# User Guide to the Agent based model for the simulation of the relationship between crime and inequality

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| **Title** | Agent Based model to simulate the effects of inequality on crime |
| **Type** | User guide |
| **Date finished** | 16/05/2020 |
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# 1.0 Introduction

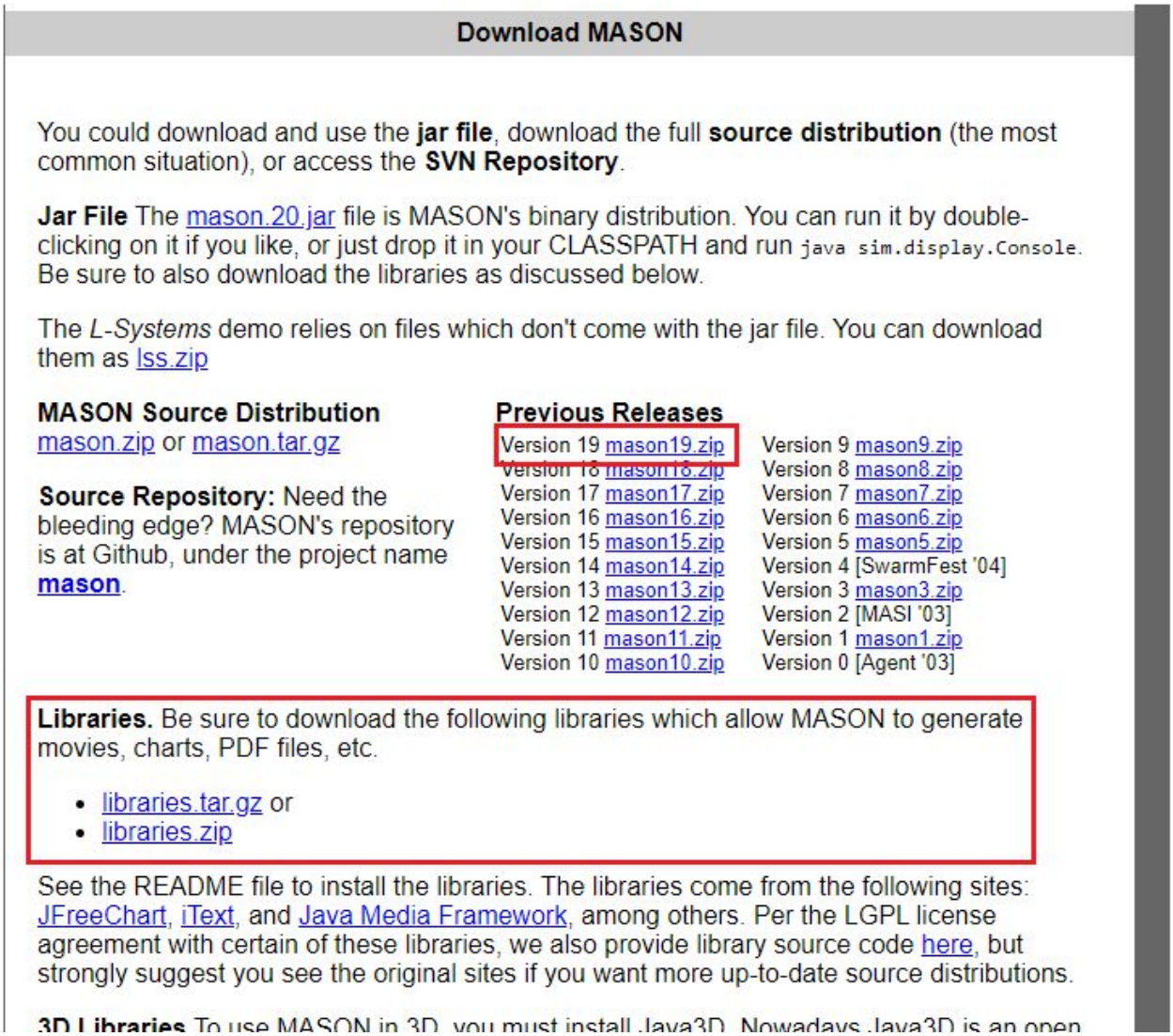
In this user guide, a clear explanation of how the application is installed will be provided. It will also give an in depth explanation on how to use the application which will include detailed explanations of features. This user guide will provide a user with information on how to instal the application first. It will then explain how to start the simulation and will then describe everything included in the simulation. Screenshots will be used appropriately to make things clearer for users.

# 2.0 Installation of application

## 2.1.1 Installation of the application

There's a good tutorial for getting Mason to work on windows machines on eclipse here: https://cs.gmu.edu/~eclab/projects/mason/extensions/eclipse/

And to get the required files to run Mason successfully head over to this website: https://cs.gmu.edu/~eclab/projects/mason/#Screenshots



**Download MASON**

You could download and use the **jar file**, download the full **source distribution** (the most common situation), or access the **SVN Repository**.

**Jar File** The mason.20.jar file is MASON's binary distribution. You can run it by double-clicking on it if you like, or just drop it in your CLASSPATH and run `java sim.display.Console`. Be sure to also download the libraries as discussed below.

The *L-Systems* demo relies on files which don't come with the jar file. You can download them as lss.zip

**MASON Source Distribution**
mason.zip or mason.tar.gz

**Source Repository:** Need the bleeding edge? MASON's repository is at Github, under the project name **mason**.

**Previous Releases**

| | |
|---|---|
| Version 19 mason19.zip | Version 9 mason9.zip |
| Version 18 mason18.zip | Version 8 mason8.zip |
| Version 17 mason17.zip | Version 7 mason7.zip |
| Version 16 mason16.zip | Version 6 mason6.zip |
| Version 15 mason15.zip | Version 5 mason5.zip |
| Version 14 mason14.zip | Version 4 [SwarmFest '04] |
| Version 13 mason13.zip | Version 3 mason3.zip |
| Version 12 mason12.zip | Version 2 [MASI '03] |
| Version 11 mason11.zip | Version 1 mason1.zip |
| Version 10 mason10.zip | Version 0 [Agent '03] |

