

Designing Affect in an Interactive Chinese Shadows Theater

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1 Introduction

During the last few years, with the establishment of the computer as an everyday presence into different environments, tasks and even objects, the role of interaction with computers became more and more relevant. Computer systems started to be adaptable to the user and in particular to her preferences or needs. But interactions in general, that is human-human interactions, are loaded with specific clues, gestures or signs that allow for rich exchanges and thus rich experiences. How can computers gain from the richness found in human to human interactions?

One way is to also load the human-computer interactions with rich elements, other than information communication, allowing for different feelings and reactions from the user side: in particular, building affective interactions. Characters with facial expressions, nice images, sounds, color can be a step into the design of an affective application. Another, is to become responsive, aware, adaptive, responding to the user, and her emotions in particular.

Many application areas have been considered as benefiting from human/computer affective interactions. Intelligent learning environments, interactive art, computer games, are but a few.

In the present paper we discuss one area of application of affective interactions that is interactive theater.

We are designing an interactive shadow puppets theater, called I-shadows, that aims at giving users (children) story telling experiences with shadows puppets. The system is still in its infancy, and we will only report some of the design experiences carried out, in order to bring the child into the affective loop we are trying to create.

2 The Idea

Emotions can be expressed through sound, color, shapes, forms, movement among other. Children usually express their inner states by carrying on make belief activities where the characters in the make belief stories act emotionally and in context. Given this, we are designing an affective application (the I-Shadows exemplar, reported already in a previous Humaine deliverable) that will provide children, ages seven to nine, an interactive experience for collaborative storywriting using Chinese shadows (see Figure 1).

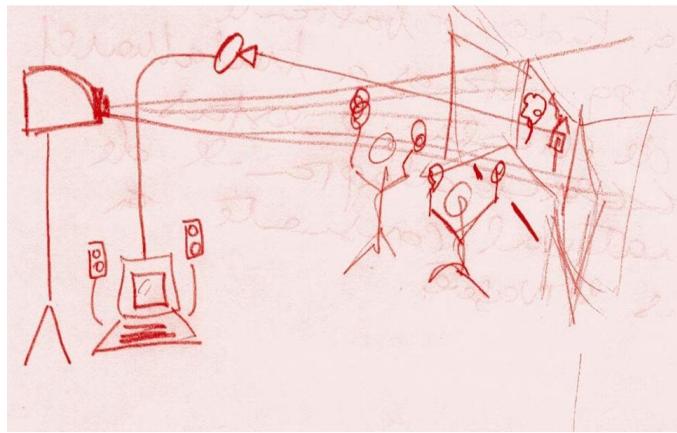


Figure 1: I-Shadows, creating stories with Chinese shadows

The I-Shadows will allow for a group of children to create stories, using a projector, a projected screen and a set of shadows previously made with colored shapes (cuts of transparent paper- see Figure 2). We have designed a set of shadows all with different colors and with a variety of puppets that allow for a rich repertoire of characters to be used in the stories.

By physically manipulating the shadows, children can build stories on the screen and portray affective actions by the props and characters in the story. A camera placed above the children, will detect the motion and emotions of the shadows in the screen (made by the children) and will intervene, interactively, adding new elements to the story being created, such as new forms and shadows, affective sounds or even music. The elements created by the computer will allow for a story structure to be maintained and will guide the children in the collaborative story construction.

The audience, whom can be either placed behind the screen or also manipulating shadows, will be able to see a play on the screen, which will be a result of the collaboration between several children and the computer, in a collaborative and creative story-writing experience.

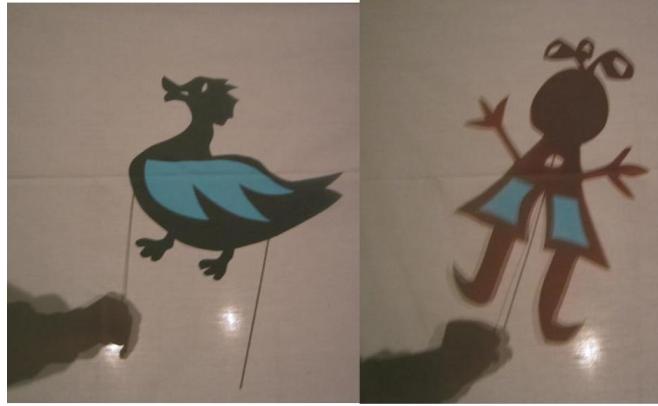


Figure 2: A boy and a duck

3 Design Experiments: Creating Affective Experiences

The first step into building the application, was the design of the setting and of the characters to be handled by children. The design was done based on requirements for the vision system to be build (each shadow should have a back shape definition and a color associated). Figure 2 shows two of the shadows designed. Once the setting designed, we carried out some experiments with children to assess the idea and determine how to build the application based on the typical actions carried out by children.

