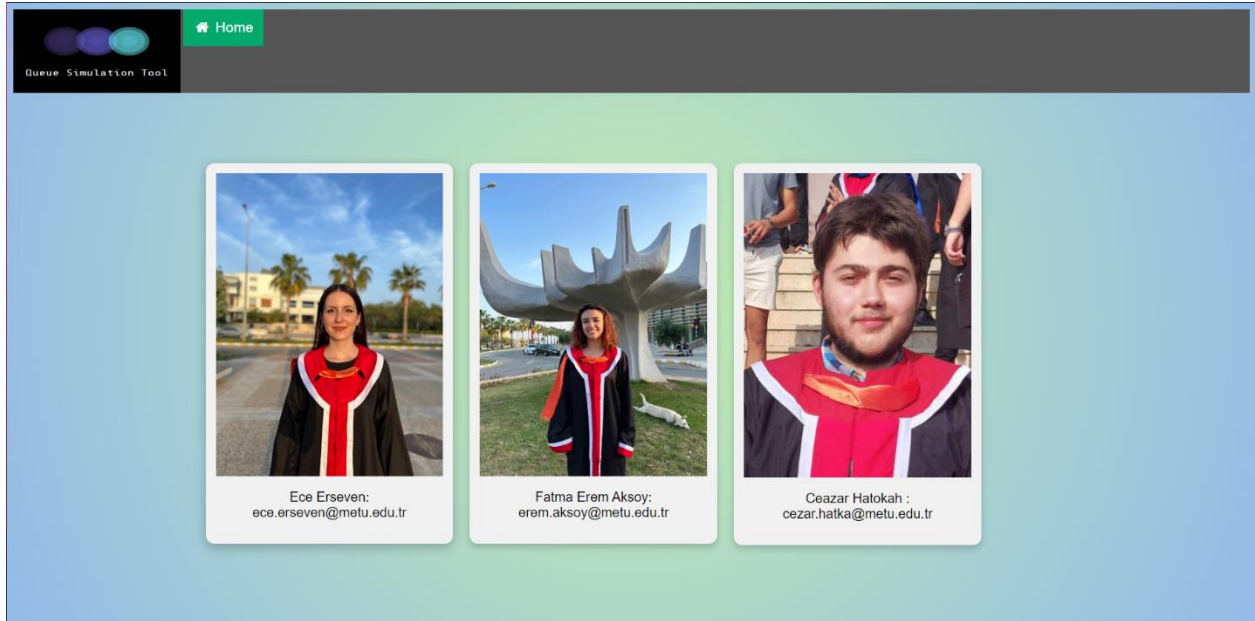

4.2   Simulation Page

Click 'Create Simulation' to refer to the simulation page of the application. Select the simulation type that you want to run by clicking on it. If you only know the Kendal's notation but not the name of the simulation, you can easily refer to the description provided under each type.
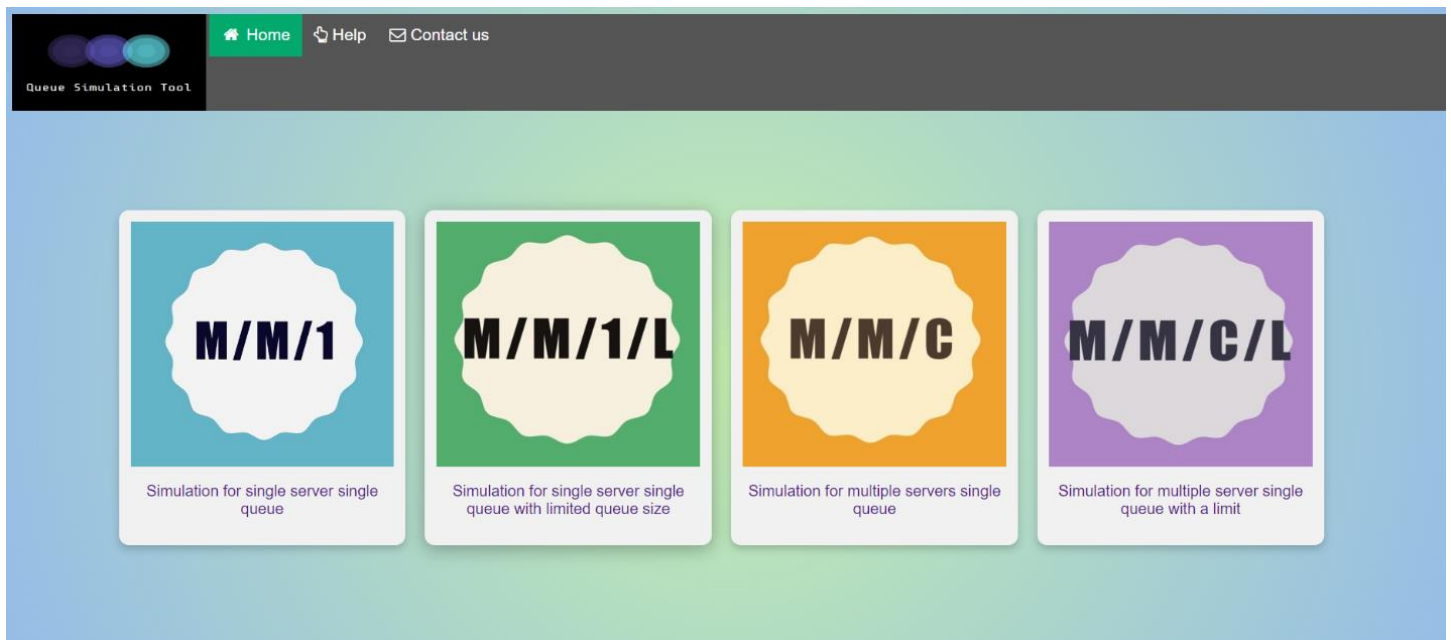
4.3   Contact Page