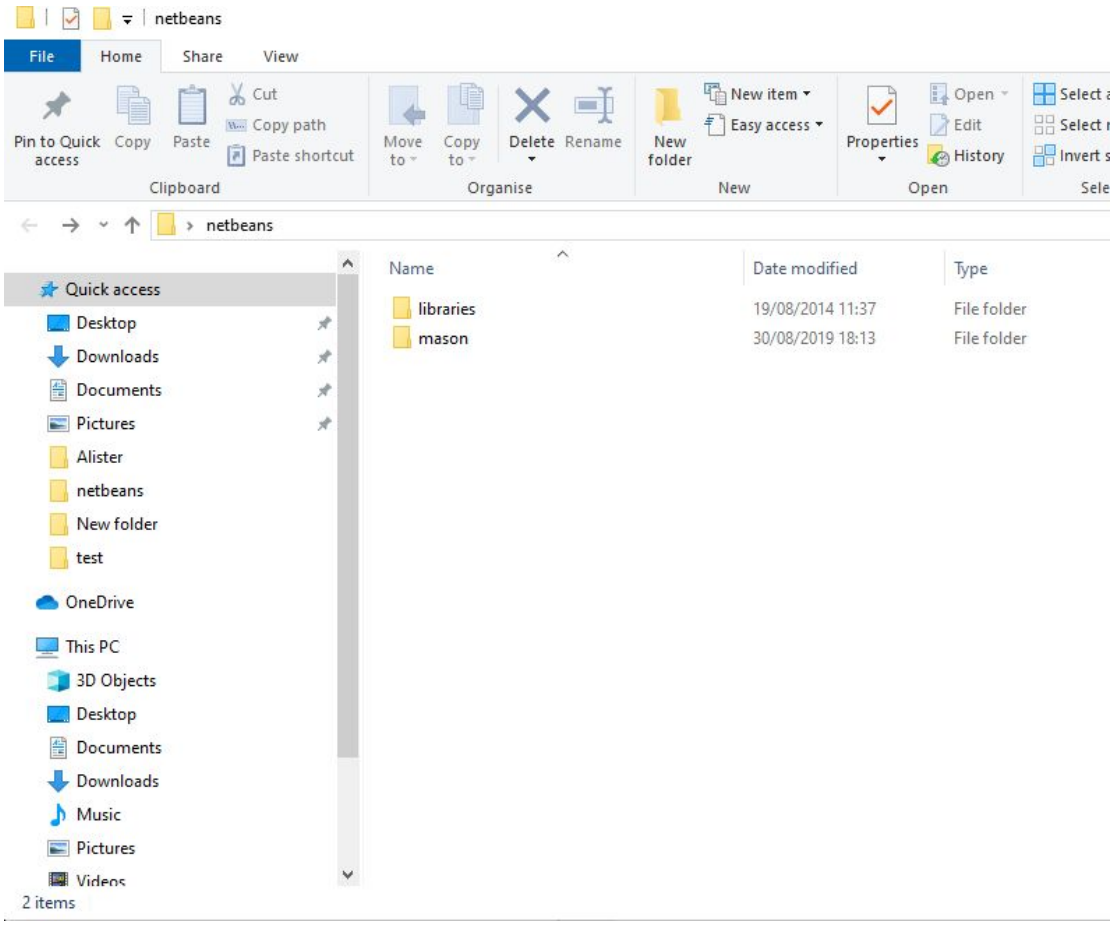
**Libraries.** Be sure to download the following libraries which allow MASON to generate movies, charts, PDF files, etc.

- libraries.tar.gz or
- libraries.zip

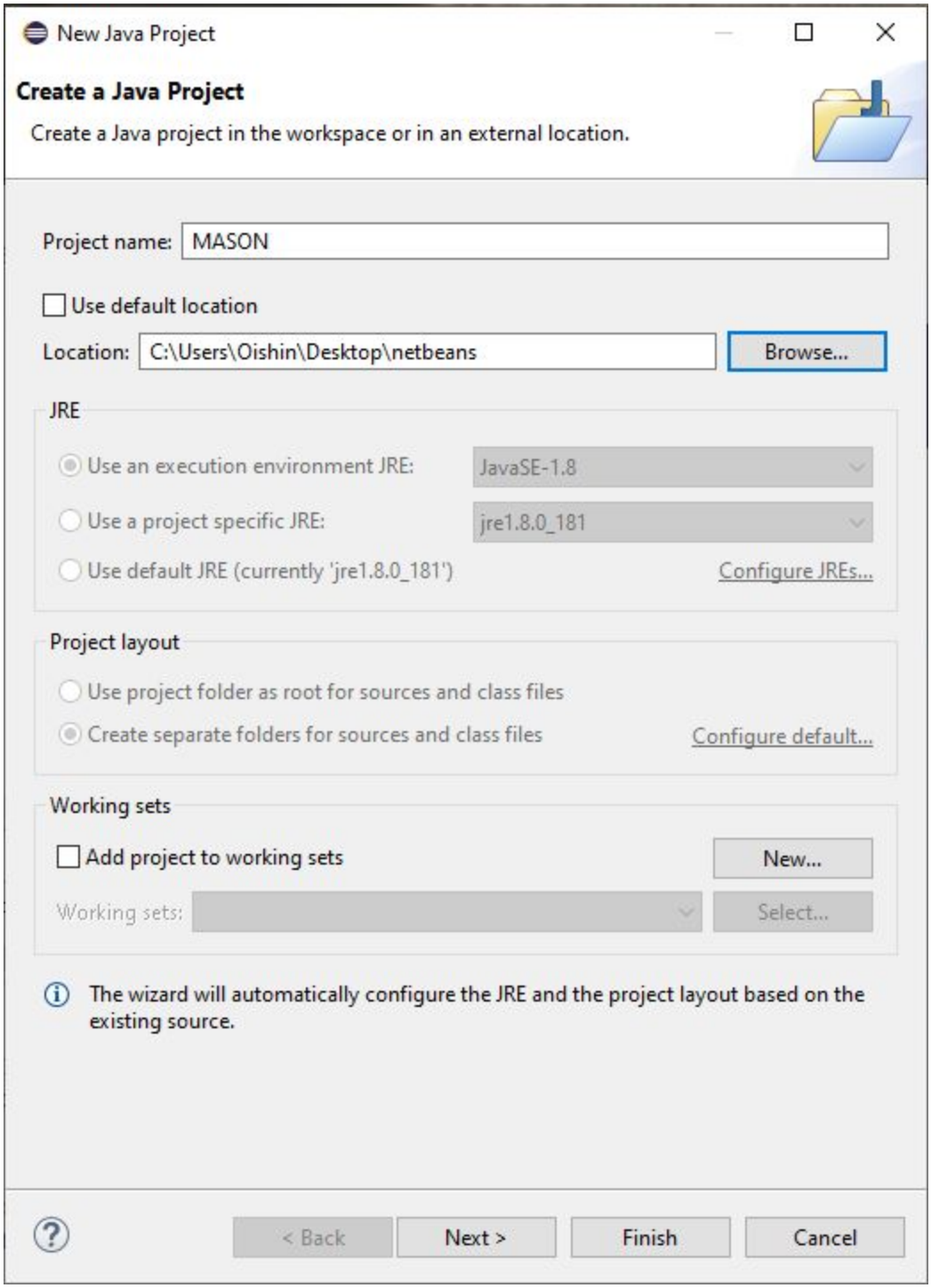
See the README file to install the libraries. The libraries come from the following sites: JFreeChart, iText, and Java Media Framework, among others. Per the LGPL license agreement with certain of these libraries, we also provide library source code here, but strongly suggest you see the original sites if you want more up-to-date source distributions.

