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| Title            | 参加型施工及びパッシブデザイン手法を用いた小規模建築のプロトタイプ開発                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| Abstract         | <p>2023年度の本研究では、3ヶ年計画の1年目として、パッシブデザイン手法を用いた参加型施工可能な小規模木造建築の構法開発を目的としていた。実際にプロトタイプの設計と施工実験を行い後述の成果を得た。なお2023年度の研究成果は、2023年度卒業論文として発表した。</p> <p>設計に関して、文献や類似の事例調査からシーガル・メソッドに基づく参加型施工手法の原理と、パッシブデザイン手法を整理し、それらを日本の木材規格・構造的制約・気象条件に適応させた1つのプロトタイプを設計した。その特筆すべき成果として、従来の参加型木造建築の設計過程からのアップデートとして、客観的な快適性能指標を用いたパラメトリックデザイン手法を導入した点が挙げられる。設計の初期段階から環境評価プログラムLadybug-Honeybeeにより光環境解析を行い、最適なフレーム形状を得るためのアルゴリズムを生成した。1970年代に考案された参加型施工手法シーガル・メソッドのもつ躯体フレームの形状可変性と、パラメトリックデザイン手法との親和性に着目した。一方で、基礎の設計が完了していない点が設計上の課題として挙げられる。</p> <p>施工に関して、設計案の一部を実寸大で屋内に施工し、その効果と課題を明らかにした。主な効果としては、フレーム組立時に事前に桁材を取り付けることで、素人参加型の建設でも施工精度を担保できることが明らかとなった点が挙げられる。主な課題としては、開閉式の開口部を素人参加で施工する場合、蝶番の施工誤差や木材寸法の狂いが気密性の悪化を招き、快適な環境形成に悪影響を与えることが挙げられる。この原因として、1つの開口部に対して換気や屋外観賞といった複数の役割を持たせていた点を考察している。</p> <p>以上のように、本年度は小規模木造建築の設計とモックアップ制作により、パッシブデザイン手法を用いた参加型施工建築構法の効果と課題を明らかにした。来年度以降は得られた課題を設計に再度フィードバックし、実際に屋外でも施工実験を行うことで、より実践的な効果と課題を分析する必要がある。</p> <p>Our research this year was conducted as the research in the first year of a three-year plan. We designed a prototype of a small-scale wooden building with participatory construction methods and passive design methods and obtained the following results through design and construction experiments. Those results of this year were published as a graduation thesis in March, 2024.</p> <p>We invented a timber construction method with participatory construction, adapting the Segal Method and passive design methods to Japanese contexts, such as timber standards, structural constraints, climate conditions etc. through literature reviews and case studies of similar projects. One of the most remarkable results of this research was that the parametric design method with grasshopper introduced objective comfort criteria into the design of the participatory timber construction. By the grasshopper's plugin "Ladybug-Honeybee", we analyzed the environmental parameters in advance, and optimized the design of our proposal parametrically because the shape variability of each frame structure, which allowed anyone to easily participate in the design and construction process, was advantageous to parametric design. On the other hand, the site was not yet determined, so we couldn't develop the design of the foundation.</p> <p>We constructed a part of the proposed design inside at a real scale to clarify the effectiveness and challenges of our proposal. The remarkable effectiveness was that the accurate construction of the frame structures by laypeople could be achieved, with the joint system which connected joists and frame structures before raising the frames. On the contrary, we found the challenges in the opening system. In the case of amateur construction of retractable openings, construction errors in hinges and deviations in wood dimensions lead to deterioration of airtightness, which affects the formation of a comfortable environment. As a cause of this problem, we consider the fact that a single opening had multiple roles, such as ventilation and viewing.</p> |

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|       | Through the design and mock-up production of a small-scale timber construction, this year we clarified the effectiveness and challenges of the participatory construction method using passive design techniques. Next year, it will be necessary to analyze the practical effectiveness and challenges by feeding back the issue obtained to the design and conducting actual construction experiments outdoors. |
| Notes |                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| 3. 本研究課題に関する発表                     |                                                                                                                                    |                                                                              |                                      |
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| 清水俊祐, 角田大, アルマザン<br>ホルヘ            | 西谷の観楽小屋                                                                                                                            | 日本建築学会大会デザイン発表会<br>(関東)                                                      | 2024年8月<br>(投稿済)                     |
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