

University of Nicosia (UNIC) – Department of Architecture
in collaboration with
University of Innsbruck – Department of Architecture

How the study of wood craftsmen's joint techniques, categorizing and digitizing them can be utilized to develop a library of digital models and scripts and contribute towards the development of a Grasshopper Add-on empowering designers, architects, and fabricators?

M.Sc. Thesis

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Masters in Computational Design and Digital Fabrication (CDDF)

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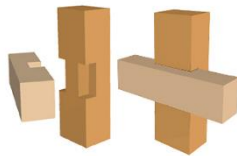
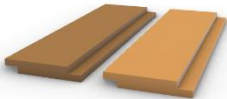
FEBRUARY 2024

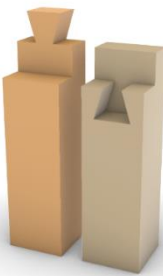
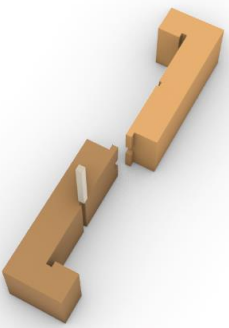
Abstract

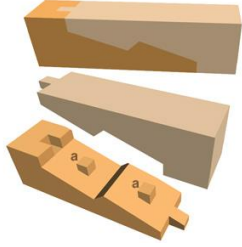
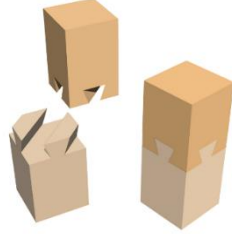
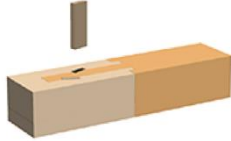
Traditional joinery techniques have been utilized for centuries and are fundamental in woodworking. Not using metal or mechanical fasteners, they showcase the ingenuity and craftsmanship of woodworkers across various cultures and rely on the interlocking of wood components, precision cuts, and fits with solid structural integrity. This work dives into the traditional techniques of wood joinery from a digital and modern fabrication perspective. It includes a comprehensive literature review and data analysis, and creates digital cataloging with models and scripts, i.e. digitizing joinery, to ease the digital creation process for project developers and computational designers. It undertakes the identification, cataloging, and categorization of joint types, digitizing, 3D modeling, creating Grasshopper scripts, and generating a proof of concept on how to use the catalogue in Grasshopper to programmatically make a joint. This work is made available to the public through a Web App backed up by a MySQL database.

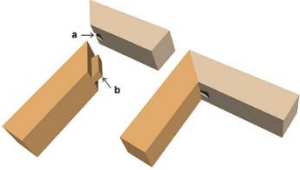
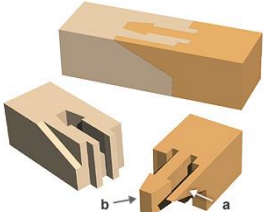
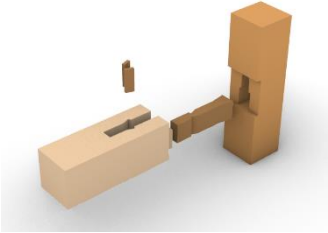
Annex A

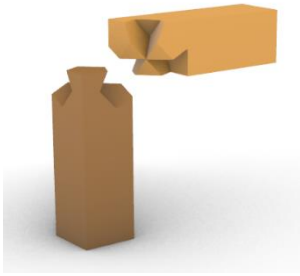
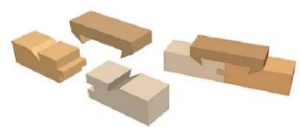
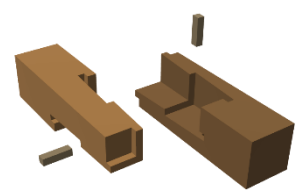
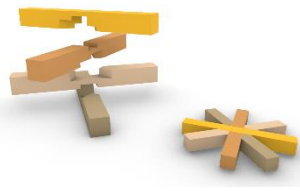
List of Selected Joints

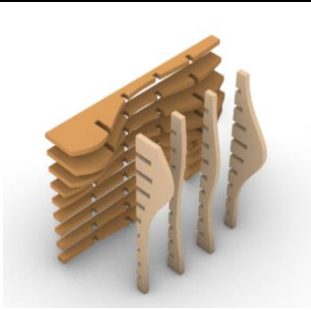
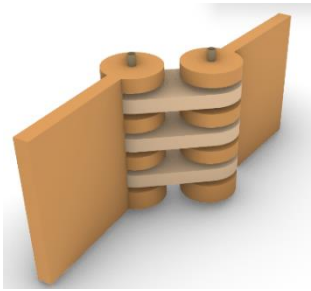
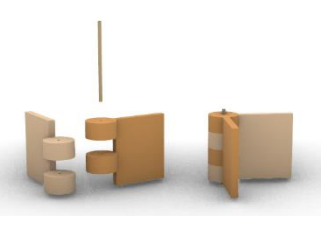
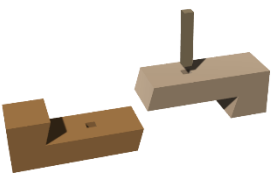
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3	<u>Hakodome</u>		✓	✓	✗
4	<u>Mortise and Tenon</u>		✓	✓	✗
5	<u>Chigaihagi</u>		✓	✓	✗
6	<u>Hibukurahagi</u>		✓	✓	✗

