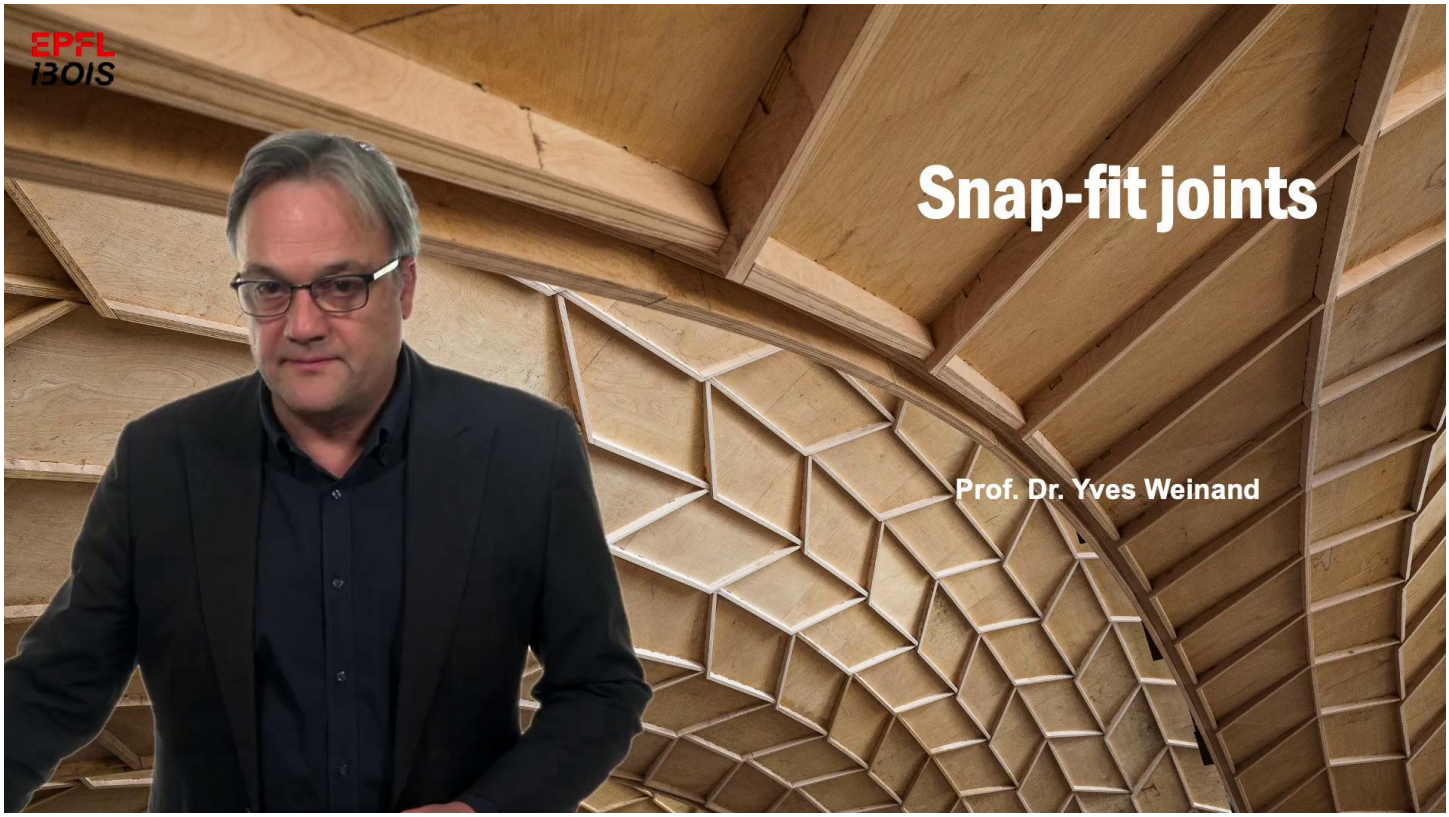
