Theoretical Foundations for Experiential Systems Design

Bibliographic Reference:

Marc Davis. "Theoretical Foundations for Experiential Systems Design." In: *Proceedings of the ACM SIGMM 2003 Workshop on Experiential Telepresence (ETP 2003) at the 11th Annual ACM International Conference on Multimedia in Berkeley, California*, ACM Press, 45–52, 2003.

Theoretical Foundations for Experiential Systems Design

Marc Davis
University of California at Berkeley
School of Information Management and Systems
Garage Cinema Research
(510) 643-2253

marc@sims.berkeley.edu

ABSTRACT

As multimedia researchers analyze and design "experiential systems' there is a pressing need to place that work on a solid theoretical foundation. Without careful analysis of the objects and methods, terminology, and conceptual frameworks of experiential systems design, misconceptions about what experiences are and how they can be computationally addressed can allow research to proceed in less fruitful directions. This paper addresses core theoretical issues in experiential systems design about the nature of experience, especially the distinction between data which can be represented computationally and experiences which are internal mental events We draw from theoretical work in the humanities that addresses models of human communication and meaning creation, the philosophical investigation of the structures of lived experience (phenomenology), and the application of that philosophical method to understanding the forms and functions of mediated experience (aesthetics). Phenomenology and aesthetics form a theoretical foundation for reassessing the limits and possibilities of computationally modeling and shaping experiences. Radically interdisciplinary work is required that truly integrates technical and humanistic research in order to design experiential systems.

Categories and Subject Descriptors

H.1.2 [**Models and Principles**]: User/Machine Systems; H.1.1 [**Models and Principles**]: Systems and Information Theory; H.5.1 [**Information Interfaces and Presentation**]: Multimedia Information Systems; J.5 [**Computer Applications**]: Arts and Humanities—*Fine arts, Performing arts*; I.2.0 [**Artificial Intelligence**]: General—*Philosophical foundations*; J.4 [**Computer Applications**]: Social and Behavioral Sciences—*Psychology, Sociology.*

General Terms

Design, Experimentation, Human Factors.

Keywords

Experiential systems, phenomenology, reader-response, reception aesthetics, conduit metaphor, representation, context, communications theory, cognitive science, hermeneutics, aesthetics, interdisciplinary research.

1. INTRODUCTION

The design of "experiential systems" will require insights, concepts, technologies, and methodologies from a host of disciplines that often have limited dialogue with one another. The disciplines and technologies familiar to researchers in electrical engineering and computer science—e.g., Databases, Signal Processing, Information Retrieval, HCI, and Artificial Intelligence—will have to grow to include, understand, and mutually redefine such areas of humanistic inquiry as Epistemology, Phenomenology, Semiotics, Hermeneutics, and Aesthetics. This dialogue and collaboration takes time, commitment, and considerable effort, but can ultimately result in a hybridized theory and practice capable of addressing problems no one discipline or even a cluster of related disciplines can attempt alone [5]. Hence, experiential systems design must be *radically* interdisciplinary. Its challenges and opportunities call on us not merely to draw on approaches from disparate disciplines, but to redefine disciplinary boundaries, assumptions, and methods, and in the process to form a new theory and practice of computational media design. Others have begun this effort as well [14, 20], and we can see the task of "modeling experience" for experiential systems design as a microcosm of this larger project.

This paper is an attempt to begin this radically interdisciplinary project so as to place experiential systems design on a more theoretically-grounded foundation. In the process, we will challenge and transform some of the implicit assumptions of "experiential systems" as formulated thus far, and hopefully provide fruitful new directions for research. In particular, we will discover needed rethinking about such core assumptions as the nature of experience, communication, and mediated experience.

2. DESIGNING EXPERIENTIAL SYSTEMS

In the Call for Papers for the ACM SIGMM Workshop on Experiential Telepresence (ETP 2003)[1] we read:

---

[1] http://ame.asu.edu/etp2003/etpcfp.html

"We would like this workshop to facilitate a new debate in multimedia on creation, archival, representation and transmission of electronic experiences."

