Universität Stuttgart

Baustatik und Baudynamik

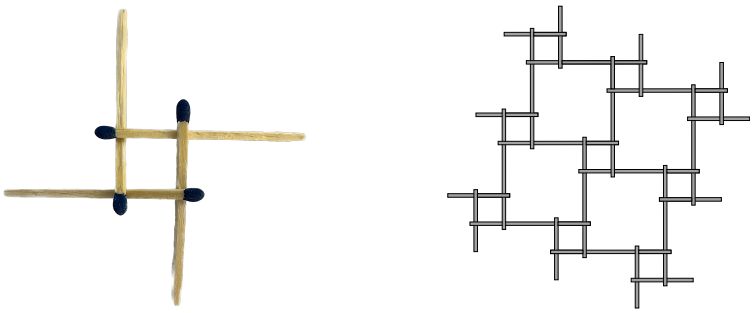
Bachelor Thesis

The Load-Bearing Behaviour of Plane Reciprocal Frame Structures

Reciprocal frame (RF) structures have been used in Japanese and Chinese architecture since the 12th century. Also in Leonardo da Vinci's *Codex Atlanticus* the concepts are presented graphically. Reciprocal frame structures are not built hierarchically as usual load-bearing structures, but consist of elements that support each other. In this way, large spans can be achieved with structural elements of small dimensions.

Although the basic concept has already been known for many centuries, reciprocal frame structures are now experiencing an upswing due to new developments in CAD-based design and calculation methods and are the subject of recent research. In [1], an iterative method was developed to calculate the forces in plane reciprocal frame structures using computer algebra systems such as Maple.

The aim of the work is to investigate the load-bearing behaviour of plane reciprocal frame structures. Both hand calculation methods and the iterative procedure from [1] are to be used. After the consideration of basic structures the iterative calculation for composite systems shall be implemented in Maple, in order to subsequently investigate the load-bearing behaviour of reciprocal frame structures in parameter studies.



Left: basic reciprocal frame structure, right: example of a composite reciprocal frame structure.

The specific tasks are

- Literature research on *reciprocal frame structures*
- Investigation of the load-bearing behaviour of basic structures of reciprocal frame structure
- Implementation of the iterative calculation method according to [1] for basic structures and composite systems in Maple
- Study of the load-bearing behaviour in connection with suitable parameter studies

Recommended fields of interest

static analysis, computer-aided calculation methods

Literature

[1] Kohlhammer, T.; Kotnik, T. (2011): *Systematic Behaviour of Plane Reciprocal Frame Structures.* In: Structural Engineering International 21(1), p. 80–86.