Implications for developing a Collaborative Designing AI

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ABSTRACT

This paper introduces a framework for creating collaborative designing systems (CDS) from an interaction design perspective. Previous research on artificial intelligence (AI) is mainly focused on recognizing the designer's intent and combinatorial problem-solving. In contrast, this framework uses an interaction design perspective on collaboration, a process that enables groups to combine skills, extend solution spaces, and increase available cognitive and creative resources to find better solutions than each individual. The framework identifies requirements in the context of design by using the agent-based model from the mixed-initiative interaction (MII) framework [1] as a frame. Resulting implications, current challenges, and projects for developing such CDS are described.

CCS CONCEPTS

•**Human-centered computing** → *Collaborative content creation;*

KEYWORDS

HCI, Collaborative AI, Design Implications

1 INTRODUCTION

Significant advancements in AI leave little doubt that we will soon use intelligent agents on a regular basis. Even though actively collaborating with such systems would enable results that exceed individually achievable solutions [3], humans still play a limited role within AI processes. Collaboration with machines has especially great potential for developing innovations and new solutions to complex problems. Such problems often include a high level of uncertainty, where neither the final goal nor the complete solution space is specified beforehand, and potential solutions are created and rejected iteratively. An example is the development of new interface designs [1]. The increasing variety of design objectives, due to rapidly increasing technological feasibilities and demands, makes the exploration of new interaction concepts and designs a crucial part of a successful design process. This paper explores the question of what an intelligent system would need to efficiently collaborate with a designer within a creative context.

2 FRAMEWORK

Based on the collaborative design process [2] and previous research, we present a framework that allows researchers to identify design implications for a CDS (Figure 1). In line with agent-based models, we distinguish a task and world model requirements for the AI.

The task model view is composed of three interaction-relevant requirements related to the current task: *Understanding task requirements* - expressing and explaining own understanding; *Providing inspiration* - following thoughts and reject ideas; and *Adapting interaction behavior* - for personalized communication strategies.

The world model view encompasses requirements beyond the current task, with potential sources of knowledge through previous

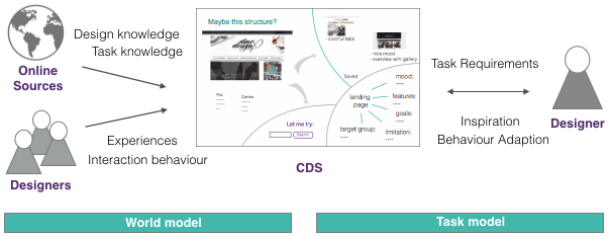

Figure 1: Framework for designing a CDS

interactions or online information. There are four requirements to enable a system to collaborate in this context: *Task domain knowledge* - features and challenges that are task specific, like common user groups or environments; *Design domain knowledge* - understanding and use of design processes and concepts as Wireframing or Moodboards; *Experiences* - learning from successful and failed projects; and knowledge about *Human interaction behavior* - communication and argumentation strategies. Each of this requirements contributes to successfully implementing a CDS.

3 DISCUSSION

The framework defines considerations for building collaborative interaction strategies from an interaction design perspective, that go beyond the currently known strategies like MII. However, some of the suggestions might be hard to realize or test. *Adapting behavior*, for example, requires a complex psychological models of human preferences and mental models combined with the ability to transform communication strategies for supporting them. Further, providing sufficient *design domain knowledge*, which includes explicit and tacit knowledge of design and its application and variation present another challenge. The framework allows, though, to identify current possibilities and ideate new ways to support collaboration between designers and creative machines.

4 CONCLUSIONS AND FUTURE WORK

Collaborative systems can significantly improve the process of solving complex design problems, as well as their outcome. While the focus of this research is creativity and design, the framework can be extended to any task that requires close collaboration between a human and a machine by only changing the domain knowledge requirements of the system. The next steps are the study and evaluation of the described requirements. In our current work, we are building an inspirational platform that allows designers to interact with an intelligent machine to develop design inspirations together.

REFERENCES

[1] J. E. Allen, C. I. Guinn, and E. Horvtz. 1999. Mixed-initiative interaction. *IEEE Intelligent Systems* 14, 5 (Sep 1999). DOI: http://dx.doi.org/10.1109/5254.796083
[2] Cecilia R Aragon and Alison Williams. 2011. Collaborative creativity: a complex systems model with distributed affect. In *Proc. of CHI'11*. ACM.
[3] Gerry Stahl. 2006. Group Cognition: Computer Support for Building Collaborative Knowledge (Acting with Technology). (2006).