UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa

Symmetry-preserving discretizations applied to Large-Eddy Simulation techniques in Navier-Stokes equations

Bachelor's Thesis - Budget

UNIVERSITAT POLITÈCNICA DE CATALUNYA

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1 Initial considerations

Considering that the thesis developed in the Report document does not contain a technical project yet an essentially a research project, the development of a budget is kind of complex, due to the fact that some elements are difficult to value given its non-material properties. Thus, this budget will consider, approximately, the total computing time of the CPUs as well as the MATLAB license, which is provided by UPC.

2 Budget

2.1 CPU hours

The laptop used to perform the simulations provided in the Report is built around Intel Core i5-8265U CPUs. Intel does not provide the total power consumption of the CPU in [1], yet considering an approximation of an efficiency of an 80% and a maximum dissipated power in terms of heat of 15W, the total power consumption of the CPUs can be estimated at around 75W.

Nonetheless, not all computation times were recorded, yet in some of them an estimation can be provided. Thus, the total computing time will correspond to, approximately, 400 hours, considering all the tests performed added to the proper simulations.

Considering [2] at September 17th 2020, the cost per kWh corresponds to 0.10644 €, thus giving a cost per CPU-hour of 0.007983 €. The reduction on CPU hours in regards to the Project Charter is explained by the lack of a HPC simulation, which was expected to be developed, in a great number of CPUs. Thus, the number of CPU-hours has been extremely reduced.

Concept	Units	Cost/unit (€/h)	Cost (€)
CPU-hours	400	0.007983	3.1932

Table 1: CPU-hours budget

2.2 MATLAB license

In order to postprocess some of the results, MATLAB was used. Thus, the cost of a full license - which corresponds to the license provided by UPC - has to be considered. The Student full license has a cost of 468.00 €, as provided by Mathworks.

2.3 Dedicated hours

Considering the work done in this Bachelor's thesis as well as the deadline extension given, the number of dedicated hours has been increased: maintaining the same dedication per week, but with eight more effective working weeks, the total amount of dedicated hours corresponds to 560. At the same cost as detailed in the Charter:

Concept	Units	Cost/unit (€/h)	Cost (€)
Dedicated hours	560	15.00	8400.00

Table 2: Dedicated hours

2.4 Final budget

Concept	Units	Cost/unit	Cost(€)
CPU-hours	400	0.007983	3.19
MATLAB license	1	480.00	480.00
Dedicated hours	560	15.00	8400.00
Total			8.883.19

Table 3: Caption

References

1. INTEL. *Intel® Core™ i5-8265U Processor (6M Cache, up to 3.90 GHz) Product Specifications*. Available also from: `https://ark.intel.com/content/www/us/en/ark/products/149088/intel-core-i5-8265u-processor-6m-cache-up-to-3-90-ghz.html?wapkw=%20Intel%C2%AE%20Core%E2%84%A2%20i5-8265U`.
2. RED ELÉCTRICA ESPAÑOLA. *PVPC — ESIOS electricidad · datos · transparencia*. Available also from: `https://www.esios.ree.es/es/pvpc`.