

Paralelização do N-Body

Adapted from 10th Marathon of Parallel Programming – SBAC-PAD – 2015

In physics, the N-Body problem consists in simulating the gravitational interaction between N particles (bodies) in a system and predicting how the system would evolve in a time frame. In this application the initial position and mass for each particle is randomly generated. The application will compute gravitational forces, positions and velocity of each particle in each time step of the simulation.

We are not interested in finding out different algorithms for computing the N-Body simulation. We just want to focus on obtaining a parallel version of the given code. Therefore, it is not allowed to change the computation method used in this problem.

Input

Input data contains the quantity of particles to be considered ($0 < N \leq 2^{15}$) and the number of time steps to be simulated ($0 < S \leq 100$), separated by a line break.

Output

Output data contains the coordinates of each particle in the \mathbb{R}^3 . X, Y and Z coordinates are separated by one space and coordinates for each particle are separated by line breaks.

Example

Input	Output for the input
4	0.38986 0.38878 0.70927
10	0.72951 0.07322 0.13581
	0.28209 0.51066 0.99480
	0.46793 0.72547 0.13771

Observações:

- Implementar uma solução paralela usando Open-MP. Deve-se testar a implementação paralela com 2, 4, 8 e 16 threads. Deve-se produzir apenas um código que será executado para qualquer número de threads;
- As execuções devem ser realizadas com os computadores do LCI, exceto os da sala 1.
- Produzir resultados para $N=16384 \wedge S=100$. O tempo da execução sequencial nesse caso é de aproximadamente 550s. A solução sequencial está disponível na intranet.