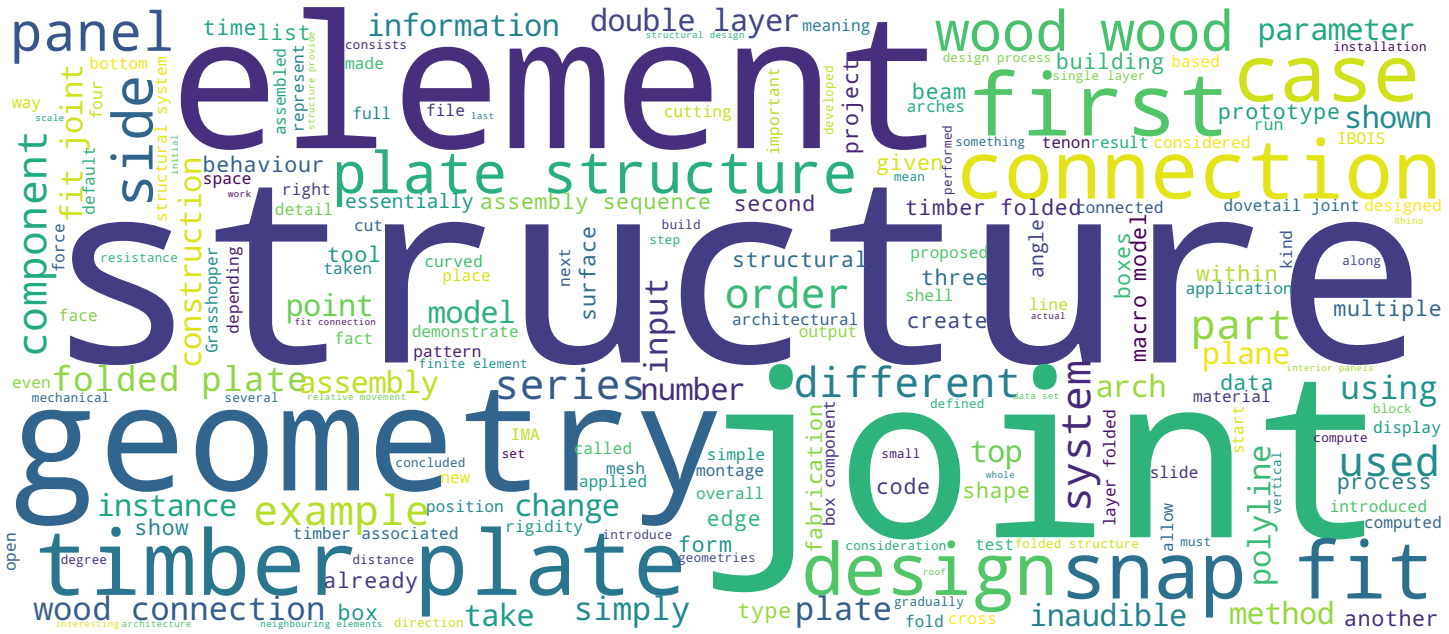


