

XIAOTONG (TONE) XU'S
THESIS DEDENSE

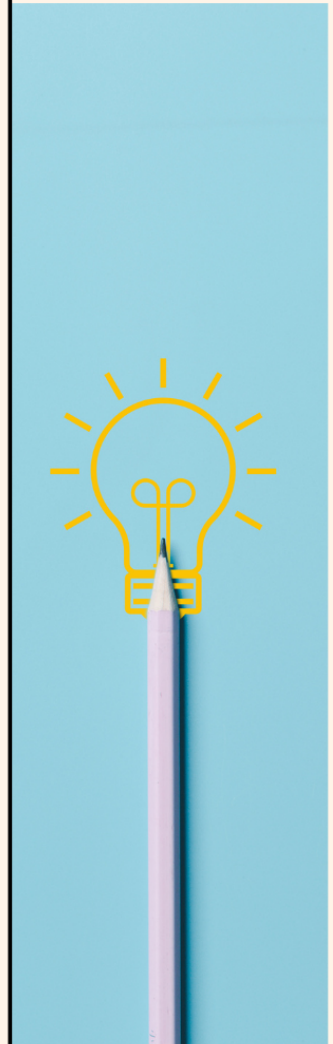
CONTEXTUALLY ADAPTING INFORMATIONAL RESOURCES USING AI TO SUPPORT CREATIVITY

Novices often struggle to come up with good ideas, in part because they lack awareness of existing ideas and knowledge in a domain. The Internet has given designers unprecedented access to example galleries, web search, LLMs, and other information technologies that support creative work in various ways. However, these tools do not typically have insight into how creators think about their own ideas, which could create a mismatch between creative information needs and resources.

In this thesis, I argue that creativity-support tools need to contextually adapt informational resources based on a user's nascent thinking to facilitate design exploration and reflective iteration. My thesis adopts a mixed-method approach to conduct exploratory studies of how creators use existing tools (i.e., a web search engine and a large language model) and system designs of new ideas for how to support them. (1) In an observational study of web search during the creative process, I found people's search behaviors heavily depended on the maturity of an idea in the design space. (2) Likewise, I analyzed how students used a chat-based LLM interface for idea iteration, and found that novice creators had challenges both with communicating their ideas in an appropriate format for an LLM and with critically reflecting on the outputs.

Based on these insights of these observational studies, I designed and implemented two AI-powered systems for adapting text-based example repositories and LLM interactions. (3) The first system, IdeateRelate, visualizes the semantic and categorical distances between an individual's existing ideas and the rest of the ideas in an idea repository. (4) The second system, Jamplate, integrates AI with expert cognitive scaffolds for design activities in a collaborative digital whiteboard. The evaluative studies of the systems show potential for better supporting reflection and iteration.

While AI-driven creativity-support tools are associated with increased productivity, they also present potential risks, such as reducing user introspection and reflective thinking. This thesis demonstrates the importance of balancing introspective cognitive processes with creative productivity for more effective idea iteration.



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