Click 'Contact Us' to see the contact page of the simulation. If you have any further questions or suggestions, you can contact with the developers using the email addresses that are provided for each one.

4.4   Help Page

Click 'Help' to see the help page of the simulation. In this page, you can refer to the steps of any particular operation you want to perform. Click on the boxes provided to get a helpful tutorial that helps with the labelled operation. Each of these operations are provided with a screenshot and a short description. You can see the sample of one of them (Creating a new simulation) below.
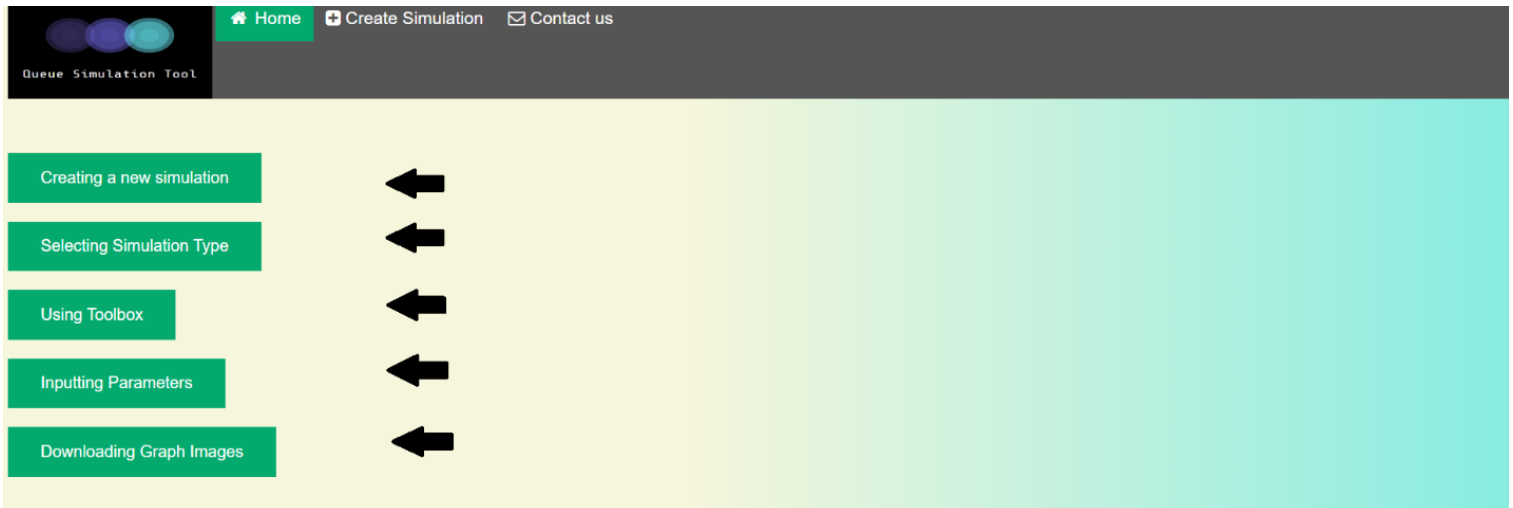
Creating a new simulation

To create a new simulation, by clicking the "Create Simulation" button, the simulation type selection page can be accessed. After this step you can choose the simulation type.