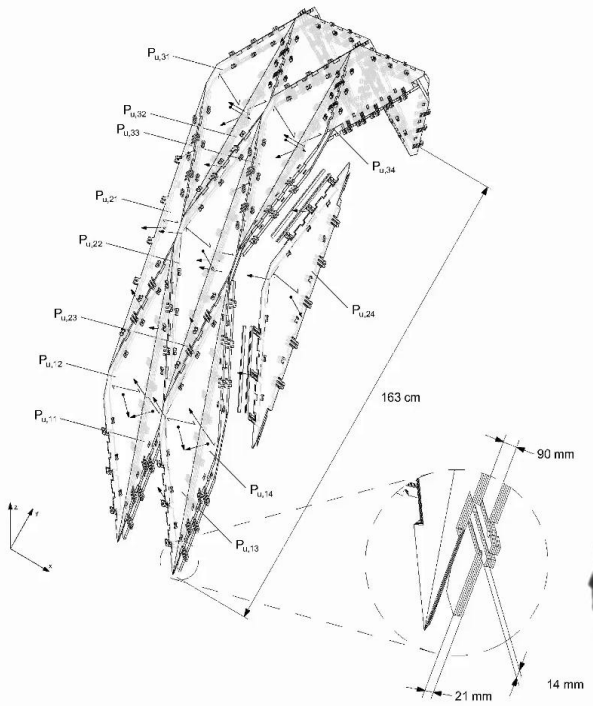


Search MOOC

Video

EPFL

Snap-fit joints



Prof. Dr. Yves Weinand

Advanced Timber Plate Structural Design

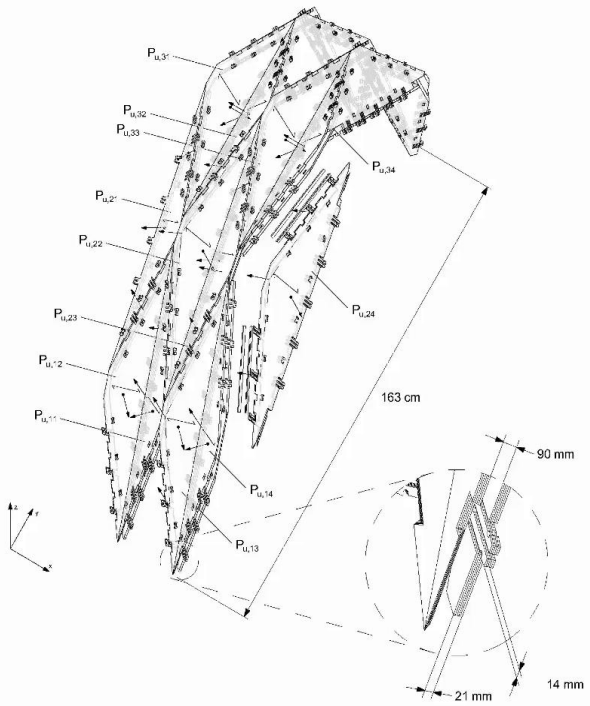
The follow-up example of another prototype is a single-layer of timber folded structure with dovetail joints. Combining algorithmic CD and traditional carpentry, we introduced an automatic production of wood-wood connections in timber folded plate structures. A design assembly methodology used in timber folded plate structures was proposed. Implementing the dovetail and Nigeria arrogate variants to the double curve timber folder plate prototype. A hexagon pattern derived from the Yoshimura Origami technique was achieved. The use of prefabricated timber plates was examined by the fabrication and assembly of a medium-scale physical prototype. Demounted and remounted structures are part of the contemporary design philosophy in such structures, which is derived from the application of the wood-wood integer connections. The geometry of the connections described allows a simultaneous assembly of multiple and non-parallel edges. Therefore, a secure interlocking mechanism with rapid and easy assembly is designed. The term interlock was used because the assembly sequence of multiple timber plates prevents the separation of the structure.

Notes

Summary

0m 04s

Snap-fit joints



Prof. Dr. Yves Weinand

Advanced Timber Plate Structural Design

In other words, the geometry of wood-wood joints and timber plates were such that there was no relative movement between the panels after the assembly. This design framework uses an all-in-one join work technique, where the positioning of plates connecting the neighbouring elements and the load-bearing force for as simultaneously satisfied.

