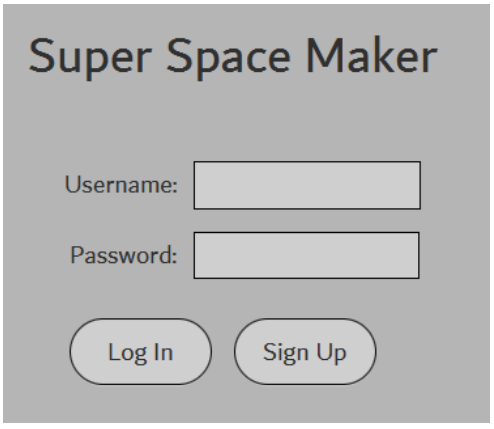
User Guide

Super Space Maker

A n-body gravity simulator that models the way celestial bodies attract each other. Newton's Law of Universal Gravitation is used to calculate the force of attraction between two bodies. Newton's equation is the following: $F = G\frac{m_1 m_2}{r^2}$. The calculation of the force depends on the mass of the bodies, the distance between each other's center of mass and the gravitational constant. The force is then used to calculate the accelerations of the astral bodies by using Newton's Second Law of Motion $F = ma$, with both the force and the acceleration being vector values and the mass being a scalar value.

1. User Login



This section of the application lets the user access it in a secured manner and any returning or new users can use the application.

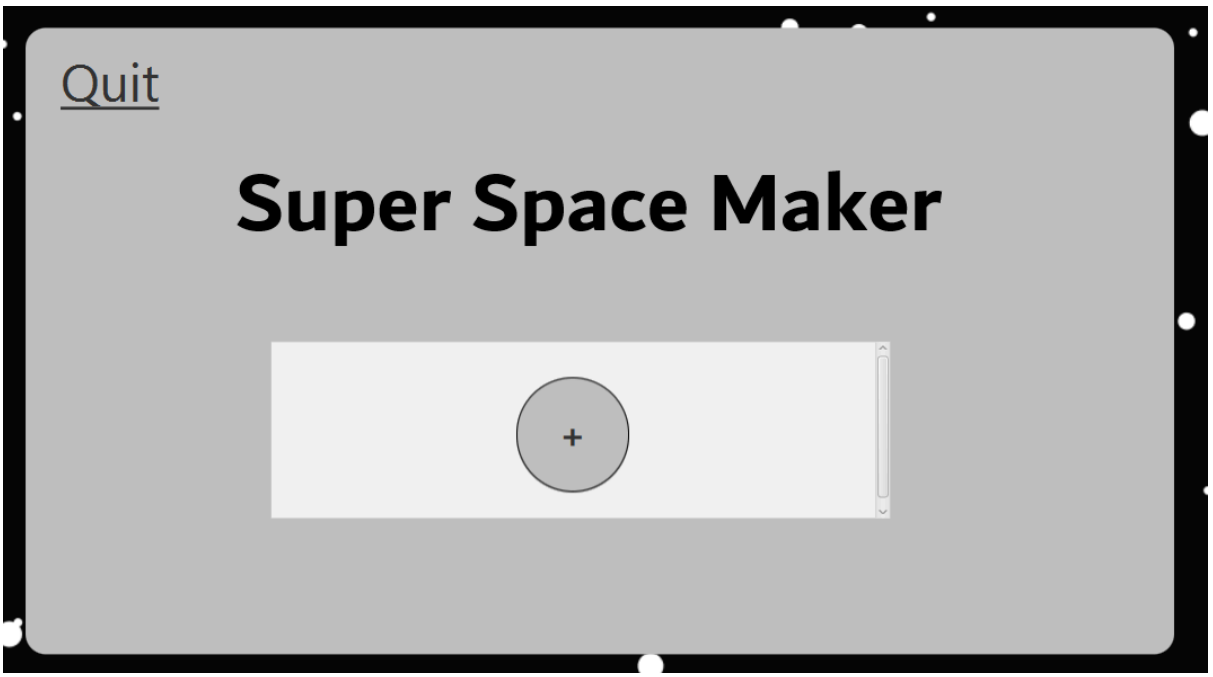
1.1 Logging in

The user can login with their credentials to access the application from where they left off.