**3D Libraries** To use MASON in 3D, you must install Java3D. Nowadays Java3D is an open

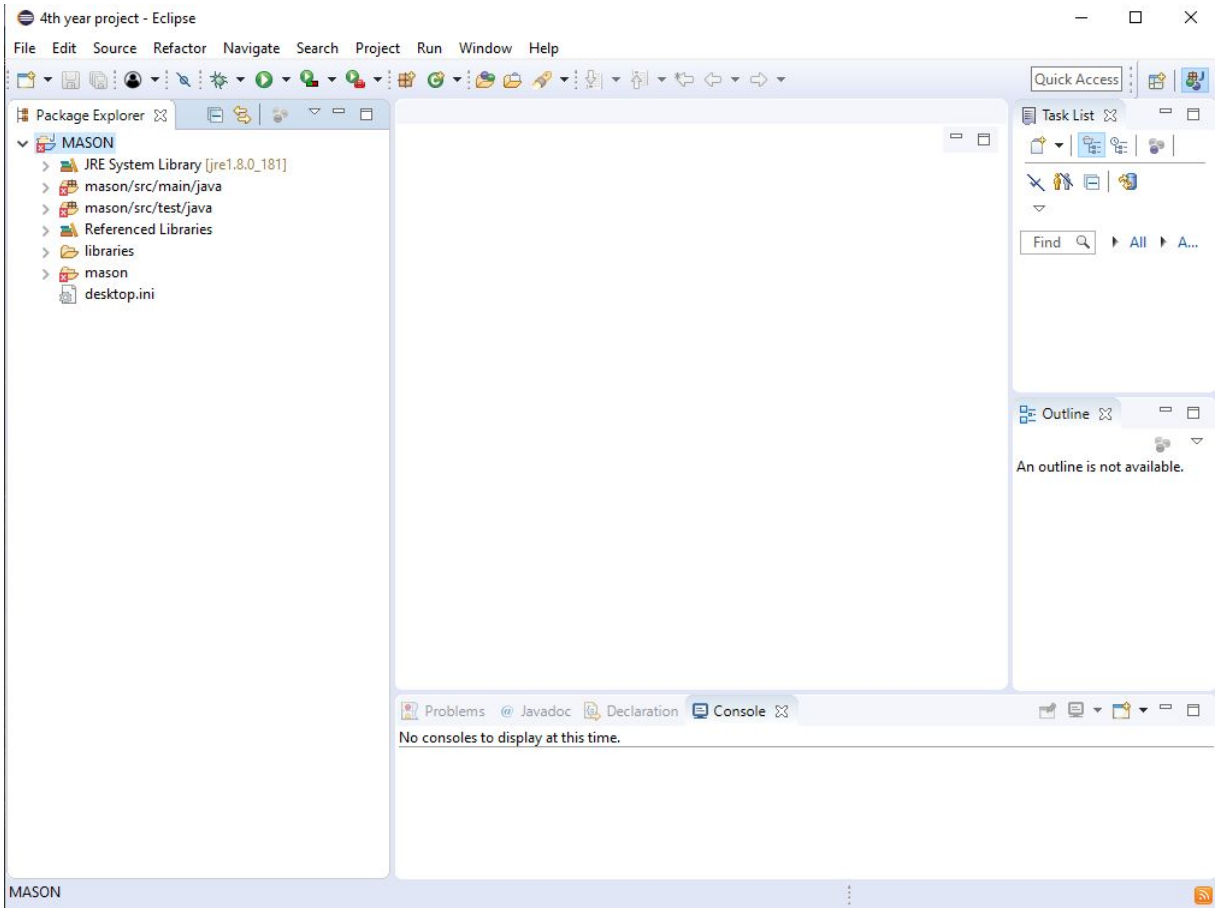
1. The first thing you need to do is download the mason19.zip file and the libraries.zip file. Unpack these files somewhere and put them into a file directory as such:



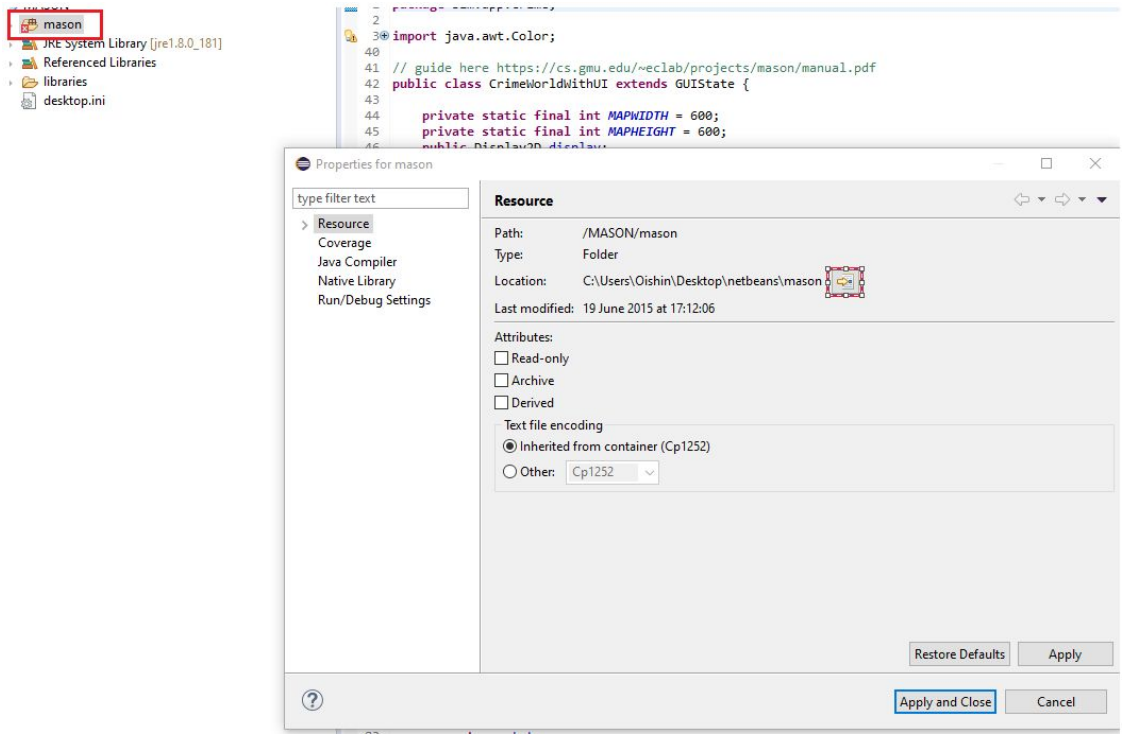

2. Now fire up eclipse and choose New, then project and select java project. Call the project MASON and untick the default location box. Now look for your file with the libraries and mason file and click finish.