3.1 First experiment

The first experiment was conducted in November 2004 with five nine year old children (3 girls and 2 boys) at a local school (see Figure 3). We wanted to find out if children could easily identify the characters, find some favorite characters and build a story with actions and emotions using the given characters.

We also wanted to access the types of actions and interactions children would have between them, and the movements they would portray with the characters.

The results showed that the characters designed (a boy, a girl, a woman, a man, the Sun, the Moon, a Dragon, a Candy, a Zebra, a Turtle, an Elephant a Fairy and a Musical flower) were easily identified and were all chosen to be used. However, the story development turned out to be more difficult than expected. The only consistent part of the stories were their beginnings as they were suggested by the teacher. The reason for that, we believe was that too many characters were available and the five children wanted to try them all



Figure 3: Theater in the First experiment

without trying to make sense of the story they were creating.

These first results, although encouraging in terms of the design ideas, was somehow disappointing in terms of richness of the interactions.

3.2 Second experiment

A second experiment was carried out in December 2004, again with five children, aged nine years old. The Chinese Shadow Theater was installed at a local school and, as in the previous experiment, we gave the children the thirteen characters. Our goal was to study the movements made by the children with the characters and see how they portrayed some emotional states with the puppets.

The experiment was carried out as a sequence of steps. In the first step, the begining of a story was told to the children, setting up the scene for the further development. Then, children had the freedom to develop the rest of the story as they pleased. At some point in the story, one of the researchers enters the story to guide the children, suggesting actions and emotions. Finally, some emotions were portrayed by the experimenter in order to see if children could identify a limited set of actions and emotions portrayed with the characters. Everything was video recorded to be examined later on.

To analyze the results, we tried to capture some properties in the movements of the shadows. The properties are as shown in table ??.

Based on these dimensions, and through the analysis of the video recordings captured, we have categorized the emotions made by the children in the sessions with the I-shadows as shown in Table 2.

Property	Characterisation
Direction	Horizontal and Vertical (the I-shadows world is 2D)
Speed	Characterized as: Very slow; Slow; Fast; Very Fast
Amplitude	Very wide; Wide and short
Frequency	Very high; High and low

Table 1: Characteristics of movements in I-shadows

	Direction	Speed	Amplitude	Frequency
Happy	Horizontal	slow	short	low
	Vertical	high	short	high
	Horizontal	slow	very long	high
	Vertical	slow	very long	high
Sad	Horizontal	Very slow	??	
	Vertical	Very slow	??	
Angry	Horizontal	very high	wide	low
	Vertical	very high	wide	high
Scared	Horizontal	very high	short	high
	Vertical	very high	short	high

Table 2: Relating emotions and movements in I-shadows

As we can see, the results suggest that there are some patterns in the movements of the children when trying to express certain emotions and that such patterns do relate to what is actually certain action tendencies associated with the specific emotions studied (see for example the action tendencies suggested in [1] or by [2]).

However, it also shows that in certain cases there are more than one pattern (see the case of happiness). Another interesting case was sadness that we could not identify any characteristics in terms of amplitude or frequency of the movement. The only strong property was that the sad expression was very very slow.

4 Conclusions

I-shadows is still at its infancy, as far as the application is concerned. However, the experiments carried out so far are encouraging and they somehow reveal that capturing patterns of movement associated with emotions is not as clear as we sometimes expect and that, in order to achieve affective interactions, the design process must engage the user straight from the start.

References

- [1] Darwin, C.: The expression of emotions in man and animals: 3:rd ed. by Paul Ekman, Oxford University Press, 1872/1998.
- [2] Lazarus, R.: Emotion and Adaptation, Oxford University Press, 1991.