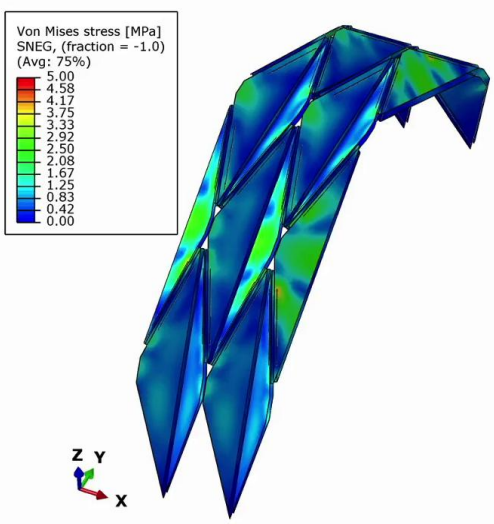
Notes

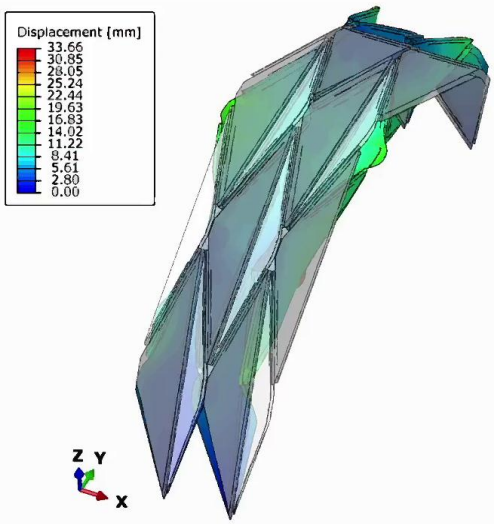
Summary

1m 32s

Snap-fit joints

Prof. Dr. Yves Weinand



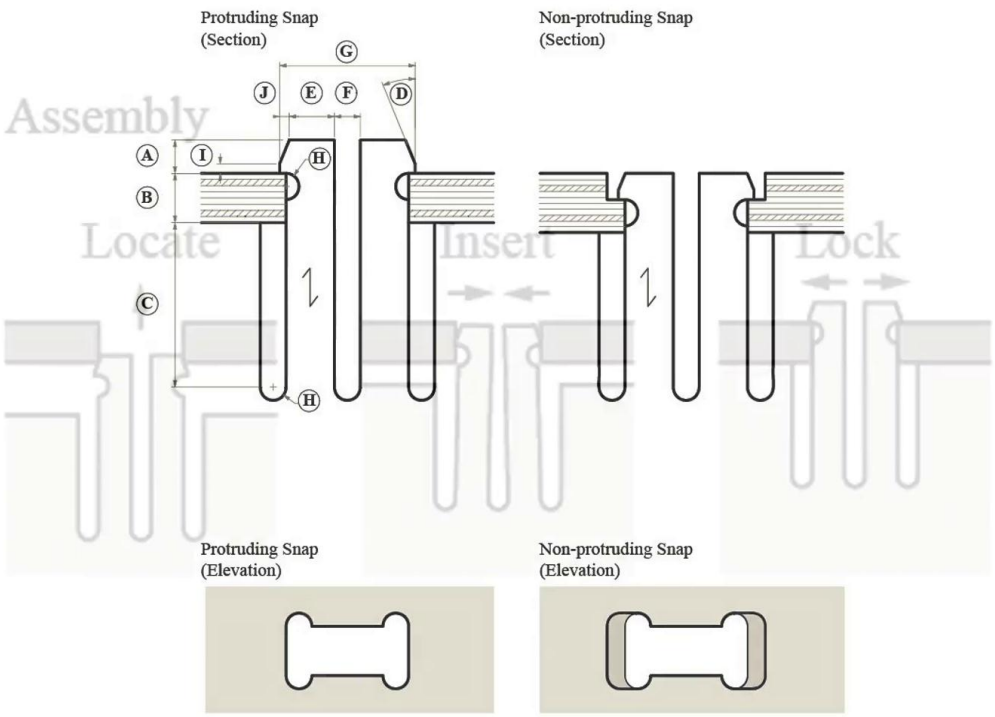


To support the geometry generation and digital fabrication, numerical simulation are carried out to demonstrate the structural performance of the system. Load combinations are derived according to Eurocode guidelines. Consequently, such a structural system offers a special structure and behaves like a reliable load-carrying mechanism. Furthermore, it is concluded that the symmetry of the IMAS should be considered in the structural design process to simulate the structure performance realistically.

Notes

Summary

1m 58s



Snap-fit joints from a double layer folded plate structure to timber pews, is another example of prototypes produced at IBOIS. We investigated the design of timber folded plates with snap-fit joints.

