Orbits 5: A Python graphical N-body gravitational simulator

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Chapter 1

Simulator and Graphics API

1.1 Relationship between simulator and API

The graphical display should not be a design specific to the operation of the simulator, so as to allow significant improvement and modification in future versions. This is to say that the simulator and the graphics API should operate independently, and communication or interaction should mainly be from the simulator to the camera, then to the API. The simulator will need to prioritise simulation, and spend all its time on this task. It should not try to optimize output for the API, this can be done within the API.

1.2 Function of the Simulator

The job of the simulator is simply to calculate the position of all objects after a time step interval. The main program will be frequently interacting with it. The simulator should have the following methods:

- Add an object to the simulation.

- Remove an object from the simulation.

- Change the default time step interval.

- Perform a step.

- Perform n steps.

There are multiple ways to perform this simulation, and the current preference is the leapfrog method. Other methods should be available to be chosen at creation of the simulator object.

The above methods will likely not need to have a return value. All information about the simulator such as the current time step, number of particles, or the information about a particular particle, should be available via additional 'get' methods.

1.3   Function of the API

The API must have the following functionality as a minimum:

- Display a coloured pixel at a given point.

- Display a coloured circle or ellipse at a given location, filled or unfilled.

- Display a coloured regular or irregular polygon at a given location, filled or unfilled.

- Display coloured text at any position.

- Change the colour of the background/canvas.

- Clear the screen of all drawings instantly.

An extra 'bonus' feature would be to save the image drawn to file.