1.2 Signing up

If a user does not have an account or a user desires to create a new account, the signing up section lets you create a new username and password to be able to login the application.

2. Main Menu

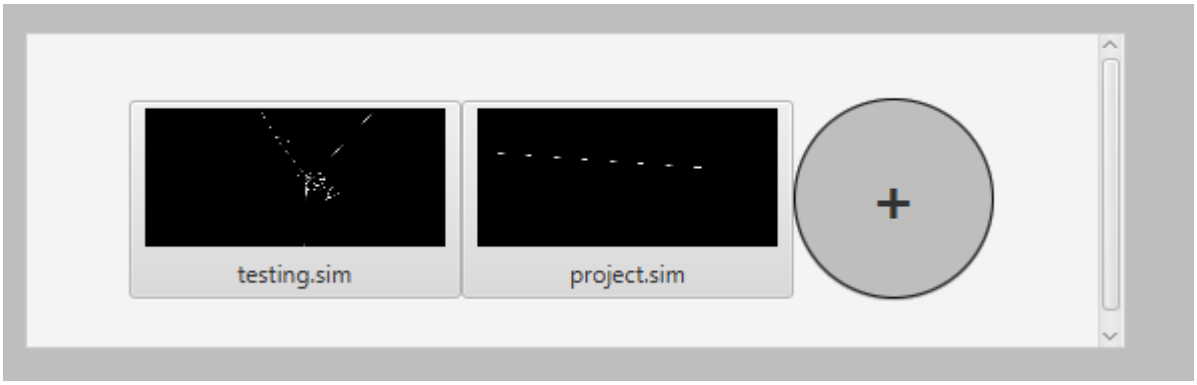


Main menu is where the application starts from when you login. Contains buttons to create new projects or load from existing projects.

2.1 New simulation

Generates a blank, un-saved, project where the user can begin to use the simulation

2.2 Saved simulations



Section containing all existing simulation files found in the application's save file. Contains buttons with an image of the last saved project.

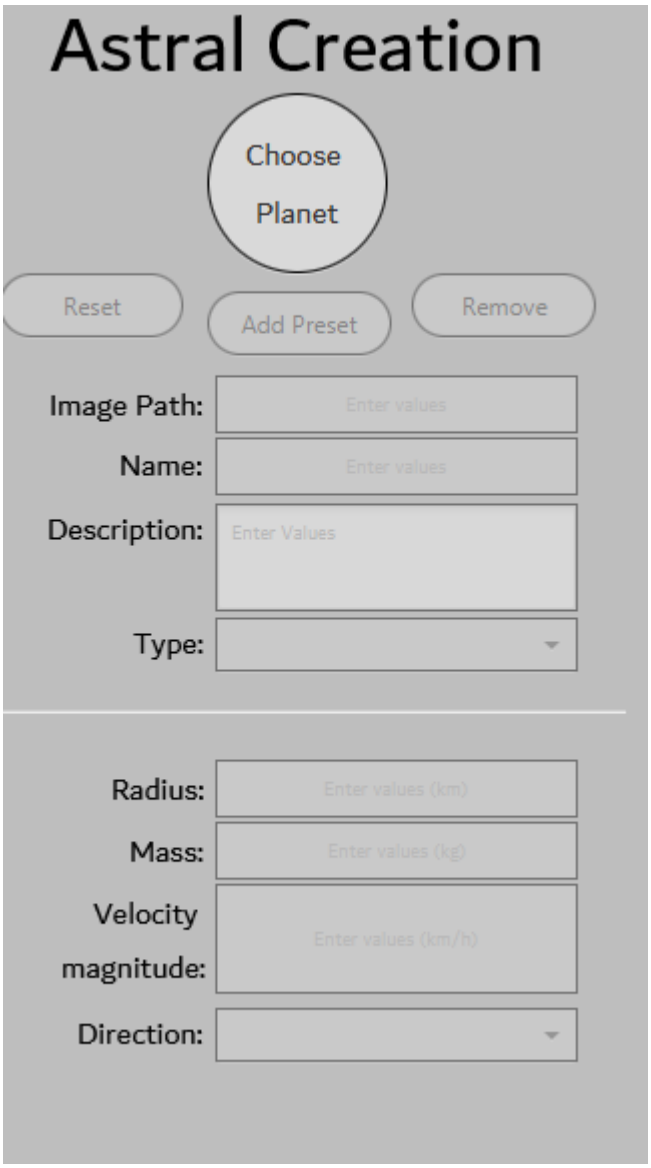
2.3 Quit

Closes application

3. Simulation

Simulation is the main component of the application where the user is able to create a gravity-based system of astral bodies.

