



## EDITORIAL

# Cross-Disciplinary Design Methodology

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Is there a cross-disciplinary design theory and methodology? This special issue includes three contributions from disciplines that are not typical engineering fields where design theories and methodologies have intensively applied and well received.

The first paper, titled “Agile Forward-Reverse Requirements Elicitation as a Creative Design Process: a Case Study of Illimitable Space System v2” by Mokhov *et al.*, presents a requirements-and-specifications reconstruction process for systems that dynamically involve multi-disciplinary stakeholders. This paper uses a case study of Illimitable Space System, a multi-modal interactive entertainment platform that enhances interaction between the actors and graphics or sound environment. The success of this platform depends on the satisfaction of different stakeholders, e.g., performing artists, stage and lighting designers, software developers, and the directors/producers of the show or installations. The system was developed based on demands from multiple stakeholders while systematic analysis was missing and documentations were lagging behind. To ensure its sustainability and maintainability, the authors reconstructed the requirements through a reverse design process by following the Environment Based Design methodology. An example is given to show the effectiveness of the reverse design process in integrating demands from multiple stakeholders.

Going to a finer level of integrated design, the second paper titled “Hybrid Formal Method for Verifying Temporal and Spatial Coherences in SMIL Document Using Hoare Logic and Disjunctive Constraints” by Mekahila *et al.*, investigates challenges in the presentation of multimedia documents with Synchronized Multimedia Integration Language, such as a document that integrates both temporal and spatial information. Conflicts happen sometimes in the integration process. This paper proposes a tool/algorithm to help users identify, verify, and correct any conflicts between spatial and temporal information. The examples given in the paper show that the tool is effective.

The last paper, titled “Validation of Recursive Logic in Graphic Design” by Yu and Chen, deals with artistic design. It discusses the effect of recursive logic on graphic design. The work applies the Recursive Object Model (ROM) to graphic design to manifest a story. They first analyse the topic from the story and describe actions between different subjects and objects. Then, the authors generate visual elements for the decomposed actions and integrate them to a design idea to solve the design problem. They prove that the ROM tool from recursive logic can effectively make the graphic design more “orderly, precise, and valid.” They also conclude that graphic design process follows the recursive logic process and can be improved through recursive logic.

The papers in this issue focus on integrated design at different levels and from different disciplines. They range from system-level design for improving the overall system performance to idea generation methods

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for effective and creative graphic design. They consider applying logical design methods to guide/correlate with the design activities. Future research may not only build on the topics here, but also branch into other exciting research opportunities in human-centered design, user experience research, healthcare system design, and many other fields. We hope that this issue will stimulate further research and discussion on trans-disciplinary integration design solutions, and help the community make continuous advances in unifying cross-disciplinary design methods/theories and practices.