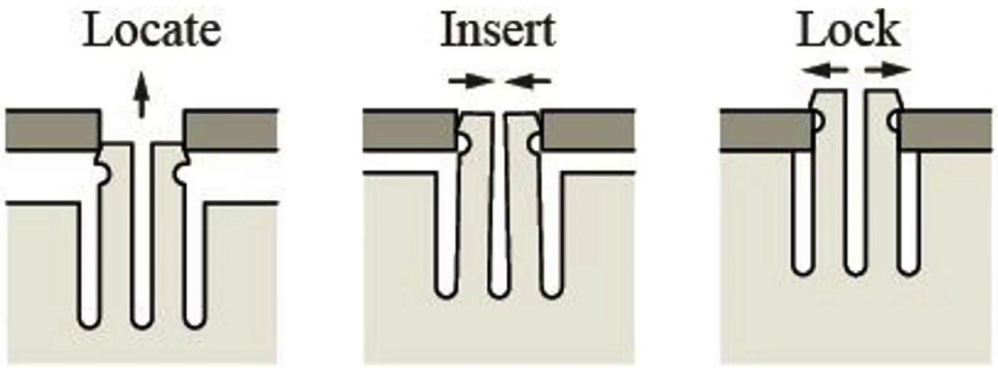
Notes

Summary

2m 36s

Prof. Dr. Yves Weinand

Assembly

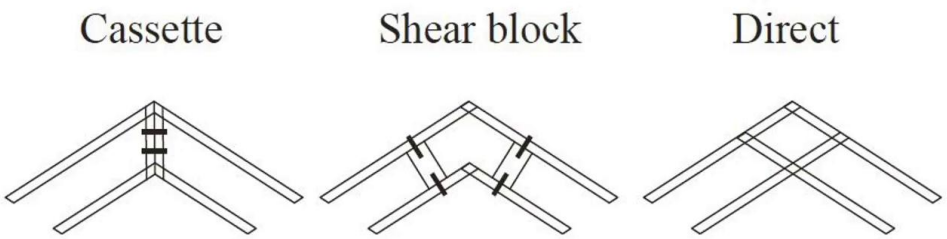


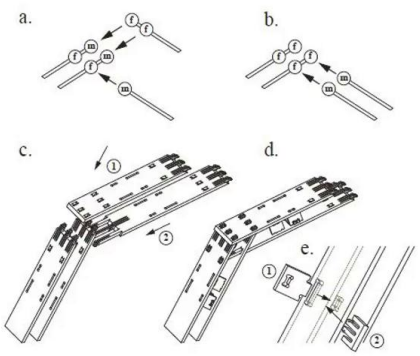
This image shows that the associated case study was a double-layer folded plate structure where snap-fit joints were combined with dovetail joints to connect structure panels. Instead of using a single-layer of thick panel, a double-layer folded structure provides greater inertia by introducing static height, where it does not consider increase the structure height. Another advantage of the double-layer structure is that it enables the installation of insulation materials. The interior panels are first to cross each other like a motorized and tenant joint, thanks to the snap-fit connectors. Then the snap into the exterior layers of both. The interior panels, then double lock the exterior panels in place. The two additional line joints per edge improve the overall stiffness and rigidity of the connection.

