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Smart and Sustainable Buildings

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Abstract

Buildings consume **40% of the overall energy**, both in EU and US, and are responsible for an excess of **30% of CO₂** emissions. Future smart & sustainable buildings, which optimise the performance and energy use at all stages of building life cycle, are therefore a key priority. In sustainable buildings, aspects such as **external climate, building envelope, internal environment** and **building energy management systems** must be considered. As buildings and systems grow more complex, so too does the need to use advanced simulation techniques to analyse these systems. There are three major types of numerical methods to support this analysis: (i) **building performance simulation** (ii) **computational fluid dynamics (CFD)** and (iii) **reduced order models**. The different types of numerical models and their possible coupling has been proven to be an effective tool for the development, commissioning and operational optimisation of sustainable buildings.

The IRUSE research group is currently working on providing research which formalises methods for creating and calibrating models of the built environment. This work aims to provide models which are capable of delivering more accurate prediction of energy performance in buildings as well as a means of optimising comfort and efficiency.