To most multimedia researchers this sentence would not cause any concerns other than purely technical ones (what are the basic constituents of experiences that need to be represented, how complex are they, what structures should we use to represent them, how can these representations be compressed for storage and transmission, etc.). We are used to the challenges of creating, archiving, representing, and transmitting *data* (especially bits which represent pixels or audio samples). However, as we will discuss below, *experiences are not data*. A humanistically informed critique of the implicit assumptions in the above cited passage would provide an alternate set of assumptions about what experiences are and how amenable, or not, they may be to computational processing. In contradistinction to the implicit model of experience stated above, I will attempt to show that:

- Experience is *not an object* (or even a collection of objects), *but a process*

- Experience is an intangible process of interaction among humans and the world that has its existence in human minds

- Experience is not something that can be archived or transmitted

- We can only archive or transmit the materials (data) which occasion experiences in human minds

- Every new interaction with these materials is itself a new experience

The investigation of these new assumptions and their ramifications should have a fundamental effect on the project of experiential systems design. In order to begin this investigation we will attempt to understand experience from humanistically informed theoretical models of experience, communication, and mediated experience.

3. MODELING EXPERIENCE

The history of philosophy is replete with a variety of models of the nature of experience. The subdisciplines of "ontology" and "epistemology" respectively examine "what the world is" and "how we come to know it." Recounting that entire history is clearly beyond the scope of this paper, but a significant moment in that history occurred in the early twentieth century when certain philosophers attempted to reconcile opposing models of experience into a unified framework grounded in our lived experience of the world. The attempt to reestablish the philosophical project on the basis of our lived experience is known as *phenomenology* [1].

Prior to phenomenology, long standing oppositions existed between views of the nature of the world and our knowledge of it. *Rationalism*, exemplified by the work of philosopher and mathematician Rene Descartes, believed that all that could be known with certainty to exist or be true was rational thought, and that the external material world, including the body, could not have reliable ontological or epistemological status [6]. *Empiricism*, exemplified by the work of philosopher John Locke held that knowledge is the product of the human sensorium's perception of sense-data from the external world [13]. Hence, for

empiricism, knowledge is not grounded in the ratiocinations of a logical mind, but in the supposed correspondence between the sense data we passively receive and their source in the world. Both rationalism and empiricism respectively problematize the theory of experience by reducing all experience on the one hand to the product of human reason and on the other to the passive reception of sense impressions. Phenomenology attempts to overcome these opposing philosophical views, neither of which can account for the interaction of the mind and the body in human perception and experience. For phenomenology "the ultimate source of all meaning and value" is neither human reason nor the sense data we receive, but "the lived experience of human beings" [1].

The work of phenomenology is a reflective, and ultimately interpretive, examination of the structures of lived experience "from the inside." Through the work of Edmund Husserl, his student Martin Heidegger, and Maurice Merleau-Ponty, phenomenology reoriented the locus and focus of philosophical inquiry toward questions of embodied cognition. How do we come to know the world and ourselves through our "being-in-the-world?" While Husserl initiated the phenomenological project, his work suffers from a belief that the act of phenomenological reflection on lived experience (i.e., the "reduction") can be free from interpretation, and Heidegger tends towards an ontological reification of "Being." It is in the work of Merleau-Ponty that we find the best ground for a philosophical understanding of experience. Merleau-Ponty's masterpiece, *The Phenomenology of Perception* [15], provides researchers in experiential systems with a set of concepts well-suited to understanding how we experience experience.

For all phenomenologists, as for Merleau-Ponty, the nature of experience is bound up with the nature of time, especially our human experience of temporality. Importantly for computational models of human experience, Merleau-Ponty deconstructs the idea of the present moment. Rather than a model of a succession of discrete moments of time strung together to form a timeline of experience, for Merleau-Ponty, "Time is not a line but a network of intentionalities" [15]. Our experience of time occurs at the intersection of two trajectories of intention: our anticipations of what is to come and our retrospections (and reconstructions) of what has been. Therefore, the experience of the present is an intersection of the interleaved ongoing processes of envisioning the future and revisioning the past. For phenomenology, time and experience are *perspectival* and *constructed*. Experiences come into our consciousness and are shaped by the constructive activities of embodied, situated perception at the intersection of the intentional trajectories of anticipation and retrospection. This model of time and experience has important implications for experiential systems given its divergence from the standard computational model of time as an ordered succession of discrete moments [19]. How do we model human experiential time using the computational model of time as a series of moments (think of a system clock) when the phenomenological experience of time of human beings is a non-linear, construction of the present at the intersection of our expectations of the future and the past, i.e., a dynamic "network of intentionalities?"

