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Creativity Interacting with Computers

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CREATIVITY: INTERACTING WITH COMPUTERS

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ABSTRACT

Much traditional HCI research has concentrated on routine, well-defined and stable, tasks or low level computer support for complex tasks, e.g. spell-checking for someone writing a book. Increasingly, however, interest is moving to the support of people involved in creative tasks. This is the topic of the panel. Design and the visual arts will be used as typical examples of creative work and visions of computer futures and their cultural and social implications are explored.

KEYWORDS: creativity, interaction, design, art, emergence, distribution, concurrency.

INTRODUCTION

Computer systems for professional workers are often constructed in relation to a problem solving paradigm. On the other hand, studies of professional people at work suggest that they spend much more time in problem formulation than they do in problem solving. Problem solving requires expertise but problem finding requires creative thought. Should we aspire just to automate expertise or should we aim to amplify human creativity?

Just what is stimulating to creative thought and what is inhibiting? For example, a software critic can be very helpful in bringing errors to the attention of the user, but the critics knowledge can include conventional wisdom. A creative act may often involve contradicting a standard convention. So does the critic help or hinder? What should the research agenda be for advancing support for creative thought and action?

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POSITION STATEMENTS

Ernest Edmonds

For computers to support human creative thinking, they must be able to keep up with human recognition of emergent ideas. This implies that the system is not based upon a well ordered object set but has pattern recognition capability that can find the new objects, as they emerge, with minimum human guidance. Emergence is fundamental to creative thought in the sense that we find it hard to qualify an idea as creative if it is clearly implied by the preceding conditions. The creative thought introduces something new. In studies of design, for example, we see the reshaping of the significant creative events. In a recent study of innovative bicycle design it was shown that the designer, Mike Burrows, shifted his thinking from the conventional tubular frame to the concept of a single "monocoque" whole that could not have been inferred from the earlier model. As he considered smaller tubular frames he came to see the possibility of filling the enclosed space in and, then, of abandoning the traditional structure entirely. Such emergent ideas are typical of innovative thinking, but what are the implications for computing?

Gerhard Fischer

The power of the unaided, individual mind is highly overrated - much of our human intelligence and creativity results from the collective memory of humankind and of the artefacts and technology surrounding us. Rather than studying humans in isolation, we have to develop models of distributed cognition and new role distributions between humans and computers. To exploit artefact, group and institutional memories and to bring design concepts into unseen and untaught, yet relevant contexts, new representations are needed to serve the task at hand. Task-relevant reminding is critical for creative activities. Artefacts do often not speak for themselves' therefore mechanisms are needed to increase the back-talk of artefacts. Human knowledge is tacit and it only surfaces in the context of specific tasks. This implies that problems are not given, requiring the integration of problem framing and problem solving. In our research over the last decade we have tried to create computational

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artefacts supporting these challenges. The domainorientation of our design environments brings tasks to the forefront, thereby transcending 'human computer interaction' by supporting 'human problem-domain interaction'.

Joy Mountford

Have you ever seen anyone, doing much creative work directly using a computer? Computers were 'invented' more as productivity aids, which has made them more or less useless in the creative domains. When do you see mathematicians, even, working their thoughts through directly on a computer screen? The tools of the creative businesses are typically paper and pencil, white boards and physical objects. Ideas are initially sketched out in a rough form. The nice, orderly approach of word processing makes everything 'look' and be perceived in a finished form. The issue is how much can we change this orderly system to encourage the use of the computer for alternate methods and thought processes? Is it as simple as change the I/O environment? What is important to capture during the process of creation?. What are the relevant parts of the entire process, and when are these different from performing or answering a problem? I think the computing domain needs a balancing of their focus areas, to those that enable more creative acts. This is only likely to occur when artists and scientists are more aggressively encouraged to work much closer together.

Frieder Nake

The Hungarian composer of complex music ("maximal music"), György Ligeti, says he is making minimal, close to zero, use of the computer, but maximal use of his brain. The computer does not, by itself, influence creativity much. Yet its existence changes our views of the world, and thus it has an impact on creative work. It has often been said that with the computer, artists, designers, or architects may easily play with hundred of variations. Thus, computers have an impact on the combinatorial aspects of creativity. Combinatorics, however, is only the trivial aspect of creativity. Saying this, should not divert us from the importance of the groundwork of creativity. The computer is "the machine to think with", it has been said. More precisely, it is a semiolic machine, the machine to carry out algorithmic semioses (sign processes). If we want to understand the relation of computers to creativity, we can learn from conceptual art. Creativity happens when an innovative idea encounters the proper material, and "shapes" it. When creating, I may directly manipulate my material, or I may only describe how to manipulate it. A definite influence of computers on creativity is the separation of description and manipulation. The computer is the machine for creativity in post-modernism.

Douglas Riecken

How might the process of innovative design benefit from the application of computing technologies? We could employ the computer during a design session to enumerate an exhaustive set of views representing plausible solutions to a given problem. Of course, this would require the computer to be endowed with an extensive domain specific knowledge-base. A critical concern regarding this approach is the embodiment of aesthetics in the knowledge-base. When formulating solutions, a knowledge-based approach could focus its search criteria biased by emergent design properties which satisfy some aesthetic value. To achieve this behaviour, a knowledge-based system should (in the minimal case) functionally entail two physical characteristics. First, the knowledge schema which serves to represent various compositional levels, ranging from the design primitives to complex composite design artefacts, must be extremely flexible; the schema must be reconfigurable so as to functionally support plan reformulation. The knowledge embodied in the system must provide a representation for aesthetic values and a mapping between these values and the different types of design artefacts.

Robert Spence

I have recently completed a series of interviews with visionary engineers in a project which has attempted to look forward to the design office in the year 2020. A topic of wide concern, and commented upon in depth, the early 'creative' stage of design was nevertheless one for which a pressing need was identified rather than solutions envisaged. The possibility of the computer itself being creative was dismissed. Pencil (probably soft) and paper, together with the essential eraser, frequently combined with face-to-face discussion with colleagues, will still be common in 2020. What will have emerged by then, however, is a range of ways in which the computer will facilitate the creative process. Emergence, where a new concept emerges from the combination of two existing ones, may be facilitated by pattern recognition and/or neural networks. And CAD software will be so designed as to allow suspension of judgement so that decisions can be made at any time. The form of computer-based tools will reflect the need to support two concurrent processes, those of problem formulation and problem solution proceeding in tandem, at any level from component to system.

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