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The Influencing Machine - Emotions in Interaction

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INTRODUCTION

Computers generally work on an unemotional basis: they solve problems, they follow orders, they present information, without understanding, considering, or mirroring the emotions of the user. But in human relationships, emotions play an important role; for this reason, an interaction between human and machine that only includes the rational is often uncanny and sometimes even incorrect. The Influencing Machine is an installation that explores the potential role of emotion in human-computer interaction.

The Influencing Machine is a system that allows people to influence the expressive behavior of a computational system through emotions. The system draws on a large screen in a child-like way. By manipulating a voodoo doll, users can change the emotions that are being expressed in the pictures. The Influencing Machine is inspired by Ed Burton's seminal work on children's drawing [3].

CONCEPT

The Influencing Machine bases its style of avatar-user relationship on the metaphor of the Influencing Machine, a paranoid delusion first described by Victor Tausk [6] and extensively described by Bruno Bettelheim in his case study of Joey, a boy who believed he was mechanical [2]. People suffering from the Influencing Machine delusion feel that they are being controlled by a machine which projects hallucinations, produces or removes thoughts, feelings, and physical sensations, and changes one's bodily composition.

This Influencing Machine is a projection of part of a person's sense of self; i.e. their sense of self is split into two parts which share control of the person. In this way, the Influencing Machine is a model of what it is like to have shared control between two entities. In the Influencing Machine system, the user does not directly control but uses emotions to indirectly influence the agent's behavior, acting as the Influencing Machine for the agent.

The Influencing Machine installation works as follows: the user enters a (physical) room, onto whose walls are projected expressive, child-like drawings, which are being done by the computer in real-time. In the center of the room lies a physical voodoo doll. By touching the voodoo doll in different areas, the user affects the emotions and developmental state of the agent, which in turn changes the style and content of the drawings. The agent itself is not seen; the user experiences it through its expression in drawings. Over the course of the interaction, the agent ages from 9 months, when it merely scribbles, to about 5 years, when the content of the drawings starts to become highly representational.

IMPLEMENTATION

The architecture of the system is planned to contain the following parts:
(1) a physical voodoo doll with touch sensors, which measures when people touch each surface of the doll;
(2) a pattern-matcher, which receives as input touch-information from the voodoo doll and uses pattern-matching rules to generate influences to the agent's emotions;
(3) an emotional model which uses these influences to update the agent's emotional state, passing on changes to the drawing style;
(3) a developmental model which uses changes in emotions to update the agent's developmental state and sends the currently developed pictorial elements to the drawer and
(4) the drawing system which generates the actual, real-time drawings based on the current emotional style and pictorial elements.
These drawings are then observed by the user, who touches the voodoo doll in response, and the process begins again.

The pattern matcher will take as input sensations from the voodoo doll. The voodoo doll's body is divided into 4 zones, which represent the head (intellect), hands (exploratory), body (physical), and heart (emotional). The pattern matcher looks for particular patterns of activity in each zone, matching them to emotional influences, in ways that make sense for the agent's personality and developmental state. For example, a pattern-matching rule could be ``if the heart is touched ten times in a row, increase the feeling of being smothered by 2."

The emotional model for the agent will be based on the depth-psychological literature on analysis of children's drawings (e.g. [4] [5]). This literature uses radically different emotions from those which have been common in AI emotional architectures; rather than happy, angry, sad, the literature discusses emotions like sense of flow, feeling of physicality, rigidity, or contentment. While highly meaningful in the context of children's drawings, these emotions are neither clearly defined nor orthogonal to one another (for example, `rigidity' is almost the opposite of `flow'). The agent's emotional model is therefore planned to be a minimum-commitment model, consisting of emotions which have a simple label and value, connected into a spreading activation network allowing them to reinforce or inhibit one another.

The agent's developmental model will again based on the literature on children's drawings. This literature tends to describe the gradual complexification of children's drawings in terms of an accumulation of pictorial elements which appear in a particular order and are triggered by certain emotional states. For example, if a child draws a human figure surrounded by a circle, this means a kind of protection (``house'') that the child is seeking or feels. Using these analyses of children's drawings, we can construct a directed graph of developmental states, their associated pictorial elements, and their emotional triggers

This representation will be used for development in the Influencing Machine system. Nodes of the graph represent the agent's state, and contain pictorial elements. Links represent triggers where the agent moves from one state to another. An agent can be in multiple states simultaneously (e.g., `drawing human figures with arms but no bodies' and `drawing houses around human figures'). An agent changes state when a trigger occurs, typically because of changes to the emotional state. For example, the `rule' above can be implemented by triggering

entry to the house-drawing state when the agent is in the previous state and security has been above 4 for 30 seconds. The output of the developmental model is pictorial elements which are used by the affective renderer to generate the current drawing.

The drawing system will be programmed in Hap, an agent architecture developed by the CMU Oz project [1]. It will use emotional and developmental state to guide the choice of and attributes for drawing behaviors. The output drawing commands will be implemented with nonphotorealistic rendering techniques.

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