From phenomenology we learn that experience is not a thing, but a process, and more particularly, a process that takes place in human minds/bodies. Therefore, experience itself is an inner

psychic event which cannot be stored or transmitted. Only the *data* we are reacting to and interacting with may be stored or transmitted. In his essay on "Experiential Computing," Ramesh Jain writes: "In an experiential environment, users apply their natural human senses directly to observe data and information of interest related to a particular event" [12]. Jain's notion of experiential systems correctly realizes that only the data that occasion experiences can be stored and transmitted, and not the experiences themselves. However, Jain's model of experiential systems apparently does not yet account for the inherent subjectivity and selectivity in determining which data are "related to a particular event." The objects that we experience cannot be known independently of our processes of experiencing them. Experiences are constructed out of the interaction of individuals and the world, and are therefore always already constituted from a particular point-of-view—there is no objective viewpoint on an experience. Not only are experiences inner mental events, they are not uniformly so. Experiences are shaped by the expectations of their experiencers and hence there is no one experience that can be said to exist in relation to a given set of data. There is no unitary objective experience, only diverse individual experiences.

This plurality of points-of-view raises interesting issues in determining which data from the lived world will be sampled, and how, when recording the data that are "related to a particular event." One's model of what the experience is, what aspects of it are relevant, and how those aspects may be interpreted by others all condition the choice of which data to record and how to record them. Furthermore, how might we enable humans to computationally model their interpretations of these data for other humans to access and add to? How do we select and represent the data that occasioned experiences, the contexts of these experiences, the interpretations of these data and of other humans' interpretations? What happens when these data and interpretations are communicated to others? These issues are central to the sister science of phenomenology, hermeneutics [9], which is the study of interpretation, and to basic questions about the nature of human communication.

4. MODELING COMMUNICATION

In phenomenology, we discovered models of time and experience that are perspectival and constructive. These aspects of experience raise issues about how experiences are formed in human minds and how the data and interpretations of these data may be communicated to other people. The model one has of the process of communication is absolutely fundamental to how we design human-machine systems, and especially so for how we may design experiential systems. What is of paramount importance is that the model most designers (and users) have of how communication works sets up a series of expectations about the process of communication that results in very poor design decisions. We will look at the implicit model of human communication that underlies most system design, reveal its broken assumptions, and propose an alternative model of human communication as a foundation for the design of experiential systems.

4.1 The Conduit Metaphor

In a groundbreaking essay in Ortony's important edited book, *Metaphor and Thought*, Michael Reddy provides an analysis of and two metaphors for understanding human communication [16].

Reddy characterizes the underlying metaphorical assumptions implicit in the way we talk and think about how we communicate. He describes the "Conduit Metaphor" whose model of thought, language, and communication infuses and confuses both our process of communicating and our understanding of that process. Figure 1, taken from Ferdinand de Saussure's[2] *Course in General Linguistics* [17], depicts the underlying model of communication in the Conduit Metaphor in which communication is conceptualized as a process of transferring thoughts from one person's mind to another through the conduit of language:
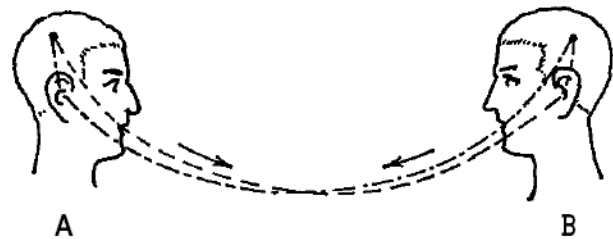

Figure 1. Illustration of the "Conduit Metaphor" of Communication

Reddy convincingly analyzes the way we talk about communication to reveal the fundamental pervasiveness of the Conduit Metaphor. Consider these examples:

- It's hard to *get* that idea *across to* him.
- I *gave* you that idea.
- It's difficult to *put* my ideas *into* words.
- The meaning is right there *in* the words.
- His words *carry* little meaning.
- That's not what I *got out of* what he said.

