

論文 / 著書情報  
Article / Book Information

題目(和文)	
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学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

(博士課程)  
Doctoral Program

# 論文要旨

THESIS SUMMARY

系・コース : Department of  
Department of, Graduate major in Arch. and Building 系  
Eng., ESD Course コース

申請学位 (専攻分野) : 博士  
Academic Degree Requested Doctor of (Engineering)

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Academic Supervisor(sub)

## 要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words )

This thesis deals with the challenge of constructing a thought-framework for systematically describing interpretation activity in design. Such a description can facilitate the future implementation of highly-adaptive human capabilities in digital design support systems.

Chapter 1 introduces the general topic of interpretation, and points out potential pitfalls in its study. Following this, we focus our inquiry on an important interpretive ability, commonly referred to as “seeing as” (which facilitates dynamic changes in perspective as a response to changing situations). We then state our research aims, and formulate our research question accordingly. The boundaries for our inquiry are set, and our research question is decomposed into four sub-questions, each addressed in a separate chapter of this work (chapters 4-7).

In Chapter 2 we lay out the theoretical background for the work, by introducing key concepts from various fields and disciplines. First, we provide an overview of interpretation in design. Second, we discuss the approach of situated cognition and its effectiveness in studying thinking and action. Third, we touch upon key concepts in knowledge representation and reasoning, which we see as essential for understanding interpretation activity. Fourth, we provide an overview of artificial intelligence approaches to computational design, and review representative examples of computational design systems from each. Fifth, we discuss key notions in semiotics and linguistics, in order to build a firm foundation for analyzing interpretive acts. We then conclude this chapter with an introduction of traditional Japanese rock garden design (JRGD), which we have embraced as a case study in this work.

Chapter 3 presents our methodological approach, which sets one foot in computational design (chapters 4-5), and another in observation of design activity (chapters 6-7). In this, we introduce and justify our choice of JRGs as a case study for the work, as well as our design task (for observing interpretation activity), which was devised in this context.

In Chapter 4 we lay the theoretical foundations for systematically dealing with interpretation, by identifying key entities which lie at its core. We review the practice of interpretation in traditional JRGD, and formulate a computational framework for relating objects with interpretations. The framework is implemented and tested in a Computer-aided Design (CAD) environment, by attempting to generate spatial designs based on interpretive descriptions.

Chapter 5 furthers our efforts by proposing a formal framework for representing and storing interpretations within a database. The framework is implemented via integrating a CAD environment with a logical inference system, and tested by matching stored interpretations with spatial designs.

Chapter 6 turns to design observation, to enrich our understanding of interpretation on the basis of empirical data. We devise, execute and analyze a design task in the context of JRGs, and draw insights regarding how subjects engage in interpretation. We then propose a framework for modeling interpretation in design, which enables to trace the assignment of interpretations in action.

In Chapter 7 we revise and repeat our design task, in attempt to deepen our understanding of human interpretive practices. We suggest how interpretation activity may be understood through a new notion termed “narrative worlds”, which frames our various insights so far. This notion, which draws on theories

in design cognition, discourse analysis and the philosophy of mind, enables to visualize and understand processes of interpretation through the eyes of the designer.

Chapter 8 discusses the main result of this work – a conceptual framework for systematically inquiring into this activity. In this, we clarify our contribution and position it within state-of-the-art models for computational design. Various implications for design theory and practice, as well as for knowledge engineering and artificial intelligence, are suggested. In addition, we specifically relate our findings with JRGs, which both inspired and enabled this project. We then discuss the main limitations of the work, and suggest possible ways in which these may be addressed.

Finally, Chapter 9 discusses future directions for research, on the basis of the current limitations and by considering our research goals, and concludes this dissertation.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).

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Attention: Thesis Summary will be published on Tokyo Tech Research Repository Website (T2R2).

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