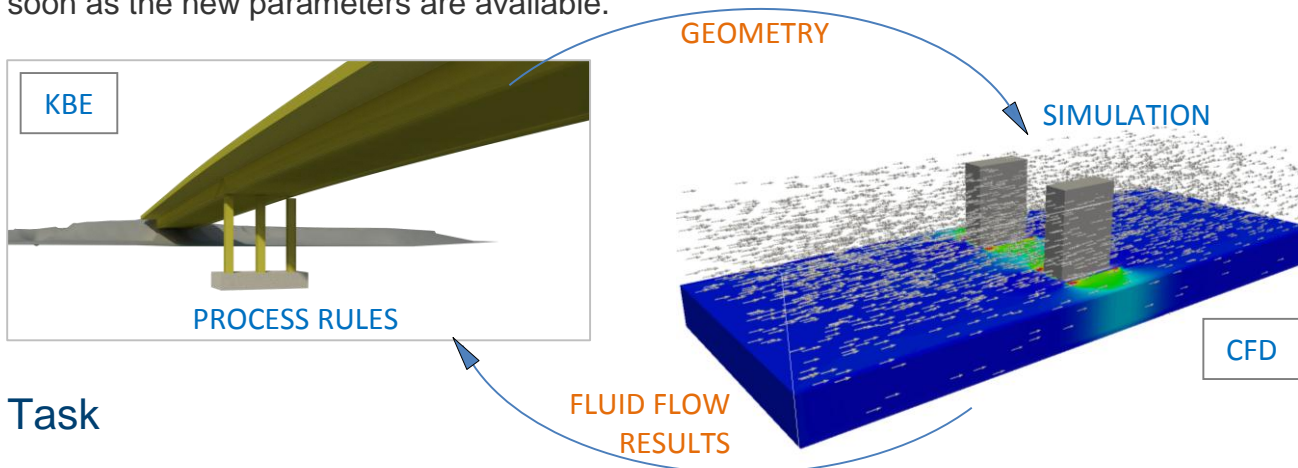Software Lab 2015:

Modeling: ★★★☆☆
Mathematics: ★★☆☆☆
Programming: ★★★★★

Bridge design: Coupling KBE and CFD models

Setting

Knowledge-Based Engineering (KBE) systems are applied for rule-based infrastructure planning. In order to design a bridge, based on simulated parameters of fluid flow underneath, using Computational Fluid Dynamics (CFD) software, a bi-directional coupling of KBE and CFD applications is necessary. As the same model is differently represented in these two platforms, in this Software Lab, the main task is to generate a module that converts one model representation to another. Only then, the initial geometrical parameters should be set using the KBE system. Afterwards, the CFD simulation must be run producing some meaningful results, on which basis the rules in KBE system will be processed. Within this, it would be explicitly determined, whether some bridge design parameter is to be changed, triggering a new CFD simulation as soon as the new parameters are available.

Task

The Software Lab will include all following tasks:

- Getting familiar with Autodesk Revit, Dynamo and CFD Code
- Implementation of a BRep bridge model to CFD voxel model mapping
- Implementation of bi-directional information transfer btw. KBE and CFD application
- Simulation of fluid flow parameters under the bridge
- Implementation of CFD response-methods in the KBE system

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References

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[2] Jerome Frisch, Towards Massive Parallel Fluid Flow Simulations in Computational Engineering, *Doctoral Thesis*, 30 September 2014.