Summary

Computational Fluid Dynamics simulations are vital to predict and understand complex flow phenomena. The open-source CFD library, OpenFOAM, used in academia and industry, takes on this compute extensive challenge. However, the input to these simulations is often coupled to other fields and would require implementing complex models in OpenFOAM. This package dramatically simplifies the process of coupling one-dimensional tools to OpenFOAM with the FMI standard 2.0. This library offers the possibility to transform an OpenFOAM case into an FMU or the potential to coupled FMUs via python with OpenFOAM.

Statement of need

Modeling experiments with CFD can be complex as boundary conditions in experimental setups are constrained by geometrical, physical, and mechanical aspects, just to name a few. To accurately predict experiments, these boundary conditions need to be modeled precisely, which may require implementing a new model in OpenFOAM that, for example, predicts the pressure drop and heat exchange in a pipe. The FMI standard addresses this issue by defining a container and interface to exchange multi-physical systems. FMU4FOAM enhances the modeling capabilities by combining the multi-physical domain models expressed by the FMI standard with OpenFOAM. This approach simplifies not only the modeling of complex experiments but also allows users to verify simplifying assumptions in system level models. For example, a CFD simulation can easily replace a passenger cabin model in a "Heating Venting and Air Conditioning"-System to compare both modeling approaches. The same approach is also helpful in Guidance and Control to verify transfer function.

Citations

Citations to entries in paper.bib should be in rMarkdown format.

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Figures

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References

Smith, A. M., K. Thaney, and M. Hahnel. 2020. "Fidgit: An Ungodly Union of Github and Figshare." *GitHub Repository*. GitHub. https://github.com/arfon/fidgit.