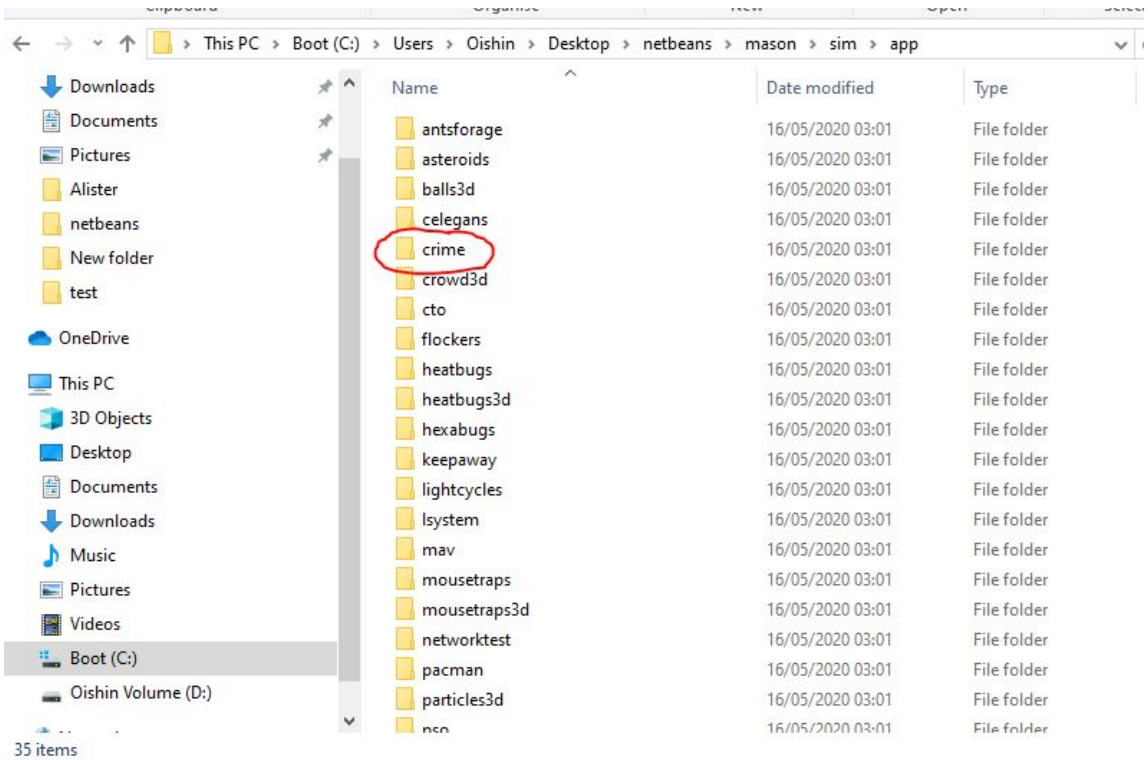

3. When that's done, you should see both Mason and the libraries folder pop up inside of the MASON directory. You will also see errors but those are due to Mason3D and will not cause us any problems.



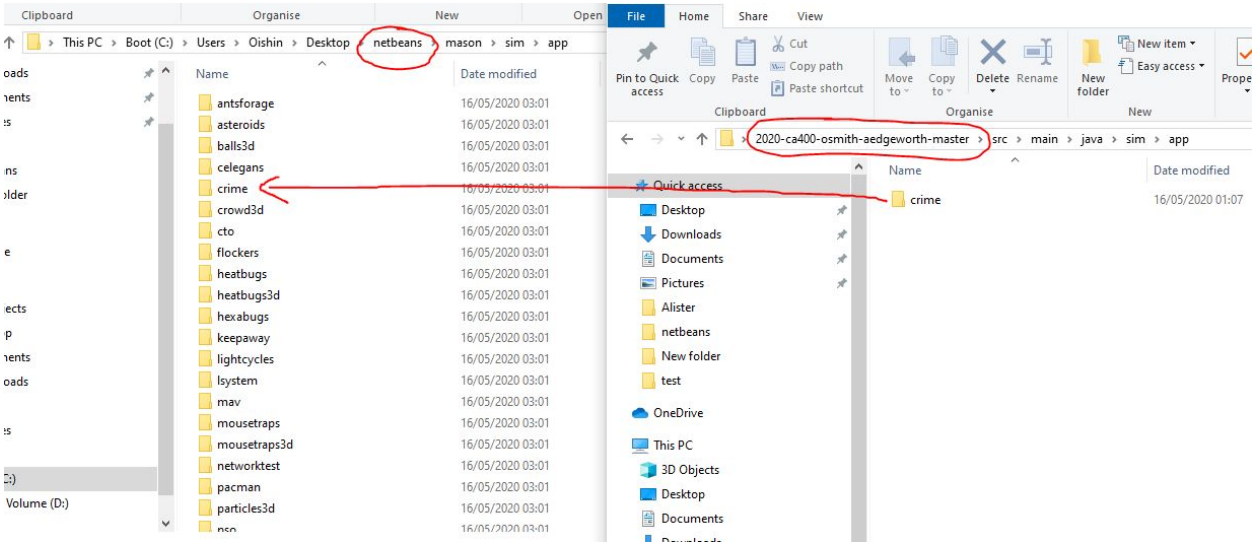

4. Now you will want to download our application. Head over to this link: https://gitlab.computing.dcu.ie/smitho25/2020-ca400-osmith-aedgeworth and download our repo. Next you will navigate to the mason folder in eclipse, right click it and press properties and press the following button to get to the mason folder.



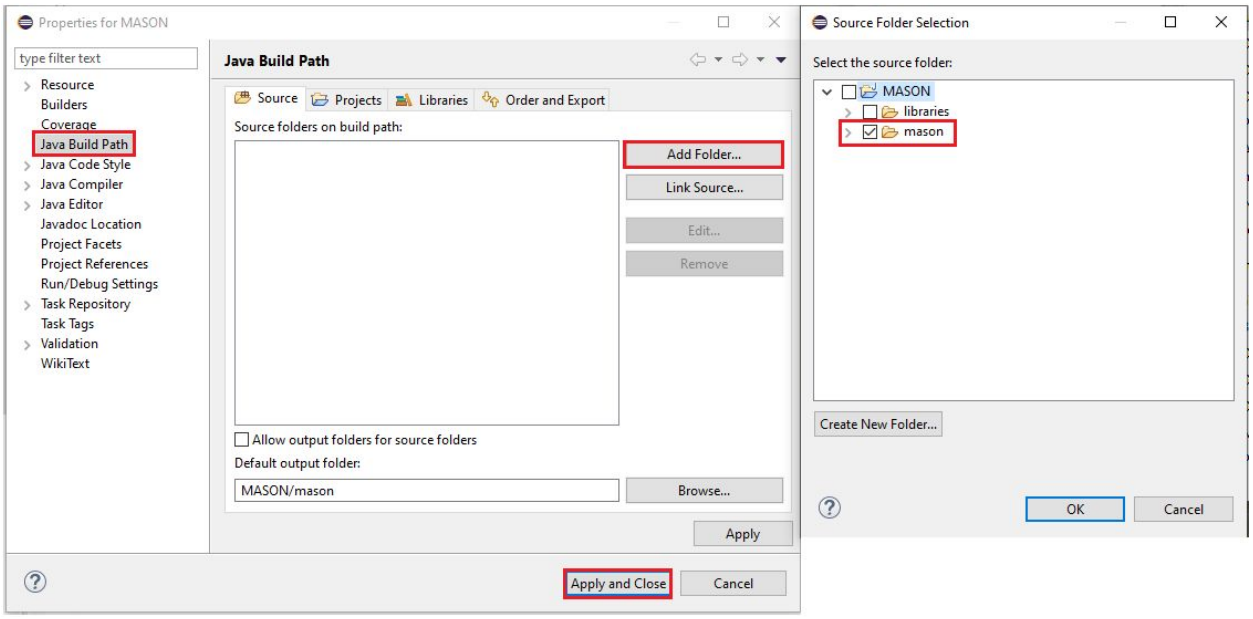

5. Here you will navigate to <yourFolderNameWIthMasonAndLibrariesInIt>\mason\sim\app which contains all the simulations included in Mason:



6. Then navigate to the 2020-ca400-osmith-aedgeworth-master\src\main\java\sim\app folder where our Crime file is located and drag and drop it into the mason app folder like so:

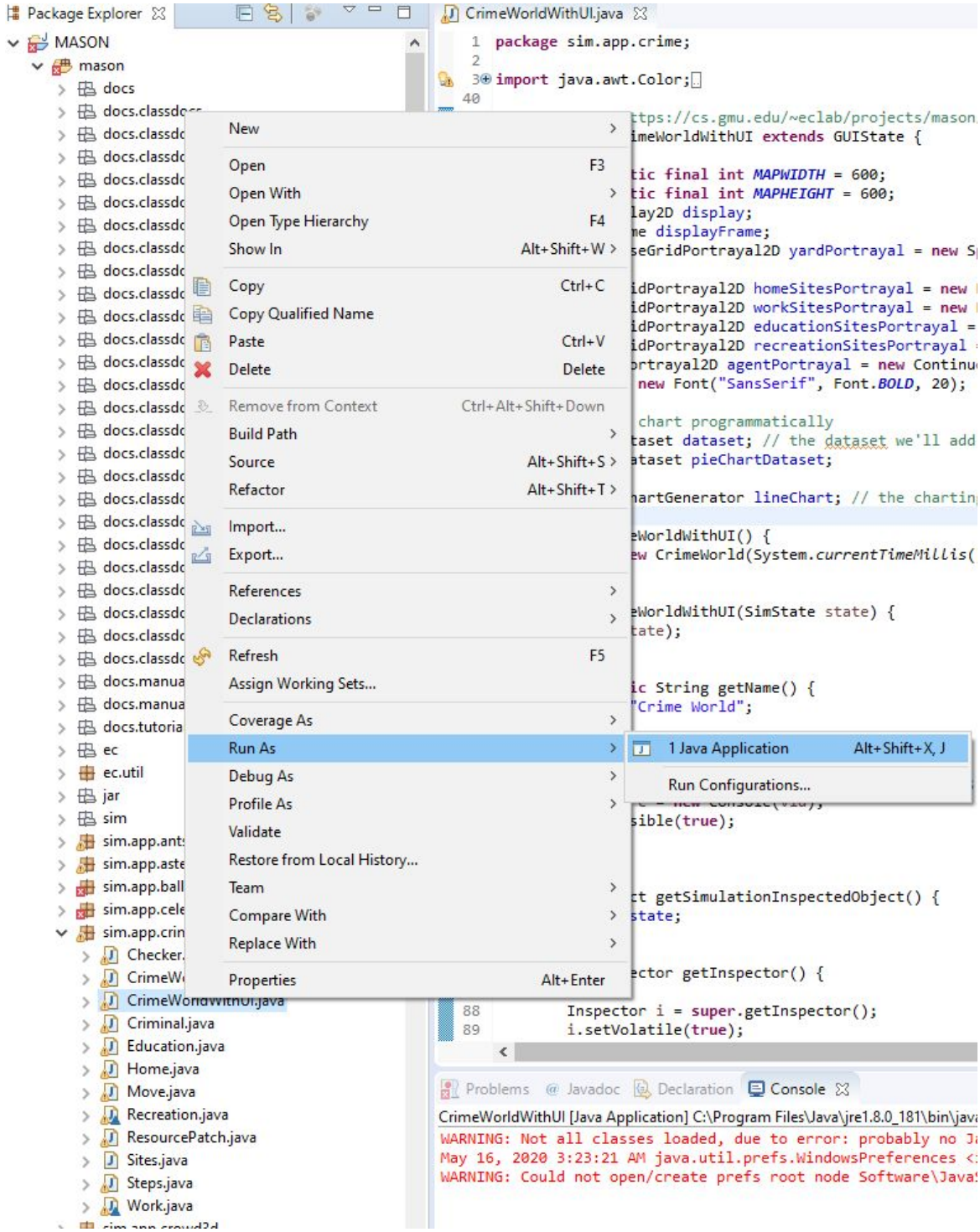



7. At this point you will want to run a file. So head over to your MASON file, select it then right click and press properties. Go to Java Build Path then source and click add folder and select only the mason folder. Now press ok and then apply and close as seen in the image below.



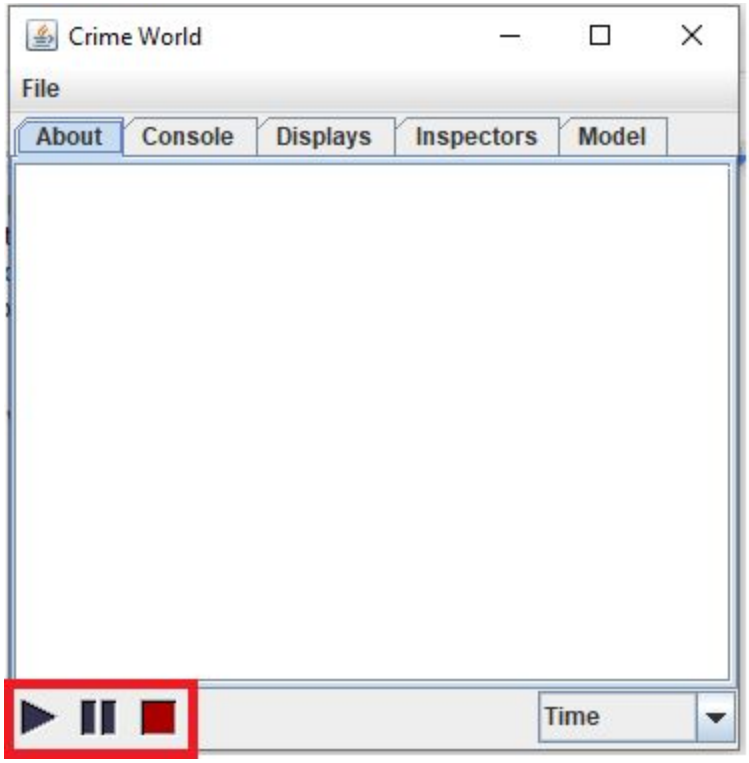
## 2.1.2 Running the application

To run the application, navigate your way down to crime and right click the CrimeWorldWithUI.java file. Press run as and click java application. A message will pop up and press proceed.



## 3.0 Features

## 3.1 Starting the simulation

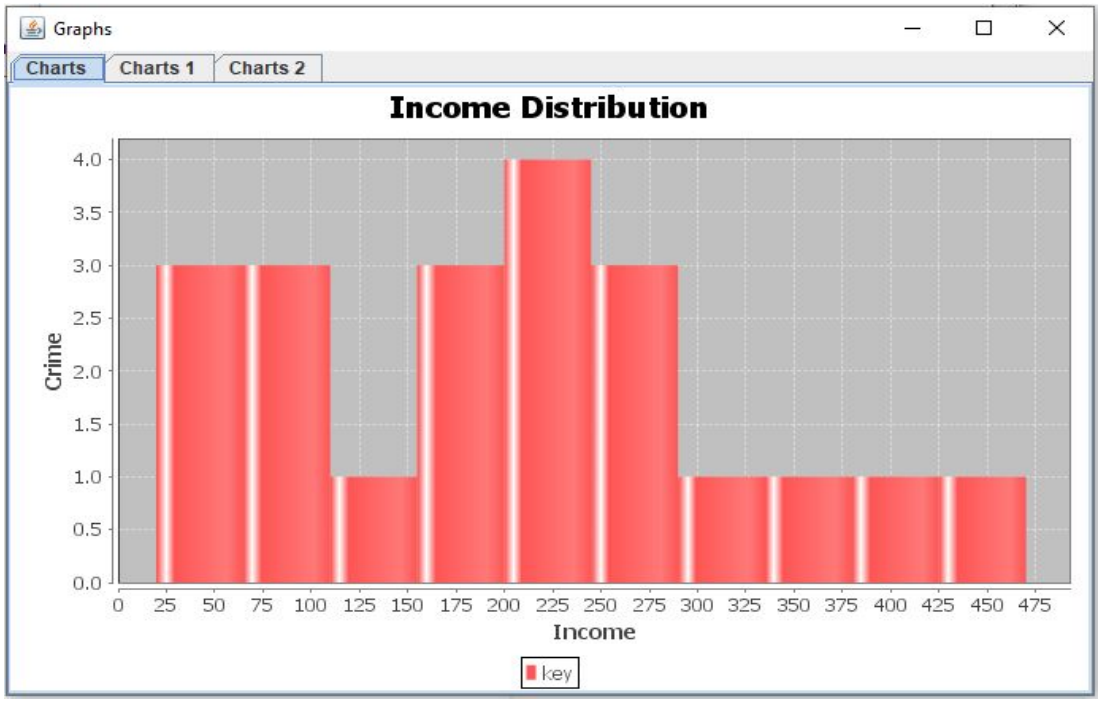



To run the simulation, you click on the play button. To pause the simulation you can click the pause button and then press the play button again to resume the simulation. To stop the simulation, you click the stop button.