3.1 Astral Creation



Astral creation is used to create new astral bodies or use existing ones. The astral bodies can then be dragged into the simulation.

3.1.1 Opening the context menu

By right-clicking the circle with the plus sign, a menu pops-up in which the user can choose from any presets, either the presets are predefined or defined by the user itself, or choose to create a new preset or a temporary astral body.

3.1.1.1 Presets

Predefined presets are basically the planets of the solar system and some of their moons and they can be used with their default values or these can be changed.

3.1.1.2 Creating a new preset

To create a new preset, the user needs to click “Add New” in the context menu, which can be found in 3.1.1. Then, fill out the required parameters and the preset can be saved by pressing on the button “Add Preset”.

3.1.2 Astral Body parameters

An astral body has 8 different parameters:

- Image path: this parameter sets the image of the astral body
- Name: this parameter sets the name of the astral body
- Description: this parameter sets a description for the astral body
- Type: this parameter sets a type for the astral body

- Radius: this parameter sets the radius of the astral body and it also affects the size of the body in the simulation
- Mass: this parameter sets the mass of the astral body
- Velocity Magnitude: this parameter sets the velocity of the astral body making it go faster or slower
- Direction: this parameter sets the direction in which the astral body should start moving, either clockwise or counter-clockwise

3.1.3 Adding an entity to the simulation

To add an entity to the simulation, you need to dragg the astral body image into the simulation and drop it where you want it to be.

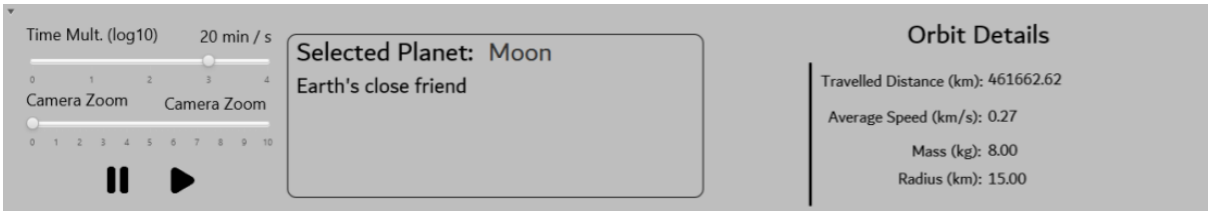
3.1.4 Resetting the astral creation menu

Pressing the “Reset” button will reset all the parameters of the astral creation menu and it will be ready to be used as if it were empty.

3.1.5 Deleting a custom preset

Pressing the “Remove” button while having a preset selected will remove it from the context menu.

3.2 Control Bar



Menu located under the simulation that displays various properties, variables and buttons for the simulation.

3.2.1 Simulation Controls

Basic play, pause and step buttons that control the simulation.

3.2.2 Selected astral body properties

Displays a selected astral body’s description and name, active velocity, travelled distance, mass and radius.

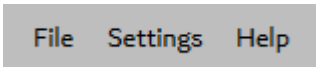
3.2.3 Time multiplier

Slider and entry box to customize the speed at which time passes in during the simulation.

3.2.4 Zoom multiplier

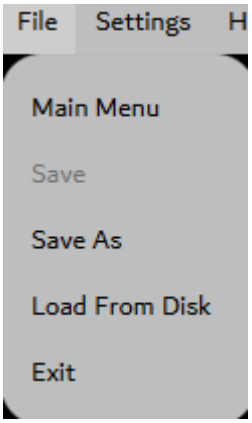
Slider that allows for the user to visually zoom in and out within the simulation.

3.3 Menu Bar



Basic application menu bar containing various essential menus and buttons

3.3.1 File



Menu bar section responsible for basic application processes and file handling buttons.

3.3.1.1 Main menu

Returns the user to the main menu.

3.3.1.2 Save

Disabled if the project has never been saved before. Saves/ updates the save of the current loaded project.

