N-Body Simulation

We'll are working through the Princeton assignment at <http://www.cs.princeton.edu/courses/archive/fall13/cos126/assignments/nbody.html>.

Here in **Part B,** we are adding physics simulation and animation to the program created in Part A.

* Your Body class should be extended with mutators so that the physics simulation can modify the velocities of each object
* You should implement a method named step which takes a time parameter (double seconds) and moves the Body object given its internal velocity for that much time
* You may internally represent forces, or you may calculate these from outside the Body
* Your main routine should keep track of elapsed time and terminate the simulation when time has elapsed beyond the time limit provided at the command line
* You may optionally (+5 pt extra credit) display elapsed time on the main screen

Here are the particular assignment requirements for us, as the Princeton material assumes Java, and we are using C++:

* You should build a command-line app which accepts the same parameters as the one specified, and reads the universe file from stdin. Name your executable NBody, so you would run it with e.g:

|  |
| --- |
| ./NBody 157788000.0 25000.0 < planets.txt |

* After the animation stops, your program should output the final state of the universe in the same format as the input.
* Please submit all files needed to build your project: .cpp's, any header files, and a Makefile
* Include the planets.txt file and all associated GIF images with your submission, in the proper directory structure as required by your code
* Fill out and include this [ps3b-readme.txt](http://www.cs.uml.edu/~yrykalov/pmwiki/uploads/Comp2040/ps3b-readme.txt) file with your work
* Make sure to do make clean before tarring up your code
* Submit your work in a directory named ps3b

***The TA should be able to type the following to run your code:***

|  |
| --- |
| make  ./NBody 157788000.0 25000.0 < planets.txt |

Submitting

Submit your work via Bottlenose: <https://grader.cs.uml.edu/assignments/619>

The executable file that your Makefile builds should be called NBody (the grading script checks that this executable builds successfully.)

Grading rubric

|  |  |  |
| --- | --- | --- |
| **Feature** | **Value** | **Comment** |
| core implementation | 70 | full & correct implementation = 70 pts; nearly complete = 60 pts; part way = 40 pts; started = 20 pt |
|  |  | - planets revolve counter-clockwise (remember astronomical positive Y is SFML smaller Y) |
| Makefile | 15 | Makefile included |
|  |  | targets all and clean must exist |
|  |  | all should build NBody |
|  |  | must have dependencies correct |
| output the final state | 5 | the same format as the input |
| ps3b-readme.txt | 10 |  |
| **Total** | **100** |  |
|  |  |  |
| extra credit | +5 | display elapsed time |
|  | +5 | create new universe (and describe in readme) |
|  | +5 | play sound file |