Explanation

1. **Algorithm**
   The time complexity of the brute force is $O(n^2)$ if calculating the gravity on each body.
   This algorithm reduces the time complexity to O(nlogn). Basically I followed the algorithm described here: The Barnes-Hut Algorithm and https://en.wikipedia.org/wiki/Barnes%E2%80%93Hut_simulation.
2. **Implementation**
   For most unclear code snippets, I made comments. This implementation is based on a 2D plane, and (0,0) is located at the topleft corner. Each particle represents an actual body in space. Gravity is considered to be the only force between two bodies.
   All code is original and based on my simplest assumption, but only the pattern in Image.cpp which is used for image generation is from online and modified for my use.
3. **Compile**
   I used Makefile to compile the program. I have included it in the zip file. Because I am on Mac, I tested g++ and clang++ as my compiler and they worked nicely.
   Sorry, I do not have the resources to test it on Windows. If you are running on Windows, please change the compiler accordingly in the Makefile.
4. **Run**
   If compilation is successful, you can run the program on shell by: "./NBody", this will use the default setting. This will simulate 100,000 bodies in a 1600*1600 image with unit time to be 100.
   You can input custom parameters like "./NBody -r 800 -n 50 -t 200", this will generate a 800*800 image that simulate 50 bodies with unit time 200.

PS: I just realized there might be a bug. I am trying to fix it.