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Computers as Theatre

Second Edition

quality and nature of these contributions are strongly influenced by the available tools.[7] Perhaps the greatest difference between theatre and human-computer interaction is that the human interactor is also part of the efficient cause; that is, interactors are co-authors. We will return to this topic.

End cause: The end cause of human-computer interaction is what it is intended to *do* in the world. Thus the end cause obviously involves functionality; word processors had better spit out documents. But *experience* is an equally important aspect of the end cause; that is, what a person thinks and feels about the activity is part of its reason for being the way it is. In this sense, as Michael Mateas (2004) observes, the interactor co-shapes the end cause as well in terms of the kind of experience she wants. Or, to use Norman's famous doorknob, the end cause of the doorknob may be different for the person who opens it and the person who locks it. This aspect of the end cause, especially in "productivity" applications, seems trivial to many; it is too often handed off as an afterthought to harried interface designers who follow programmers around with virtual brooms and pails. At the very least, a person must understand the activity well enough to do something. At best, he or she is engaged, pleased, or even delighted by the experience. In this as in many other aspects of well-designed interaction, the world of computer games has been much more effective at producing pleasurable experiences. How much better it is to place the notion of pleasurable experience where it can achieve the best results—as part of the necessary nature of human-computer interaction.

The Six Elements and Causal Relations among Them

One of Aristotle's fundamental ideas about drama (as well as other forms of literature) is that a finished play is an *organic whole*. He used the term "organic" to evoke an analogy with living things, insofar as a whole organism is more than the sum of its parts, all of the parts are necessary for

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7. Theatrical artists increasingly rely on computer-based tools for such tasks as lighting and scene design, lighting execution, moving scenery, designing costumes, storing and simulating dance notation and period movements, and, of course, writing scripts. Theatrical folk express the same frustrations with their tools as graphic designers and other artists who are working in the computer medium itself.

life, and the parts have certain necessary relationships to one another. He identified six qualitative elements of drama and suggested the relationships among them in terms of formal and material causality[8] (see Figure 2.2).

I present his model here for a couple of reasons. First, I am continually amazed by the elegance and robustness of the categories and their causal relations. Following the causal relations through as one creates or analyzes a drama seems to automagically reveal the ways in which things should work or exactly how they have gone awry. Aristotle's model creates a disciplined way of thinking about the design of a play in both constructing and debugging activities. Because of its fundamental similarities to drama, human-computer interaction can be described with a similar model, with equal utility in both design and analysis.

Figure 2.3 lists the elements of qualitative structure in hierarchical order. Here is the trick to understanding the hierarchy: Each element is the formal

ELEMENT	IN DRAMA	IN HUMAN-COMPUTER INTERACTION
Action (Plot)	The whole action being represented. The action is theoretically the same in every performance.	The whole action as it is collaboratively shaped by designer and interactor. The action may vary in each interactive session.
Character	Bundles of predispositions and traits, inferred from agent's patterns of choice.	The same as in drama, but including agents of both human and computer origin.
Thought	Inferred internal processes leading to choice: cognition, emotion, and reason.	The same as in drama, but including processes of both human and computer origin.
Language	The selection and arrangement of words; the use of language.	The selection and arrangement of signs, including verbal, visual, auditory, and other nonverbal phenomena when used semiotically.
Melody (Pattern)	Everything that is heard, but especially the melody of speech.	The pleasurable perception of pattern in sensory phenomena.
Spectacle (Enactment)	Everything that is seen.	The sensory aspects of the action being represented: visual, auditory, kinesthetic, tactile, and all others.

Figure 2.2. *Six qualitative elements of structure, in drama and in human-computer interactions.*

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8. The explicit notion of the workings of formal and material causality in the hierarchy of structural elements is, although not apocryphal, certainly neo-Aristotelean (see Smiley 1971).
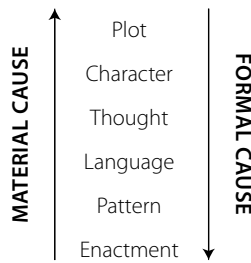
Figure 2.3. *Causal relations among elements of quantitative structure.*

cause of all those below it, and each element is the material cause of all those above it. As you move up the list of elements from the bottom, you can see how each level is a successive refinement—a *shaping*—of the materials offered by the previous level. The following sections expand upon the definitions of each of the elements in ascending order.

In his essay "A Preliminary Poetics for Interactive Drama and Games," Michael Mateas proposes two additional lines of causal relations from the player's perspective. On the side of material casuality Mateas adds "Material for Action," and on the formal side he adds "User Intention." In terms of "Material for Action," Mateas argues that affordances are necessary, but not sufficient. ". . . the interface must 'cry out' for the action to be taken. There should be a naturalness to the afforded action that makes it the obvious thing to do" (Mateas, 2004). This, I think, is an excellent heuristic for the deployment of material causation to constrain (or nudge) interactors into directions that are more likely to yield dramatically satisfying experiences. The idea that the player's intention serves as a force of formal causation also hits the mark. We will explore these ideas further in the section on Human-Computer Interaction as Mediated Collaboration in Chapter 4.

Enactment

Aristotle described the fundamental material element of drama as "spectacle"—all that is seen. In the *Poetics*, he also refers to this element as "performance," which provides some basis for expanding the definition to include other senses as well. Some scholars place the auditory sense in the second level because of its association with music and melody; but, as I will argue in the next section, it is more likely that the notion of melody pertains to the *patterning* of sound rather than to the auditory channel itself.

