Report on the optimization loops: distribute particle

Nicole Orzan

October 21, 2017

The optimization of the code was divided into 7 different steps, which are the followings:

- step 0: starting point, worst case, given;
- step 1: change of the calculus of the distance: use of the squared power of the distance, in order to remove roots calculus;
- step 2: separate the calculus of the distance in 3 dimensions; was also replaced the calculus of dx^2 with $dx * dx$;
- step 3: replacing the calculus of $1/N_g$ with a new variable, in order to avoid to do it repeatedly;
- step 4: Loop on the particles done before the loop on the grid
- step 5: insertion of the "register" variables
- step 6: insertion of new variables, in order to replace the use of x, y and z to work in 3D. Removal of the use of the functions.

For each step of the optimization it was analyzed the time spent by the program to be finished. The input used were: 50 as number of particles, 50 as number of grid points and 2 as weight function.
For the analysis to be complete, for each optimization step was calculated the mean time running the program 12 times saving the results in different files, which were then opened to calculate means.
Then was used jupyter-notebook to create the graph.
Here you can find a table containing the mean calculated times.

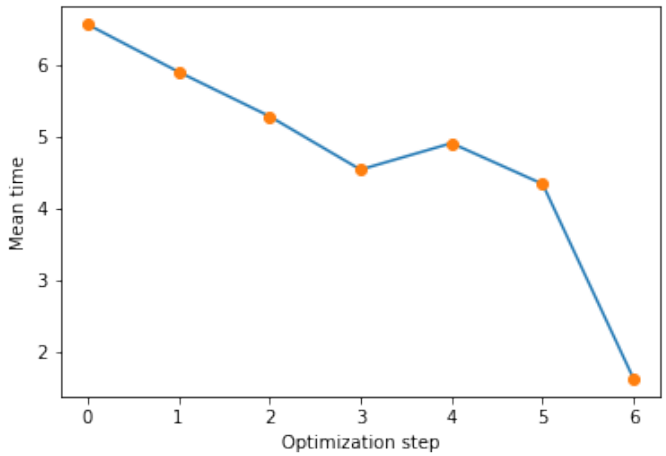

Figure 1: Mean computing time for each optimization step

Optimization Step	Mean Time
0	3.972505
1	3.485531
2	2.951075
3	2.113705
4	1.012711
5	1.172665
6	0.955033