Reddy also explains the Conduit Metaphor in terms of its major and minor conceptual frameworks. He outlines the core assumptions of the major framework of the Conduit Metaphor as:

- Language functions like a conduit, transferring thoughts bodily from one person to another
- In writing and speaking, people insert their thoughts or feelings in the words
- Words accomplish the transfer by containing the thoughts or feelings and conveying them to others
- In listening or reading, people extract the thoughts and feelings once again from the words

Reddy provides a shorthand for describing the constituent parts of the Conduit Metaphor: the thoughts and feelings we have inside our heads he refers to as "Repertoire Members" (RM); the elements of language that we communicate to each other (written and spoken words, diagrams, etc.) her refers to as "Signals" (S). Consequently, in the major framework of the Conduit Metaphor our model of communication is that Person A communicating to

---

[2] Saussure's own foundational work in linguistics at the beginning of the twentieth century assumes a passive role for the listener in connecting speech signals to mental associations in the "speaking circuit." Nonetheless, Saussure's linguistic theory inaugurated, and serves as a continuing resource, for the field of semiology, and its critical descendants, deconstruction and post-structuralism, whose emphasis on the active and situated aspects of meaning creation operate within the Toolmakers Paradigm.

Person B simply inserts RM into S. Person B receives S and extracts the RM. We also see a variant of the Conduit Metaphor in its minor framework:

- Thoughts and feelings are ejected by speaking or writing into an external "idea space"
- Thoughts and feelings are reified in this external space, so they exist independent of any need for living beings to think or feel them
- These reified thoughts and feelings may, or may not, find their way back into the heads of living humans

Clearly the minor framework of the Conduit Metaphor is an idea that is "in the air." The notion of a "Zeitgeist" is a classic example of the minor framework of the Conduit Metaphor in which RMs seem to be able to exist independently of human minds. Although it is pervasive, the Conduit Metaphor is also pernicious, since it is a misleading model of human communication. It helps perpetuate incorrect assumptions about the affordances of language and communication. Meaning is not in words, i.e., "signals" do not contain "repertoire members." The signals of communication do not function as containers of thoughts or ideas, just as data are not experiences. Thoughts, ideas, and feelings, our entire panoply of inner mental events, are just that, inner mental events; they are intangible, personal, and inaccessible to direct observation by other minds. The Conduit Metaphor also assumes that communication is effortless and that communication breakdown or having to work at understanding is the exception rather than the rule. In fact, just the opposite is the case. Meanings and interpretations are negotiated, often hard-won, post hoc constructions. Communication routinely breaks down between human beings—the process of dialogue itself is what we require in order to create meaning even for ourselves. Reddy provides an alternative to the Conduit Metaphor that emphasizes the constructive aspect of the dialogic process of human communication.

4.2 The Toolmakers Paradigm

In the Toolmakers Paradigm (See Figure 2), Reddy offers a new and compelling model for human communication that avoids the conceptual pitfalls of the Conduit Metaphor. As a basis for the design of experiential systems, it is worth recounting Reddy's explanation of the Toolmakers Paradigm.

In the Toolmakers Paradigm, people exist in a vast wagonwheel-shaped world in which each sector outside the central hub and between the spokes of the wheel has different environmental conditions. Some are predominantly wooded, others rocky, others desert, and so on, but many regions share some elements of environmental similarity (e.g., there are rocks in a forest and jungle, bushes in a savannah and swamp, etc.). However, the solitary inhabitants of the various sectors have no access to one another's sectors. They are unable to visit or see into or hear other sectors. Their only means of communication is to use some machinery at the hub of the wheel which can deliver small sheets of paper from one sector to the other. Neither people nor objects can pass through the hub, only messages. The terms of the metaphor are these: the respective sectors of the Toolmakers Paradigm represent individual minds; the various terrains of each sector represent our respective Repertoire Members (RM); and the messages that are passed back and forth through the central hub are the Signals (S) of human communication. It is important to note the key difference here in comparison to the Conduit Metaphor. In the Toolmakers Paradigm, Repertoire Members cannot pass from mind to mind, only Signals can be communicated. Reddy offers a story to explain how communication works in the Toolmakers Paradigm (and by analogy among human beings) which we condense and paraphrase here.