## 3.2 Windows

### Graphs window

Once the play button has been pressed, all three windows will display data from the simulation. The graphs window will display a couple of different graphs such as the income distribution graph and a graph displaying the total amount of homeless people vs people with homes which shows data from the very start of the simulation only.



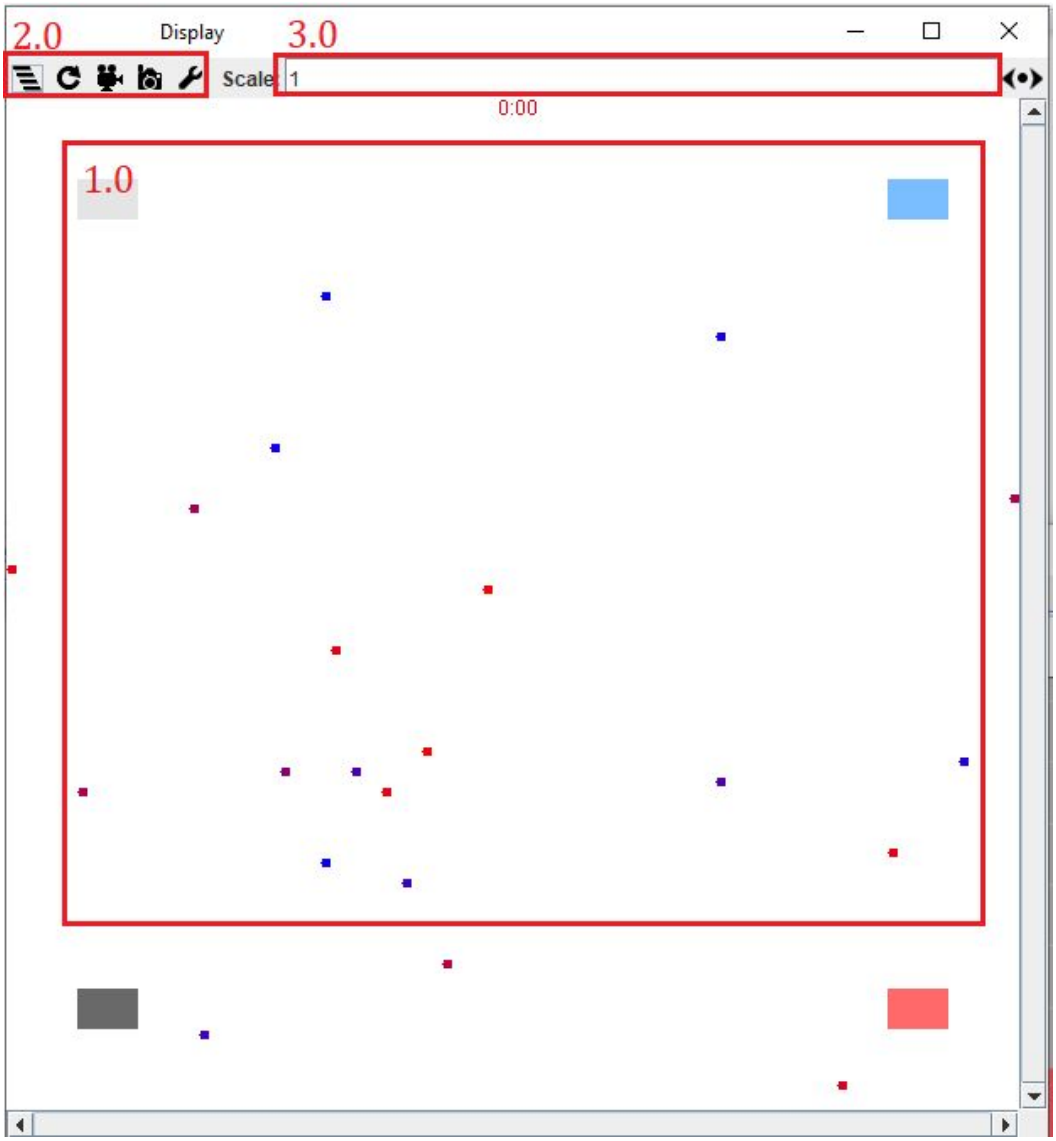

If a user wishes to, they may print out the graph by right clicking the graph itself and then selecting print. Other options such as saving the graph as a png or zooming in and out of the graph is also possible.

## Sandbox window

1. 0 This window displays the sandbox. Here a user is able to see agents moving about the screen and the sites as well as a clock on the top centre of the window.

2.0 Users may also change the settings on the top left of the window. Settings such as lower redraw rates can help to speed up the simulation. A snapshot of the current sandbo can also be taken at any time during the simulation. A snapshot takes a picture of the sandbox in its current state and is downloaded on the computer.

3.0 The scale can also be changed, to allow a user to zoom in and out of the sandbox.

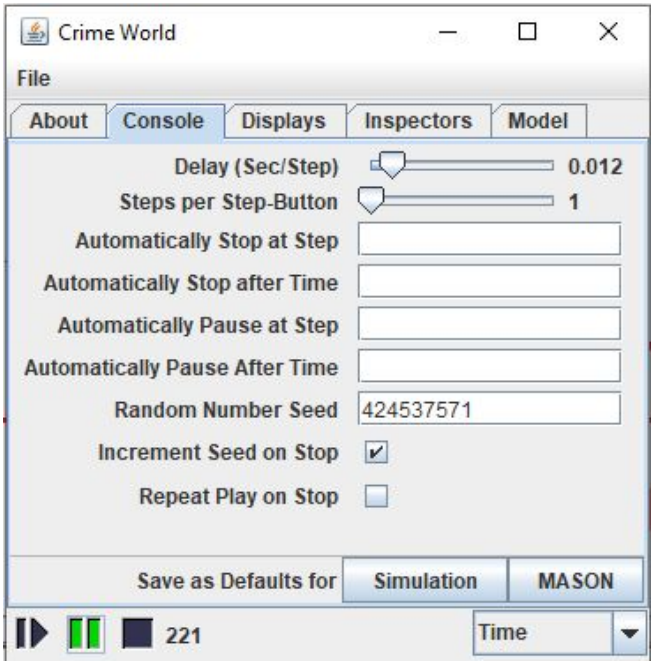


# CrimeWorld window

The CrimeWorld window is used to start and display all the current data for the simulation.

