Summary

The aim of this research is to determine what the role of words and associations is in the field of Computer Aided Architectural Design (CAAD), aiming at support for the architect in the early phase of the design process. Aspects that are researched in greater detail are the reduction of fixation and enhancement of creativity by using written words and semantic associations to make graph representations.

The research method contains two case studies along with a literature study leading to assertions and hypotheses that are tested with a working prototype in an experiment.

Theory

Representations made explicit by the user play an increasingly important role in CAAD research. The early phase of the design process requires the architect to concentrate on the design and he should not be distracted by the functionality of a computer system. The requirements for the system include that it is natural, intuitive, and representation-driven. An ideal system for the architect in the early phase of the design process understands the design draft (consisting of sketches, words, marks, and images), has the ability to have multiple interpretations of the design draft, and is able to react to the design draft without disturbing the architect in his design process.

In this research the focus lies on the use of written words in the design draft. Understanding the use of words and associations in the early phase of the architectural design process contributes to meeting the requirements mentioned for an ideal system in this phase. Implicitly, words contribute in mind – as verbal thought, flow of consciousness, and design rationale – through succeeding moves in the design process. As the architect writes during the early phase of the design process, he uses several terms to explain the main concepts of the design task and solution; words are constantly instilled with subtly different meanings. Written words support several qualities for making the design explicit: high expressive value, ambiguity, imprecision, uncertainty, invitation to reflecting, alternative interpretations, and parallel lines of thought. Words have several functionalities, which are influenced by the other representations (sketches etc.) that are made explicit in the design draft. Functionalities of written words as annotations or notes include comments, questions, descriptions, explanations, expressions, additions, and issues like calculations and diagrams.

Words lend themselves well to be played with in relation to other words like in association and analogy, and are employed by many designers in conceptualizing designs. The role of associations is twofold: (i) associations contribute to assess and understand the design rationale because the content of the design draft can be partly understood by assessing the words and associations between these words and other segments of the design draft, and (ii) associations can trigger the architect to have new ideas. Providing the architect with graphs that represent words and semantic associations contributes to the design process in generating new ideas and associations among these ideas. Associations contribute to the design in exploring the ideas and associations (be it in a lesser degree), by triggering to change of viewpoint, discipline or approach.
An ideal system is proposed by introducing the Idea Space System in this thesis. The Idea Space System records the design as a network with words and associations as information handlers. Due to this network, flexibility in the design content is obtained in three ways. First, the notion of multiple definitions or multiple terms for the same issue is supported. The network consisting all representations includes the relations among words that are defined, maintaining the ambiguity that is needed for the architect in the early phase. Second, the design information as it is captured, as a network, can be used to provide the user with valuable feedback. Third, the use of words and associations in a network makes it possible to share information with others. Information that is shared and expressed in related terms can be found as well.

It is expected that this feedback consisting of word graphs (representing words and semantic associations) aids the architect in generating new ideas and associations among these ideas, reduces the fixation experienced by the architect, and enhances creativity. These assertions concerning the value of the feedback are verified by means of a prototype in an experimental setting.

**Experiment**

The prototype of the Idea Space System and the experiment provide more detailed insight in the role of words and associations, considering the potential of reducing fixation and enhancing creativity.

The prototype is built on a platform, which supports the metaphor of the workbook, resembling as close as possible a real design setting, and which is able to capture all design draft. The written words are used to provide the user with feedback. The prototype provides feedback for the architect by showing word graphs.

This prototype is used in an experimental setting. Assessing the effect of the Idea Space System is done in both qualitative as quantitative ways. The goal of the experiment with the prototype is to measure differences in working with or without the Idea Space System. In this experiment 19 architects have participated. There are three means to assess the data: the prototype, the questionnaire, and the panel of experts. Results (the design drafts and activity logs) are recorded by the prototype. A questionnaire gave further insight in the architects' opinion about the system. A panel of experts provided ratings on the design quality concerning meeting the demands that were stated in the brief, the design process, the concept, and creativity.

Although it has not been explicitly proved that the architect is aided by the prototype system in enhancing creativity, the system did not influence creativity negatively either. Considering the fact that the architects were using the system for the first time, this is considered a promising finding. The architects did indicate to have more associations, ideas and concepts themselves due to the feedback in word graphs provided by the prototype system. Moreover, architects accepted word graphs and they have written down words that were generated by the system earlier. This indicates that they find the information in the word graphs interesting and useful.

Although the architects indicated to have more unexpected ideas, due to the feedback in word graphs, it cannot be proved that the architects experienced less fixation, nor did the panel of experts indicate a better design process. Promising findings are that architects did
indicate an improvement of the design process, workflow, and pleasure when using the system.

Concluding, the system does not aid the architect as it was intended concerning the enhancement of creativity and the reduction of fixation. The problem probably lies in the fact that architects did not have time enough to get used to the system with the emphasis on words and the feedback in word graphs.

Despite of this, much evidence has been provided in the case studies, the literature study and the experiment results for continuation of the investigations on the application of words and associations in Computer Aided Architectural Design.