Morton Heilig: a Genius and a Member of the Crash Dummy Club

Morton Heilig is regarded as a pioneer in Virtual Reality. He invented the Sensorama Simulator (also called the Sensorama Machine) in 1957 as part of a larger plan to reinvent cinema, called Experience Theatre. The machine allowed interactors to view a stereoscopic video scene augmented with vibrating handlebars and a moving seat, wind effects, and scents. He created five experiences for the machine including a bicycle ride, a ride on a dune buggy, a helicopter ride over Century City, and a motorcycle ride through New York. The most amazing thing about Sensorama was that it was entirely mechanical; nowadays we think of VR as a computational system. I think it's also interesting that he called the genre "Experience Theatre"— a sort of blend between cinema, theatre, and arcade ride. Ultimately, Heilig couldn't get funded to build the rest of his dream. He died in 1996.

Sensorama

Heilig became a member of what I call the Crash Dummy club, to which I also belong. That's folks who had ideas to make things before they were economically feasible—things that were ahead of their time. Our work with VR at Telepresence Research (with Scott Fisher, Michael Naimark, Steve Saunders, Mark Bolas, Scott Foster, and Rachel Strickland) as well as the Placeholder VR project in Banff qualified us for the Crash Dummy club.

Being a Crash Dummy is an uncomfortable but fine, wild ride.

One probably temporary difference between drama and human-computer interaction is the senses that are addressed in the enactment.[9] Traditionally, plays are available only to the eyes and ears; we cannot touch,

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9. Aristotle defined the enactment in terms of the audience rather than the actors. Although actors employ movement (kinesthetics) in their performance of the characters, that movement is perceived visually; the audience has no direct kinesthetic experience. Likewise, although things may move about on a computer screen, a human user may or may not be having a kinesthetic experience. In biology, the relatively recent discovery of mirror neurons in the brains of humans and some higher primates challenge this view. Science has shown that, when observing another individual doing something, "mirror neurons" in the observer's brain respond as if the observer were taking the same action. This may go a long way toward defining at least some of the physical basis for empathy (see Keysers 2011).

smell, or taste them. There are interesting exceptions. In the 1920s, for instance, director David Belasco experimented with using odors as part of the performance of realistic plays; it is said that he abandoned this approach when he observed that the smell of bacon frying utterly distracted the audience from the action on stage. In the mid-1960s, Morton Heilig invented a stand-alone arcade machine called Sensorama, which provided stereoscopic filmic images, kinesthetic feedback, and environmental smells; on a motorcycle ride through New York City, for instance, one could smell car exhaust and pizza.

In a much more serious vein, Jerzy Grotowski's Laboratory Theatre experimented with involving the audience in the production in a variety of ways in the 1960s and 1970s. The point was not so much to expand the sensory palette of the audience, but to create "unself-conscious" participation by the audience in the form of deep emotional engagement. In his masterful book, *Towards a Poor Theatre* (1968), Grotowski acknowledges that he has two ensembles to direct: the actors and the spectators. In the Laboratory Theatre's ground-breaking performance of *Doctor Faustus*, Grotowski had the audience seated at long banquet tables. The audience was "asked to merely to respond as people might at such a function."

A spate of interactive plays and "mystery weekends" in the late 1980s employed the scheme of having the audience follow the actors around a space, although only as observers and not participants in the action. In one "interactive" play of the period, *Tony and Tina's Wedding*, the audience was invited to follow the actors around from room to room (kinesthetic), to touch the props and sit on the furniture (tactile and kinesthetic), and to share in a wedding banquet (taste and smell). Another notable example is Chris Hardman's Antenna Theatre, an approach where audience members move around a set prompted by taped dialogue and narration that they hear through personal headphones. These works have roots in experimental theatre work in the 1960s and 1970s by such artists as Judith Melina and Julian Beck of the Living Theatre, Robert Wilson, John Cage, and many others. Contemporary performance art shares many of the same origins. It is interesting that the development of interactive theatrical genres has been concurrent with the blossoming of computer games as a popular form of entertainment.

In fact, it is at the areas in which dramatic entertainment and human-computer activity are beginning to converge that pan-sensory representation is being most actively explored. When we examine that convergence, we can see ways in which human-computer interaction has evolved, at

Robin Hood

In 1975, Bill Morton, a fellow theatre MFA student, and I wrote an interactive play based upon the tales of Robin Hood. I directed the play and staged it on the Ohio State campus around Mirror Lake. The play began as the audience gathered beneath one of the conveniently crenellated turrets of the Faculty Club. The Jester (played by Bill, a sort of Everyman character) announced the play. The Minstrel Alan-a-Dale began to strum her guitar and sing one of the many songs composed for the play as other cast members welcomed the audience (mostly children) to "Sherwood Forest."

Upon arriving, a little fellow about five years old looked up and touched a leaf on a low-hanging oak tree. "What's this?" I replied, "That's an oak leaf in Sherwood Forest." He reverently repeated my words and studied the leaf quite closely. I bet that was the first time he *really looked* at an oak leaf.

Following the Minstrel, the audience came upon scenes in progress at various venues. The first was on a small bridge where Robin and Friar Tuck were engaged in their notorious fight with staffs. Egged on by the other characters, the audience soon learned that they, too, could make comments or cheer, and that the actors paid attention to them, sometimes responding directly.

One day, we had a group of blind children in our audience. During a scene where the Sheriff's men were sneaking up on Robin, these children's acute sense of sound prompted them to interact with Robin more directly than most other kids. "Someone's right behind you!" "I hear somebody sneaking around over there!" Robin responded to their warnings and, making the choice to throw the choreography

Alan-a-Dale leads the children into the world of Robin Hood.