Parallel Computing

2022/2023 1st semester

Exercise Sheet #1 21-09-2022

Try out the example programs presented in the classes on your PC.

You find the example programs on *UC Teacher* or at this link:

`https://trixi.coimbra.lip.pt/cap/?action=material`

Find out the number of cores (i.e. threads) for your PC. Use this number as number of processes in the exercise, using 4 processes at minimum.

Modify the program that rolls dice n times in the way that, for each event, a pair of dice is rolled, and the total number of the dots on both dice is counted as result.

In order to simulate this event, you will have to draw two independent random numbers between 1 and 6, and add the results.

Create a frequency distribution for all possible numbers of dots on the two dice (2 to 12).

1. Use a Python program without any parallelization ("single core") to simulate 10 million events, and compare the result with the one expected by combinatorial analysis for verification. Measure the real time the program took to complete.

2. Create a parallel code in order to run the same exercise in n parallel processes, for 10 million events in total as well.

   Run it on your PC with the number of cores (i.e. threads) present, at least $n = 4$.

   Measure the real time the program took to complete, and compare it with the time needed for single core calculation on the same PC.

Submit the codes of your programs (1 até 2) at `https://trixi.coimbra.lip.pt/cap` .

Put your answers to the questions in a comment section of the source codes (free text inside a pair of three double quotes):

```
"""
Comment text with answers
"""
```