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Title: Review of "Sound Shape Space: Architectural Representation of Soundscapes with the Use of Artificial Neural Networks" by Ing. arch. Karolína Kotnour

Dissertation review:

Ing. arch. Karolína Kotnour's dissertation, "Sound Shape Space: Architectural Representation of Soundscapes with the use of Artificial Neural Networks," offers a comprehensive exploration of the potential of incorporating artificial intelligence (AI) in architectural design and its integration with human-computer interaction. The research focuses on employing AI within form-finding models and investigates the implications for architecture design and HCI. By leveraging recent developments in the field of AI, Kotnour presents an original and thorough analysis of the present and future research opportunities in this domain.

The dissertation proposes a new perspective on architecture, considering it as a dynamic and intelligent system influenced by natural and cultural sub-processes. Kotnour suggests a hybrid approach that combines physical and virtual processes, allowing structures to adapt to environmental dynamics and behavioural patterns. This innovative strategy paves the way for addressing architecture in a novel way, driven by scientific and technological knowledge and the resulting cultural transformations.

Located within the emerging field of Architectural Intelligence, Kotnour's thesis aims to contributing to the development of methods for adapting architecture to environmental and social changes. The research showcases the development of new machine-learning models based on neuroevolutionary algorithms and Meta-learning. These models enable the representation, analysis, and generation of optimal spatial forms to effectively adapt to dynamic environmental changes. By integrating generative design principles, the dissertation introduces a fresh approach to the architectural design process. The encoding of intelligence within neural network models, capable of rewriting existing code protocols, enables active problem-solving and dynamic adaptability. This research field holds significant potential for further exploration, and Kotnour's dissertation presents a valuable contribution to its advancement.

The dissertation thoroughly examines existing research in Adaptive and Intelligent Architecture, supplemented by a comprehensive analysis of computational and scientific tools relevant to the

study. Methodological choices are logically and systematically clarified, although a more in-depth comparative analysis within the realm of intelligent architecture would have further strengthened the research. As an emerging field, the lack of practice-based studies and projects highlights the importance of conducting further research in this domain.

The interdisciplinary nature of the research, combining architecture with disciplines such as cognitive neuroscience, human-computer interaction, digital modelling, machine learning, sound-spatial structures, and quantum physics, is impressive. Kotnour skilfully connects these diverse fields, enabling the development of new architectural forms through the combination of experimental approaches and computational models. Although the focus lies on sound-spatial structures, the research is a compelling case study for implementing contemporary computing technologies in architecture. Furthermore, the ambition to develop a meta-architectural framework software for evolutionary architecture opens up extensive possibilities for future research and development.

Undertaking this ambitious and complex research required the exploration of tools beyond the traditional architectural toolbox. The dissertation's comprehensive examination culminates in the development of an original model for architectural research. While some sections could benefit from tighter editing to address repetitive elements and improve the clarity of the main arguments, the significance of this relatively new field justifies its approval as an accepted PhD dissertation in architecture. The research has the potential to shape the architecture of the future and to help it respond to emerging needs such as mass migration and the environmental climate crisis.

In conclusion, I highly recommend the acceptance of Karolína Kotnour's dissertation, "Sound Shape Space," for a PhD in architecture. Its innovative approach, interdisciplinary scope, and contribution to the field of Architectural Intelligence make it a valuable research endeavour. With some minor improvements in critical cultural analysis and editing, this work has the potential to pave the way for future research in this rapidly evolving domain.

A handwritten signature in blue ink that reads "Yael Eylat Van Essen". The signature is written in a cursive, flowing style.

Dr. Yael Eylat Van Essen

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