Natural Language Controlled Parametric Design

Lucian-Constantin UNGUREANU, Timo HARTMANN
Technical University of Berlin, Germany
l.ungureanu@tu-berlin.de

Abstract. The aim of this paper is to propose a flipped approach of human-computer interaction. Taking into account the challenging social and physical context the civil products need to be created, the practitioners rely on finding creative ways to solve the daily issues. Integrated Collaborative Engineering (ICE) provides the framework which allows the practitioners to focus mainly on the creative part of the design. The current progress in the field of technology provides the tools are needed (hardware and software), but, paradoxically, due to technological advancements, these tools become more and more intricate. Consequently, the practitioners need to stay up-to-date and most of the times, only using a limited amount of software capabilities. Thus, instead of asking the practitioners to familiarise with software formalism, the authors propose the use of natural language for human-machine interaction. This paper focuses on features extraction out of natural language aiming to control the parametric design. This paper proposes a framework to achieve this, and at the same time investigate the requirements needed to create an ontology towards controlling the parametric design using natural language. Finally, the paper draws future research directions, as well the main concerns and limitations.

1. Introduction

The main process which aims at testing and implementing different design perspectives is the Integrated Collaborative Engineering (ICE). The objective of ICE is to provide the practitioners with a way to focus on the creative side of the design when it comes to providing solutions to issues and design questions, and this process should involve all actors. The current practice of collaborative design process requires the use of the generated 3D models to visualize the design, also as input for the multi-physics simulations required. Generating, implementing, and testing a limited number of options consumes more than 50% of the current design time (*Gane and Haymaker, 2009*). In a perfect scenario, the changes will be applied and assessed in real time during the collaboration workshops, ending with a suitable solution agreed by all parties. However, often the participants do not have the skills to handle the tools and not enough knowledge about specific software formalism. In reality, most of the collaborative design meetings end with a possible range of options and alternatives which will be later on implemented by the designers and discussed during a follow-up meeting. This leads to a fragmented and repetitive process, and the main factors are highlighting an insufficient development of the tools. Thus, the creative side of design exploration is limited and restricted.

Parametric design and engineering (PDE) offer the opportunity to expand the design explorations side. PDE allows for a hierarchical and logical decomposition of the product, considering the interfaces between elements and data in order to create a highly automated routine and a minimum number of parameters to control the whole systems. This number of