Final project

Turbulence and CFD models: Theory and applications

Single task

You are asked to choose a case of your preference and conduct a validation study. That is, assess how accurately your computational results compare with benchmark data (experimental or numerical) or analytical data. If possible, you must also quantify the modeling error from a qualitative and/or quantitative point of view.

At the following links, you can find a collection of validation databases,

- https://turbmodels.larc.nasa.gov/

- https://www.grc.nasa.gov/WWW/wind/valid/archive.html

- http://qnet-ercoftac.cfms.org.uk/w/index.php/Main_Page

- http://cfd.mace.manchester.ac.uk/ercoftac/

- https://cfl3d.larc.nasa.gov/Cfl3dv6/cfl3dv6_testcases.html

- http://www.rpmturbo.com/testcases/index.html

- https://www.cfd-online.com/Wiki/Validation_and_test_cases

- http://sandi.co.in/v2/home/projects/

- https://www.aij.or.jp/jpn/publish/cfdguide/index_e.htm

- https://gitlab.com/OpenCAE/VandV

- https://confluence.cornell.edu/display/SIMULATION/FLUENT+Learning+Modules

- http://www.ttctech.com/Samples/aeroflo_samples.htm

- https://zcfd.zenotech.com/validation

The previous list of links is only a reference; you can use any case from any source. The only requirement is that your case must be turbulent, and experimental, numerical, or analytical data must be available in order to conduct the validation.

You must write an initial draft and send it to me for review. Then, you will have a one time opportunity to improve your report based on my observations and suggestions.

After submitting your final report, you must deliver a brief presentation where you explain your case setup and summarize all your results. You can use PowerPoint or whatever presentation tool you use for presentations. Your presentation should not be longer than 15 minutes.

Finally, remember that your work must be reproducible.

> *"Replicability is a cornerstone of science. If an experimental result cannot be re-obtained by an independent party, it merely becomes, at best, an observation that may inspire future research [1]."*

> *"Reproducible research is the idea that data analyses, and more generally, scientific claims, are published with their data and software code so that others may verify the findings and build upon them[2]."*

General guidelines

- Be technical and concise when written your report.

- Your case must be turbulent.

- Experimental, numerical, or analytical data must be available.

- You must provide the validation data.

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[1] J. P. Mesirov. Accessible reproducible research. Science 327, pp. 415–416, 2010.
[2] https://www.coursera.org/learn/reproducible-research

- You must include at last three references.

- Your case must be reproducible. This means that you should give enough information so anybody can reproduce your case and results.

- While conducting the validation study, use all the skills gained during the course.

- If you want to share large files, please share a link (Dropbox, Onedrive, Google Drive, etc.). Do not send large files to my email.

- For movies, share a YouTube link.

- There is no limit on the number of pages. But please, do not overdo, you can write this report in no more than 15 pages (figures and tables included).

- It will be highly appreciated if you write your homework using LaTeX (this is not compulsory). You can use overleaf, which is a free online LaTeX editor.

  - https://www.overleaf.com/

- You can get a quick start on using LaTeX at this link:

  - https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minute

- Use any of the bibliography styles described at the following link,

  - https://www.overleaf.com/learn/latex/biblatex_bibliography_styles

- You can cite Ansys Fluent as follows,

  - Ansys Fluent Academic Research, Release 2020, Help System, Ansys Fluent Theory Guide, Ansys, inc.

- You can write your report in English or Italian.

- Do not hesitate to contact me if you have any questions.

Deadline

You should submit the first draft of your report no later than 15 July 2020.

You can send it to my email: joel.guerrero@unige.it