Imagine that the person living in sector RM1 (the woody environment) develops a tool: a wooden rake for clearing away leaves. She wants to share her invention with the people in the other sectors. She goes to the hub and draws three identical sets of instructions for making the rake and sends these instruction sheets through the hub to the individuals in sectors RM3, RM4, and RM5. Each individual in their respective environments receives the instructions and goes to work to try to construct something useful with them.

While the environment in RM1 has a lot of wood and trees in it, the environment in sector RM5 is mostly rocky. So the person in RM5 tries to implement the design for the rake, fashioning a thick wooden handle with a stone head. The person in RM1 did not bother to specify the material for the handle or the head since based on the materials and environment found in her sector she tacitly assumed they would both be made of wood. The person in RM5 completes the "rake," but finds it unwieldy and heavy and wonders at the strength of the person in RM1.

The person in RM5 surmises that the person in RM1 uses the "rake" to dig up small rocks to in her environment. The person in RM5 then adapts the tool for his own environment, by changing the unwieldy head to two large prongs which will make the tool better suited to dislodging large rocks. The person in RM5 then sketches out his tool design and sends copies to the other sectors.

Persons from other sectors develop their own tools on the basis of the plans from the person in RM1 and the person in RM5, but they are not the main players in this little story. The person in RM1 fashions a tool along the lines suggested by the person in RM5, but can see no use for a double-pronged wooden pick in her own sector. She also wonders if the person in RM5 has misunderstood her original design, and so produces another more detailed set of instructions for the person in RM5. The interchange between the person in RM1 (woody world) and RM5 (rocky world) goes on for some time, with some frustration until in an absent-minded display of anger grinds the person in RM1 two small pebbles together. Suddenly the person in RM1 has developed a new model of the person in RM5 and their environment. Not only does the recent interchange suddenly make sense in a new way, but a host of past communications as well. The person in RM1 and RM5 begin a rapid exchange of designs and "have raised themselves to a new plateau of inference about each other and each other's environments." [16]
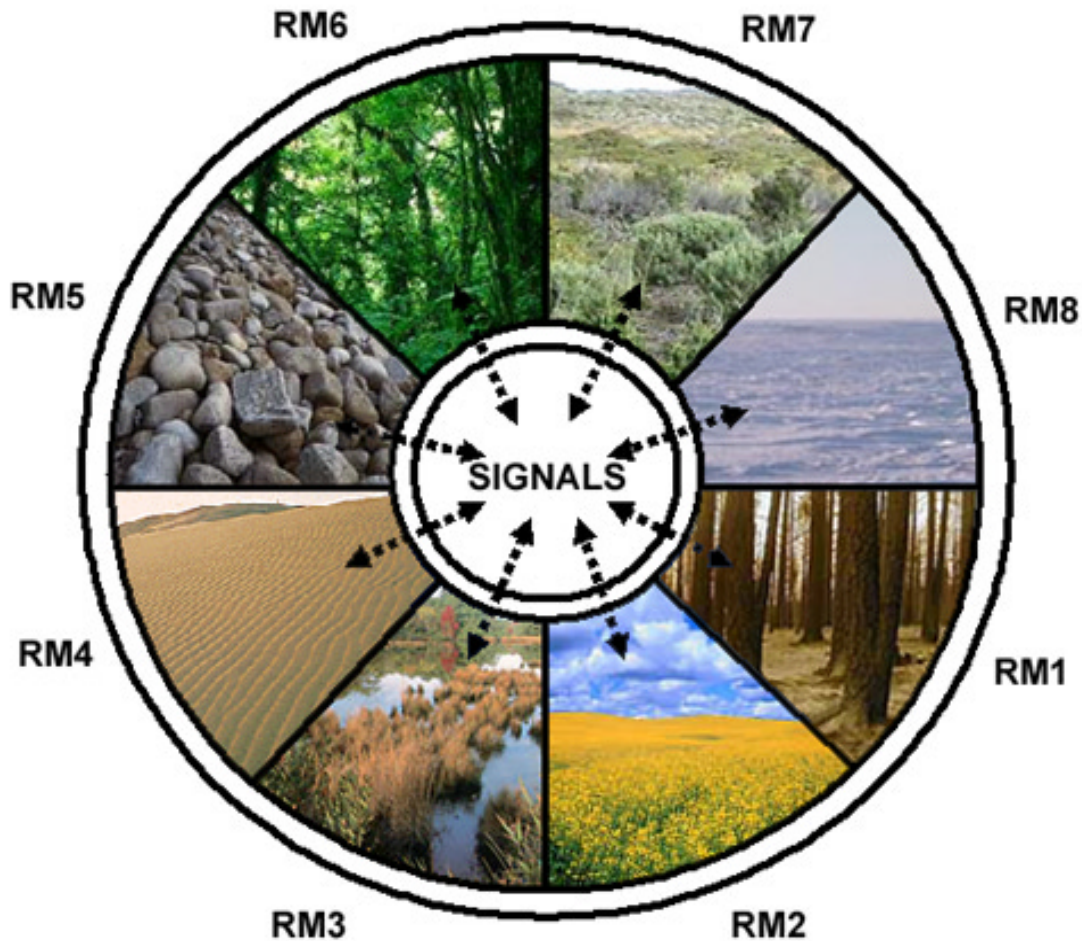
Figure 2. Illustration of Reddy's Toolmakers Paradigm of Communication

