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HYBRID DESIGN METHODS FOR COMPLEX SYSTEMS IN ARCHITECTURE & STRUCTURAL ENGINEERING

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This paper explores hybrid design methods for complex structural systems involving both customizable computing methods (e.g. programming, scripting) and established computer applications, e.g. Computer Aided Design (CAD) and Finite Element Analysis (FEA). While working with complex structures - and the underlying data models - structural engineers have gained experience in performing precise predications. But CAD and FEA - based on one static data model – early reaches a critical point where either model precision falls bellow or the model size exceeds the limits. This paper aims at indicating advantageous design methods for complex structures and their evolution throughout the whole design process.

Basically, complex structural systems are managed objects discretized by their underlying static data models. Besides, the main purpose of an information model is to model managed objects at a conceptual level [1]. A promising concept stimulates the dynamic flow of information allowing for different points of time or interest. Hybrid methods cover on one side discrete static models and on the other the continuous flow of dynamic information interchange. Any dynamic information interchange implies a communication system i.e. a system of the type indicated by C.E. Shannon [2].

Generally speaking, architects and structural engineers simply concentrate on one static data model i.e. the information source. More to the point, computer algorithms are also able to perform evolution due to inter process communication (IPC) connecting all the data models while considering geometrical orders and design configurations [3]. IPC is subject to formalized digital information models including all the information sources and destinations. Finally, we should attribute an extensive control of complex structural systems to the comprehensive deployment of communication in an analogue or digital manner.

In this regard hybrid methods are going to supply comprehensive communication systems covering all the requisite static data models. But communication implies one consistent information model. Future architects and structural engineers will therefore have to focus on information modeling and hybrid concepts of dynamization in order to encourage a project-oriented evolution of complex data models distributed in the whole design process including layout, construction and detailing.

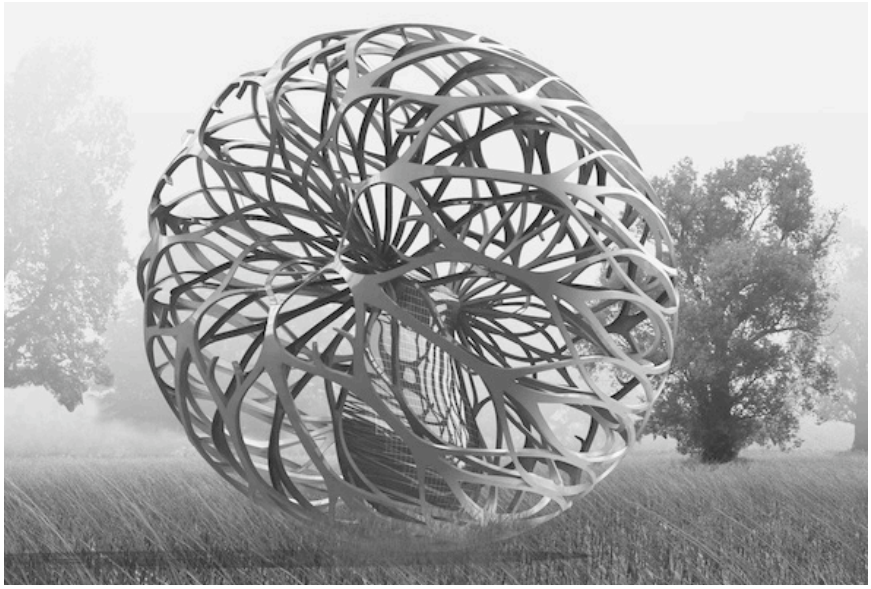

Fig. 1: Joe en Joey - a robotic sculpture (hand-laminated fibre-reinforced plastic) architecture: Lars Spuybroek (NOX), Rotterdam

Fig. 2: point_one - solar supercharger (hand-warped plane 3 mm aluminium sheets) architecture: LAVA and designtoproduction, Stuttgart

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