3.3.1.3 Save as

Allows users to save a new or existing project to the project file folder or their own directory.

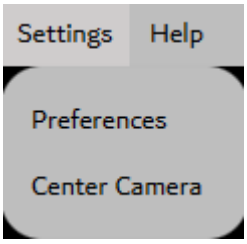
3.3.1.4 Load from disk

Allows the user to load an existing project file.

3.3.1.5 Exit

Closes application.

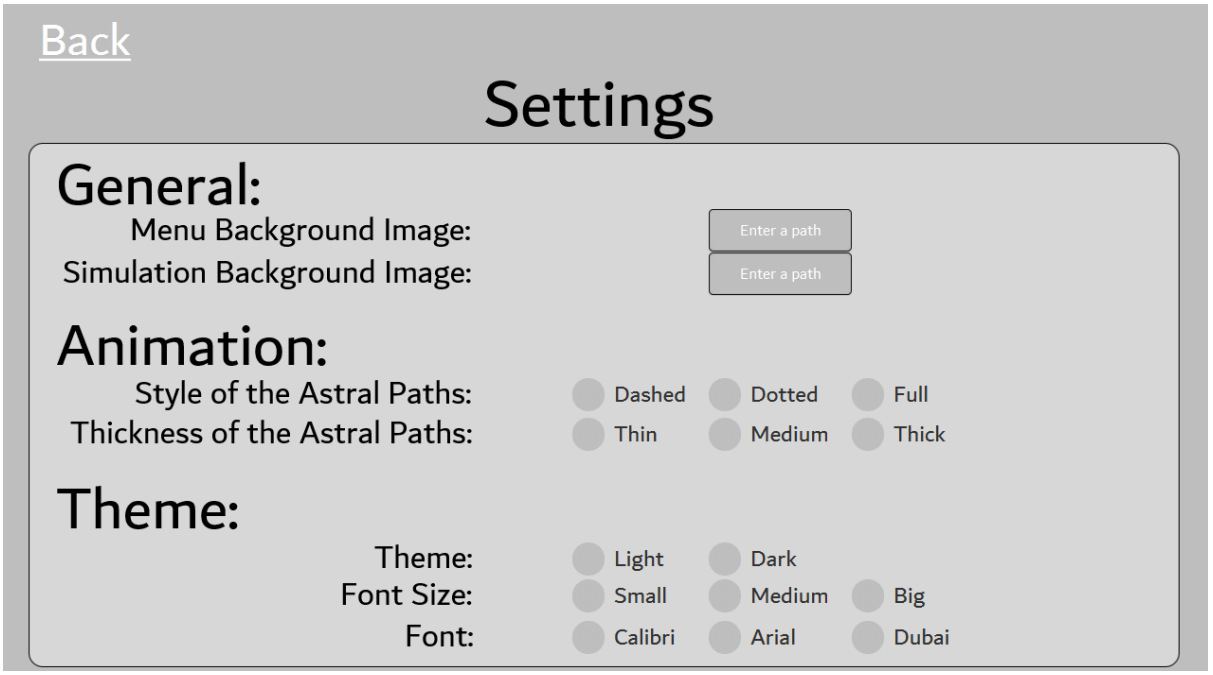
3.3.2 Settings



Menu bar section to access settings menu.

3.3.2.1 Preferences

Opens the external settings menu.



3.3.2.1.1 Menu background image

Allows the user to choose a file path for an image to change the default main menu background.

3.3.2.1.2 Style of astral path

Allows the user to change the style of the astral path lines.

3.3.2.1.3 Thickness of astral path

Allows the user to customize the thickness of the astral path lines

3.3.2.1.4 Theme

Changes the theme to either light mode or dark mode.

3.3.2.1.5 Font size

Changes the font size of the text in the simulation to the desired one.

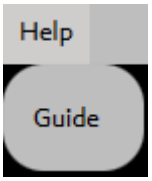
3.3.2.1.6 Font

Changes the font of the text in the simulation to the desired one.

3.3.2.2 Center Camera

Centers the camera to the center of the simulation. Basically, it resets the camera position to retrace the astral bodies.

3.3.3 Help



Menu bar section to access the user guide for guidance.

3.3.3.1 Guide

Accesses this document