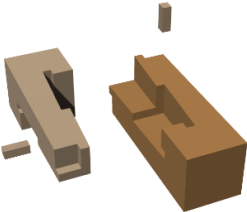
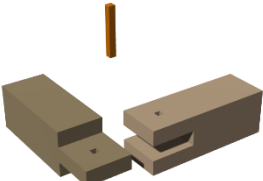
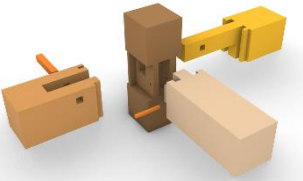
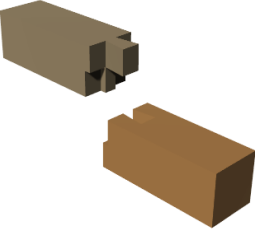
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8	<u>Isukatsugi</u>		✓	✓	✗
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10	<u>Kakushi domekata sanmai hozo</u>		✓	✗	✗
11	<u>Koshikake aritsugi</u>		✓	✗	✗
12	<u>Koshikake kamatsugi</u>		✓	✗	✗
13	<u>Shippasamitsugi</u>		✓	✗	✗
14	<u>Release buckle</u>		✓	✓	✗

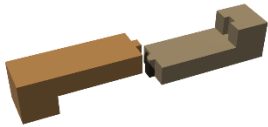
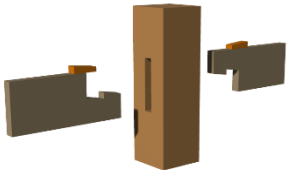
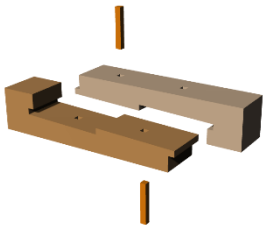
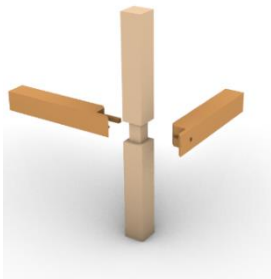
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16	<u>Shihouari</u>		✓	✗	✗
17	<u>Komisen</u>		✓	✗	✗
18	<u>Hanasen</u>		✓	✗	✗
19	<u>Shachisen</u>		✓	✗	✗
20	<u>Hiyodorisen</u>		✓	✗	✗
21	<u>Kainokuchitsugi</u>		✓s	✓	✗

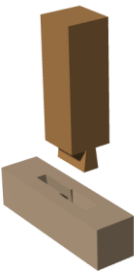
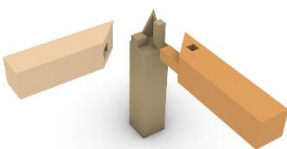
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23	<u>Aridome</u>		✓	✗	✗
24	<u>Nogetsugi</u>		✓	✗	✗
25	<u>Miyajima-tsugi</u>		✓	✗	✗
26	<u>Yatoi-hozo-shachi-sen-shiguchi</u>		✓	✗	✗
27	<u>Castle or Shiro</u>		✓	✗	✗

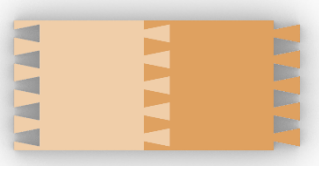
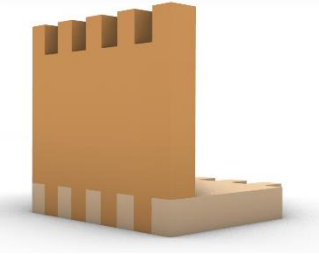
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29	<u>Scarf</u>		✓	✓	✗
30	<u>Tsukami</u>		✓	✗	✗
31	<u>Haikomi-giri</u>		✓	✓	✗
32	<u>Hako-sen-tsugi</u>		✓	✗	✗
33	<u>3-Way 2D Lap</u>		✓	✗	✗
34	<u>4-Way 2D Lap</u>		✓	✗	✗

35	Waffle		✓	✓	✗
36	Ball Joint		✓	✗	✗
	Double-action hinges		✓	✓	✗
38	Hinge joint		✓	✓	✗
39	Kakeawase-komisen-tsugi		✓	✗	✗

40	Kakeawase-komisen-tsugi		✓	✗	✗
41	kanawa-tsugi		✓	✗	✗
42	Kane Tsugi		✓	✗	✗
43	Komisen-inro-tsug		✓	✗	✗
44	Komisen-tsugi-shikuchi-no-sanpousashi		✓	✗	✗
45	Koshikake-ari-tsugi		✓	✗	✗

46	Meji-tsukikake-awase-tsugi		✓	✗	✗
47	Nimai-kama-tsugi		✓	✗	✗
48	Okkake-daisen-tsugi		✓	✗	✗
49	3-way hidden joint		✓	✗	✗
50	Osaka-jo-otemon-hikae-bashira-tsugi		✓	✗	✗
51	Otoshi-ari-hozo-shikuchi		✓	✗	✗

52	Shihou-ari-tsugi		✓	✗	✗
53	Suitsuki-sashi-shikuchi		✓	✗	✗
54	Yose-ari-hozo-shikuchi		✓	✗	✗
55	Three-way miter joint		✓	✗	✗
56	Universal joint		✓	✗	✗

57	Dovetail		✓	✗	✗
58	Box Joint		✓	✗	✗
59	Bench slave		✓	✗	✗
60	Mechanical Ball Joint		✓	✗	✗