4.3 Applying the Toolmakers Paradigm

There are fundamental differences between the Toolmakers Paradigm and the Conduit Metaphor that should shape our assumptions in designing experiential systems. In the Conduit Metaphor:

- Repertoire Members (i.e., perceptions, thoughts, or feelings) can migrate from one mind to another

- Communication is a largely effort free act of unpacking the meaning in words (i.e., the sender's RMs in the Signals)

- Communication does not involve the RMs of the receiver of the message

In the Toolmakers Paradigm:

- Only Signals can pass between human beings, not RMs

- Communication requires active engagement of both parties and often breaks down and needs repair

- The meanings of signals are not contained within them, but made out of the constructive interaction between the signals and the RMs of the receiver

Reddy's Toolmakers Paradigm provides a valuable model of communication that should inform the design of experiential systems. It inspires us to ask a different set of questions. Rather than asking how we enable experiences (which are mental events and hence "Repertoire Members") to be stored and transmitted, we ask:

- How do we select, structure, present, and manipulate data (i.e., Signals) so as to facilitate the construction of certain experiences (i.e., Repertoire Members) in various minds?

- How do we make explicit the assumptions implicit in the interpretations people make of the data (i.e., how could we communicate interpretive context and background)?
- How do we facilitate human-to-human dialogue across space and time in order to support the interpretation of the data that occasion experiences?

These questions about shaping the form, structure, function, and effects of the data that occasion experiences are actually *aesthetic* questions. They are questions about how to affect the process through which readers/viewers/users dynamically and interpretively construct Repertoire Members from Signals, experiences from data.

5. MODELING MEDIATED EXPERIENCE

The field of aesthetics is of course large and diverse. In thinking about aesthetic theory for experiential systems, our interest has less to do with the classic evaluative questions about the nature of art or of "good" art, and more with questions about the processes by which humans have aesthetic experiences, i.e., by which they actualize texts as mental events. A careful analysis of the process of reading/viewing texts, of transforming data into experiences, has been the central topic of a school of aesthetic theory known as "reader-response theory" or "reception aesthetics" which has its roots in phenomenology [18].