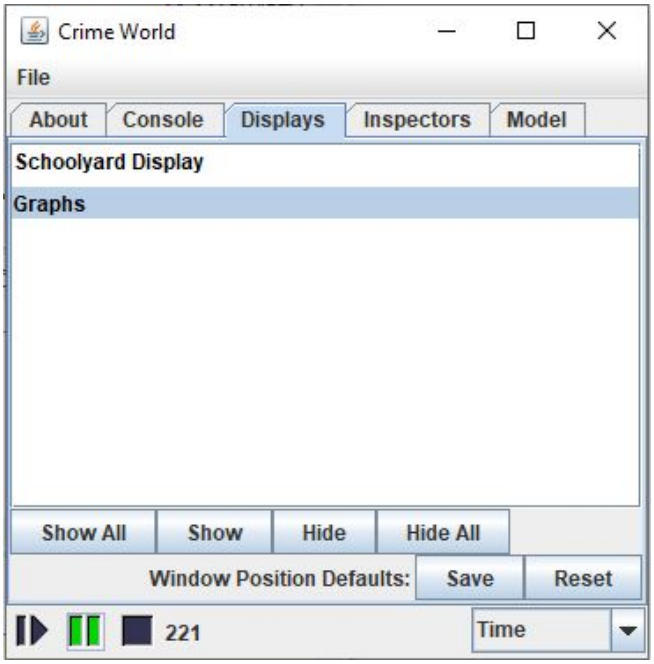
**Console Tab:**

Here, a user can set the delay between each step, set at what step the simulation should stop or pause and change the seed number. The settings can then be saved as the DEFAULT settings for both the simulation and Mason.



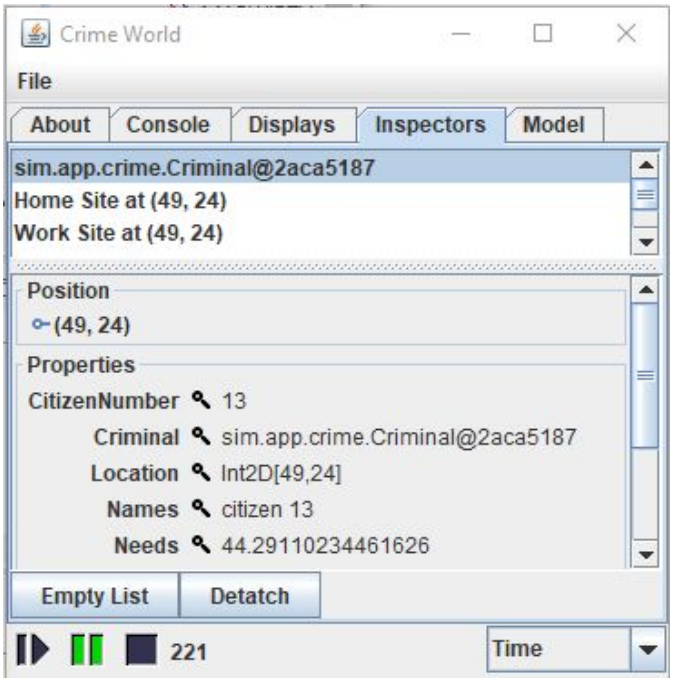

**Displays Tab:**

Displays shows all the windows that are active during the run. A user may hide each window by clicking the hide all button and make the windows reappear by clicking the show all button. A user can also save the layout of their windows for future use of the application by clicking the save button on the bottom right.



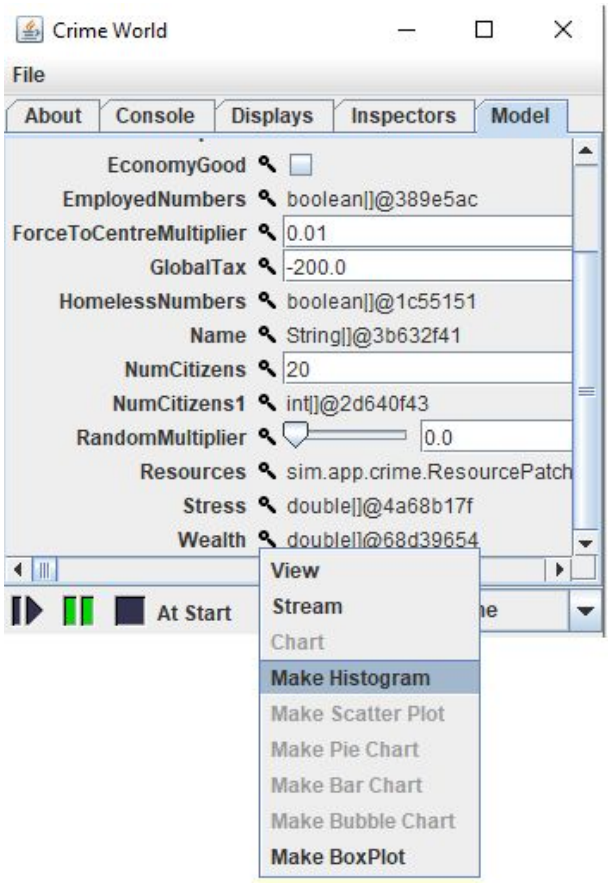

**Inspectors tab:**

When a user clicks on an agent, the inspector tab will display the information that applies to said agent. Information such as the position, citizenNumber, Location, needs and stress are displayed. A user will also see all objects held on that grid coordinate. A user may also wish to detach the properties from the window to see the properties better.

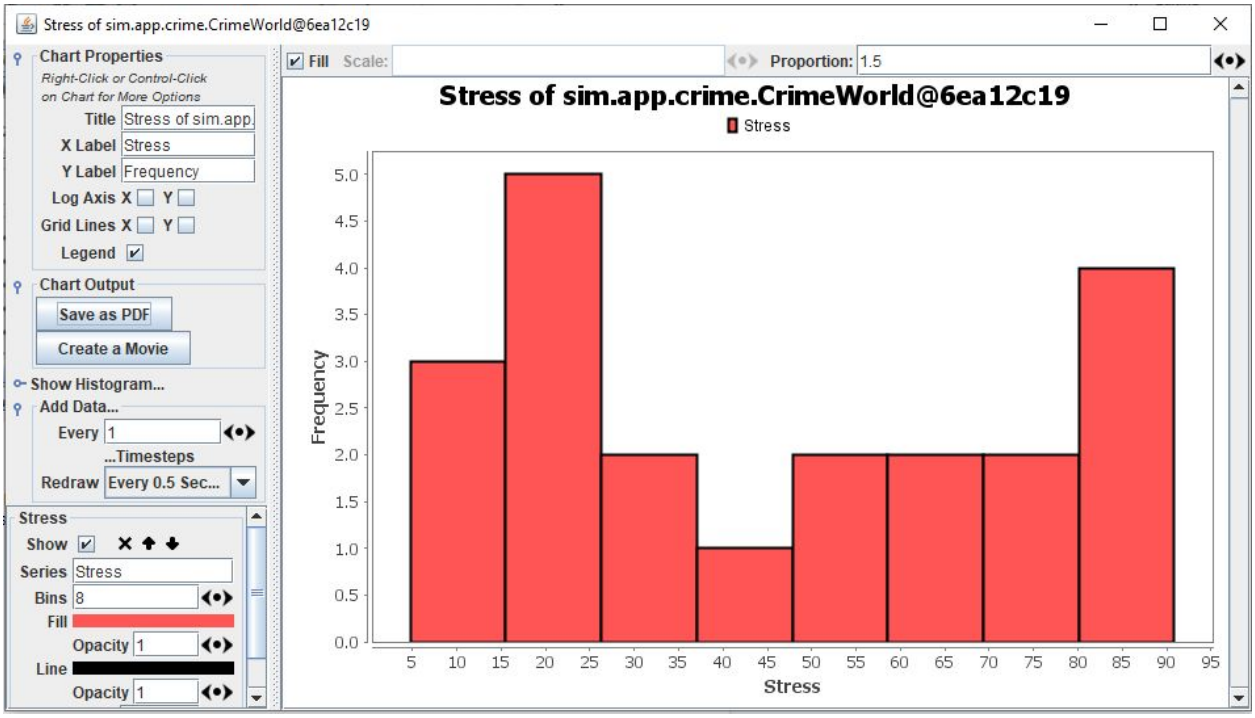


**Model tab:**

The model tab displays all the information for a simulation. Here, variables such as a good economy, number of citizens and Global tax can be set. The black magnifying glass beside each data entry such as “Wealth” in the image below can be clicked for more options