Notes

Summary

2m 50s



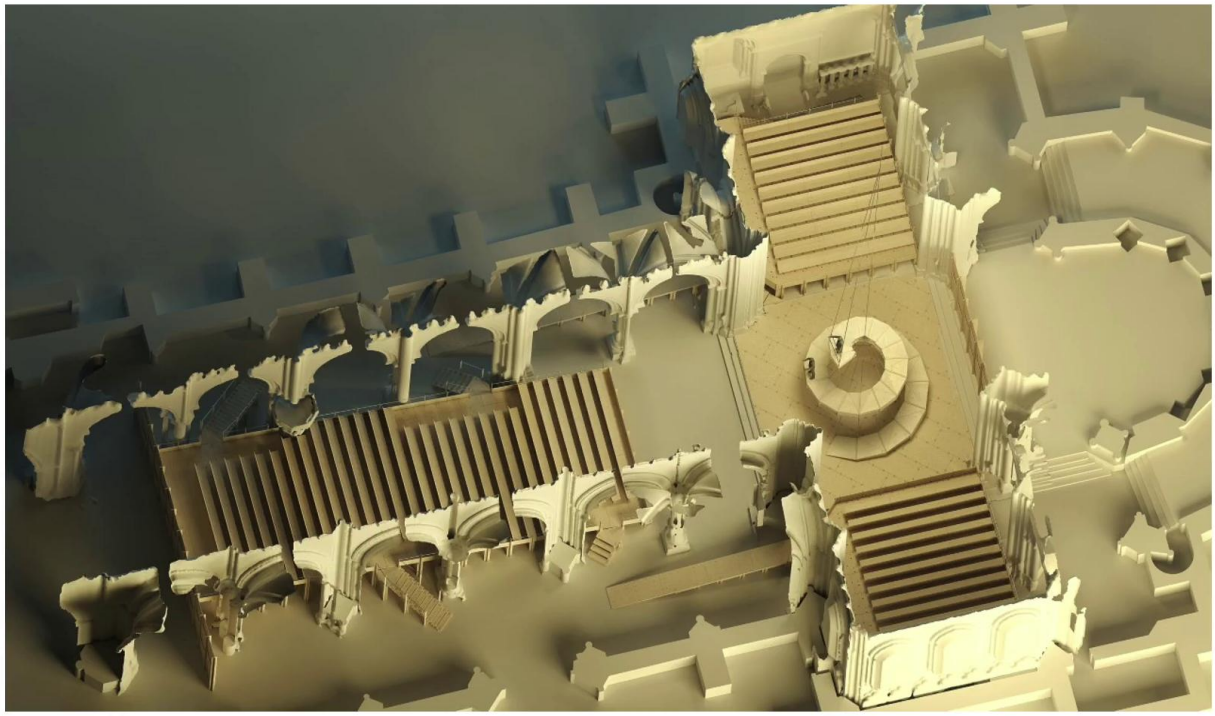


Given the assembly and the geometry, this structural system takes advantage of the vicious elasticity of timber-derived products. The prototype serves as a test platform of a direct interlocking of knee joints without additional parts. While the proposed prototype is a polygon in reality and not a real structure, the structure was decomposable thanks to the distribution of snap-fits joints along the shear blocks and dovetail joints. The prototype offers a geometrically stable structure, mainly due to the fact that the global form establishes a direct edgewise connection between all four layers of a fold. The snap-fit connection also demonstrate a considerable degree of resistance to carry shear forces parallel to the timber edges. Moreover, the assembly sequence and the geometrical form of the structure provide a full interlocking and block the relative movement between the neighbouring elements. This, in particular, helps the system to carry out intensive force and flexural moment solely through the geometry and without using additional connectors.

Notes

Summary

3m 47s



It is concluded here that this prototype allows further investigations combining different kinds of connection and distributed over the structural geometry. As another essential conclusion, an alternative to the ongoing construction technique is proposed by employing an on-site manual assembly without [inaudible 00:05:25], and additional fasteners. A second example of snap-fit application was this pew using snap-fit joints, which corresponds later to design of new pews for the Lausanne Cathedral in Switzerland, where we had a range of benches and stands to build in a very short time. The pews built with locally sourced wood have thought of a design that does not require either glue or screws.

Notes

Summary

5m 04s

Prof. Dr. Yves Weinand

The associated prototype is shown here. The pews are assembled in the same way described for the double-layer of folded plate structure. The flexibility of the tenants redesigned in specific geometrical terms, allow for a snap-fit connection, meaning that two panels can be taken or hold together only by snap-fit joints, which could also undo and reverse this whole system in order to make it dismountable. Furthermore, the entire OSB timber panels were fabricated using a computer newmarker control, CNC, wood router with an accuracy of 0.1 millimeter. Using OSB panels was interesting because we wanted to have a very economic structure and very economical connections. Each pew consisting of 14 planks and 2 wooden doors can put together by 2 people in less than 15 minutes with a simple wooden mullet. The backs were attached to the armrest and a wooden back enables them to be shifted for one side to the other in a single movement without the use of tools.

Notes

Summary

5m 58s

Shock absorbers prevent the back from banging when reversed. The seats symmetry provides the same comfort level, regardless of which side is used, and a design makes the pews easy to maintain.

Notes

Summary

7m 04s

References

C. Robeller, P. Mayencourt, Y. Weinand, Snap-fit Joints - CNC fabricated, Integrated Mechanical Attachment for Structural Wood Panels, in: G. D., H. A., S. J. (Eds.), ACADIA 2014 - Des. Agency Proc. 34th Annu. Conf. Assoc. Comput. Aided Des. Archit., ACADIA, Los Angeles, 2014: pp. 189–198. https://doi.org/978-192672451-5.

Notes

Summary

7m 17s