Program of Study: A Machine that Dreams: An Artistic Enquiry of Cognitive Models of Dreaming

Dreams represent a complex interaction between our body-minds and experiences. They are a source of imagination, inspiration, and are fundamental to being human. This research program is an art-as-research (Wilson, 1996) practise that explores the philosophical and aesthetic qualities of an electronic media artwork (Bogart, 2008; Manovich, 2001; Wilson, 2002) that implements a cognitive model of dreaming. Through the creation of the artwork the research aims to answer the following questions: *What is a dream? How can a machine be thought of as a dreaming entity? What qualities of the models are best represented in an artwork? How can the machine's "dream" be externalized for the viewer?*

The Artwork: The work is a computational process running on a computer installed in a physical context. The mechanism autonomously collects visual and aural sensor data from the installed context. These sensor images are fed into a system that models human memory. It is from this memory that the dreams are constructed. The "dream" of the system is represented on a visual and audio display to encourage the viewer to contemplate the relationship between the machine's dream and the context it senses. By anthropomorphizing the system (Turkle, 1984), the artist and the viewer are encouraged to reflect on the qualities of the machine's dreams in relation to their own experiences.

Background: During my M.Sc. study in the School of Interactive Art and Technology at Simon Fraser University, I created an artwork titled "Memory Association Machine" (MAM). The artwork was created in the context of an art-as-research practise that combines multiple approaches to art making: site-specific art, where the artwork is meant to be understood in a particular physical context (Kwon, 2004); conceptual art, where the artistic idea is as, or more, important than the physical object (Lippard, 1997); and electronic media art, where the art object is often computational and created in relation to electronic technologies. By placing my practise at the intersection of these approaches, I am is tracing the lineage between my work and that of artists such as Yoko Ono, Hans Haacke, and David Rokeby (1990, 2001).

The research program leading to MAM began with an open-ended research question: *How can a machine relate itself to its physical context without that relation being completely predetermined by the artist?* This question lead the research into three areas: theories of creativity, Boden (1994, 1998, 2004); Cognitive Science, as it pertains to creativity, Gabora (2002a,b, 2000); and Artificial Intelligence, as it pertains to creating systems with human-like abilities (Barr and Feigenbaum, 1981). A conception of creativity was at the forefront: *how could the machine exhibit creative behaviour?* MAM related to its context using a novel combination of a Self-Organizing Map (Kohonen, 2001) and a model of creativity (Gabora, 2002) as described in Bogart (2007, 2008, 2009). In an installation in Montréal (Bogart, 2007), MAM's process was presented on three displays (see Illustration 1). The left display showed the sensor image as fed into the system. The middle screen presented a collage of all memories remembered by the system that are organized by similarity. The right screen presented a cinematic montage that represented the system's emergent free-association through its remembered sensor images. This research exposed me to the rich artistic potential at the intersection between the science of mind (Cognitive Science), the science of computational implementation (computer science), and creative practise.

Illustration 1:

Methodology: Artistic practise is a method of generating knowledge and questions (McNiff, 1998). The research is composed of two major processes: realization–an artwork is produced where my aesthetic and technical choices are situated in cognitive conceptions of memory and dreaming; and interpretation–the artwork's qualities are constantly reconsidered in light of the research questions, and in relation to the cognitive models being used. The creation of an artifact is considered a method of enquiry characterized by the use of tacit knowledge (Polanyi, 1983) and a rigorous reflective practise (Schön, 1983), where artifact and theory are constantly revised in relation to one another (Bogart, 2008). The primary material of the artwork is software that encodes my artistic intention. Practise is inspired by the philosophical and technical aspects of scientific models, where the role of these models is two-fold: (1) the current scientific understanding situates the aesthetics of the artwork, and (2) the research enriches scientific theories by realizing them in a functioning aesthetic system that reflects the characteristics of their models. Cognitive models are studied with a focus on their structure and philosophical position. See Wilson (1991) for discussion on art inspired by science. The practise demonstrates validity through its contextualization within electronic media art history and its use of cognitive models.

Knowledge: The research program produces two major results – the physical artwork and knowledge accumulated through its production process. Knowledge is documented in two forms. As the artwork is produced, a detailed log is kept that reflects the research process. The log is useful as it tracks how specific aesthetic choices relate to artistic, philosophical, and scientific influences. The second artifact is the software that encodes the artwork's process. In order to facilitate diffusion of knowledge, components of the software will be released under a Free Software licence (Free Software Foundation, 2008) so that they can be used by anyone interested in exploring these conceptions of dreams and memory. Through exhibitions, artist talks, workshops, and conferences, I hope to provide a unique integration of concepts from the artistic and scientific communities. Artificial Intelligence (AI) and computational techniques are used in cognitive science but rarely do they implement whole systems that integrate models of memory and dreams with a physical environment.

Study Plan: My former supervisor, Thecla Schiphorst, will continue to provide leadership as I continue the art-as-research practise initiated during my M.Sc. study. This core activity is supplemented by the study of AI and Cognitive Science. The study of AI will be led by my senior supervisor, AI specialist and creative practitioner, Philippe Pasquier. Study of cognitive models of memory and dreaming (Hebb, 1961; Hobson, 2004; Leibold and Kempter, 2007) will be directed by Cognitive Scientist and designer, Steven Barnes.

Through the production of MAM, I developed a novel combination of Artificial Intelligence and a model of creativity. This Ph.D. research program is situated in the growing field of art-as-research practise at the intersection between technology and science. The research process will benefit electronic media artists interested in cognitive processes, push the boundaries of what we consider art objects and their relation to science, and facilitate discussion between artists, scientists, and the public regarding the relations between cultural, scientific, and technical knowledge. The resulting artwork is intended for long-term public exhibition and meant to enrich the world in which we live. It will inspire the public to consider the relationships between technology and humanity.