4. **Functional Hybrid Modelling towards mathematical physics** (Dr. Legatiuk)

In recent years, modelling languages have become a popular tool among engineers for practical modelling. They offer a high level of abstraction supported by block-oriented modelling approach together with an automatic derivation of a simulation code. However, the modelling languages are limited to some specific areas of applications, resulting in the fact that many problems of mathematical physics cannot be modelled adequately. With the aim of early detection of modelling errors, Functional Hybrid Modelling (FHM), which is a Haskell-based modelling language, has been proposed in recent years. The idea is that the modelling errors should be caught by a robust type system, however the modelling concept of the FHM is similar to popular modelling languages, and thus suffers the same limitations. In this project, we would like to extend the FHM to handle problems in the domain of mathematical physics. Particularly, the development of a type system covering models of mathematical physics together with ideas for further Haskell implementation should be addressed in the project. The aim is to provide a sufficiently expressive type system for handling coupling of different models for building a coupled multiphysics model, enabling modelling errors to be caught early. The work in this project will enforce advanced knowledge about functional programming and Haskell specifically, as well as deeper understanding of type theory and its role in theoretical computer science.