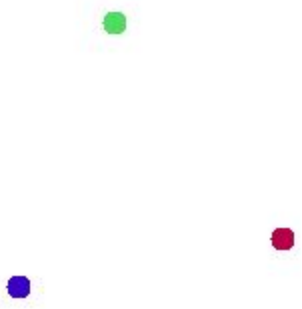



A user can graph a specific value such as the current wealth distribution and stress distribution( by clicking the black magnifying glass beside the name of the data entry and clicking histogram) as shown in the image below. Here a constantly updating histogram is generated every couple of steps. A user can also download and save the histogram as a pdf and tweak other settings to do with the histogram.




## 3.3 Agents

Types of citizens: a citizen's color will depend on their stress level. The more stressed a citizen is, the more likely they are to commit a crime and this is shown by the color change. The less stressed a citizen is, the more blue they become. There is also a small chance an agent may become sick. If an agent becomes sick, they will turn green.



## Properties

Every agent will display their properties in the Inspector tab once a user clicks on it. The properties tab shows constantly updating and relevant information for that one agent. Most of the information here changes depending on what the agent is doing and some of the information can be graphed to have a broader understanding of what is happening in the simulation as it is running.

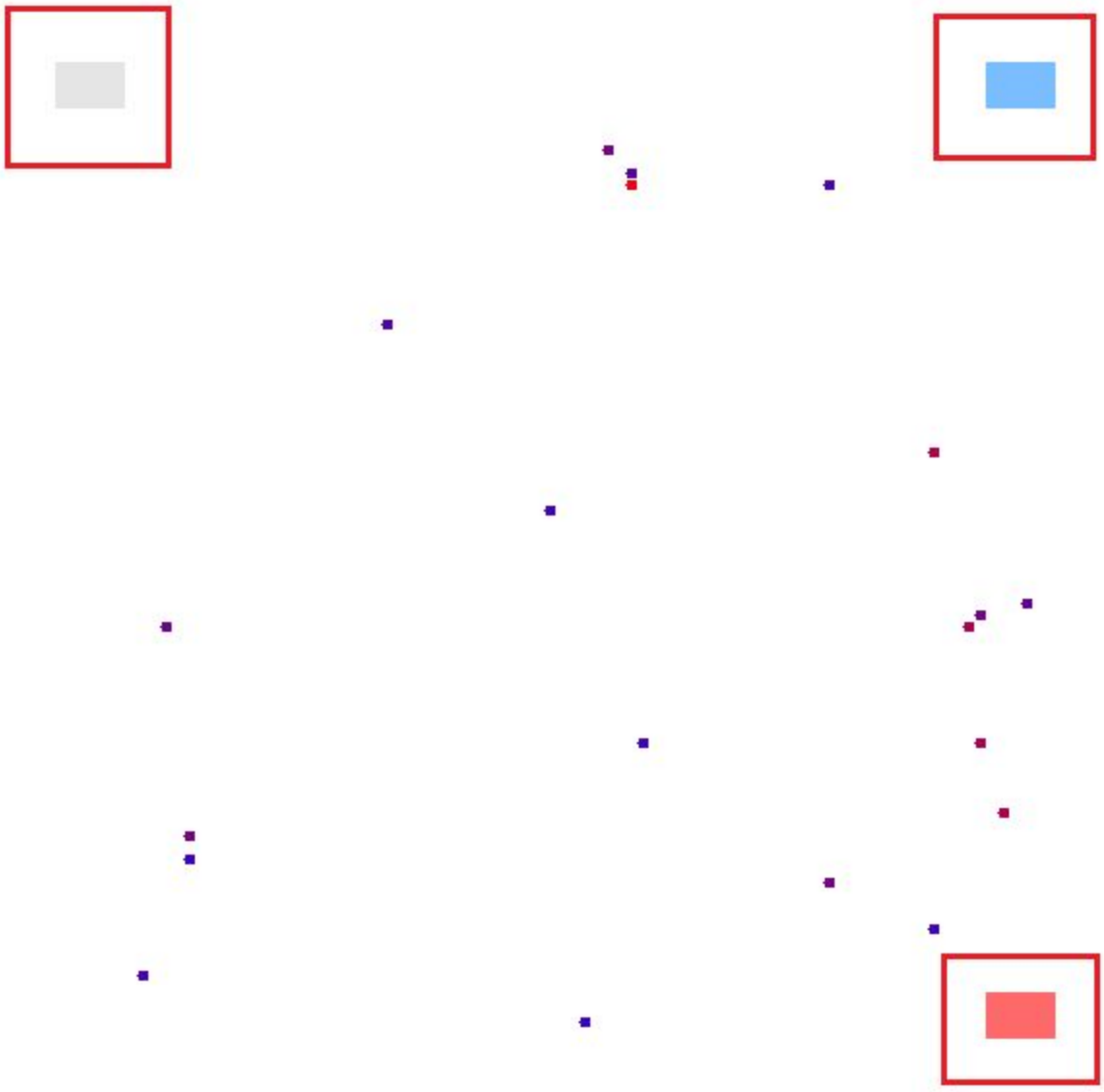

## Sites

The sites in the image below are places that the agent goes to for different reasons.

On the top left corner is the Home site which is colored grey. Most agents will spend their evenings here and will sleep and reduce their stress by relaxing.

On the top right corner is the Shop colored light blue. Once an agent's needs are depleted they will hurry over to the shop to replenish them at any time during the day.

Finally, the work site is on the bottom right corner and is colored red. An agent will travel to work every day if they have a job to earn money. Most agents will be working from 9am to 5pm, but that may vary from agent to agent.



## 3.4 Events

### Economy

The economy inside of the simulation will change as the time goes by. Every couple of days inside of the simulation, the economy might change. The economy can change from being good, to mediocre to bad. A bad economy means that a recession has hit, this can mean two things:

1. The likelihood of an agent to get demoted and work in lower paid jobs increases drastically. This means it's harder for agents to get higher paid jobs and to earn higher levels of income.
2. The likelihood of an agent to lose their job also increases drastically. If this were to happen, an agent's stress would increase more quickly as the worry of money would become a problem and in turn the agent may turn to crime.

A good economy would denote the opposite:

1. Higher paid jobs are more available meaning that each agent has more opportunities gain higher income and better paid jobs
2. An Agent losing their job becomes rare, it can happen due to unforeseen circumstances though.

## Homeless/unemployed

Homelessness and unemployment are both events that could happen to any agent. The type of economy that an agent is in affects the amount of job losses and homeless people. If the recession lasts long enough it could seriously cause problems for the agents meaning higher crime and higher stress levels.

## Crime

Crime is another big event that triggers once an Agent's stress levels are high enough. As explained above, crime happens when an agent becomes desperate enough and stress levels are high. This is caused by a lack of money, a low paying job or unemployment or disease. The image below is showing two agents in the middle of being robbed. Stress triggers the robbing event and sends the criminal (a reddish color) chasing after a target citizen (a blueish color) to steal money.