5.1 The Phenomenology of Reading

The leading contemporary theorist of reception aesthetics is Wolfgang Iser, who has undertaken a detailed phenomenological analysis of the reading process [10, 11]. In Iser, we find many of the core ideas of the phenomenology of lived experience applied to the phenomenology of mediated experience. The processes by which we experience texts utilize much of the same cognitive machinery and methods that we engage in experiencing the world. It may seem odd to refer to an experiential system as a "text," but as far as it is a set of data that is selectively structured by human beings (even by proxy through programs designed by human beings) to occasion experiences in other human beings through an interactive process, then experiential systems can be analyzed as "texts" (like books or movies) while respecting their unique computational origin and affordances.

There are several key ideas from Iser that apply to experiential systems design. The first is the distinction between two senses of "text." Iser writes:

> "The literary work has two poles, which we might call the artistic and the aesthetic; the artistic refers to the text created by the author and the aesthetic to the aesthetic realization accomplished by the reader." [11]

These two senses of text are often confused in casual discussions of aesthetic experiences, but keeping them distinct is essential for a theoretically rigorous analysis and design of experiential systems. Iser further explains the distinction between the artistic and aesthetic senses of text with a metaphor. The artistic text is like the stars in the sky, the aesthetic text is like the constellations we overall on them—different viewers can see many different constellations in the same stars.

Like Iser, Reddy also distinguishes these two senses of "text" referring to "Text1" when discussing the material form of the text (i.e., the data) and "Text2" when discussing the mental realization of the text by the reader (i.e., the experience). There is only one Text1, but there are as many Text2s are there are readers/experiencers of Text1. The process by which readers actualize texts, by which they create the myriad Text2s from Text1 is not random, it is subject to phenomenological and formal analysis. According to Iser, it is in the "virtual dimension" between text (i.e., Text1) and reader that the text (i.e., Text2) is realized. In creating Text2s from Text1, we have an analogous phenomenological experience of time as when we create experiences from sense data. When experiencing texts, we *anticipate* what is to come and *retrospect* on what has come before, all the while building up an inner mental *gestalt* of the story world. The interaction between the reader's mind and the text is an ongoing process of *illusion-building* and *illusion-breaking* by the reader in which we construct a gestalt that is both of us and not of us, both intimate and alien at the same time. This uncanny aspect of aesthetic experience is made possible by the *gaps* in the text, the missing information which we ourselves have to infer and supply to complete the world of the text, and the *alien associations* in the text that can challenge the mental models we construct when filling in the gaps of the text. Aesthetic experience is the process of building up a world that is simultaneously made out of our inner mental repertoire and responsive to the potentially alien associations of the text was produced by other minds. Hence in building up the illusion of the world of the text, the inner gestalt we experience, our expectations can be frustrated, the illusion broken, and our understanding retrospectively revised, much as in Reddy's parable of the Toolmakers Paradigm the inhabitant of the wood world has to revise her model of the world of her interlocutor when her model of the other person's mental terrain proves unreliable. The aesthetic process of building up, breaking down, and revising the mental models we construct from data is the process that artistic texts attempt to structure by virtue of their *formal systems.*

5.2 The Phenomenology of Viewing

David Bordwell, a leading contemporary film theorist, applies ideas about the phenomenology of mediated experience to the analysis of our reception of motion pictures in a way that is analogous to what Wolfgang Iser has done for written texts [3, 4]. Bordwell's work is relevant to experiential systems in that he articulates how the formal structures of the text interact with the cognitive apparatus of the viewer, the norms and conventions established by prior texts and viewers, and the formal system inherent in the structure of the text itself to achieve certain aesthetic responses and effects. Bordwell's work addresses key issues in the formation of narrative understanding, the various techniques and effects of film narration, and the aesthetic principles and functions of form. Understanding how to map from the analysis of the formal structures of media to its constructive reception by the user is essential for the analysis and design of experiential systems.

The careful reader might ask, aren't visual media fundamentally different from text? Aren't they analogous reproductions of the world and hence not subject to the same phenomenological processes we engage in while reading? While experiences, textually mediated experiences, and audio-visually mediated

experiences all have different affordances, it is important to understand that even in the case in which the "text" is a recording of the physical world (e.g., a photograph or movie), the viewer is engaged in a phenomenological process of constructing an inner mental experience in response to the recorded data.

In film theoretical discussions of mediated experience, there was an active debate between two views of the ontological status of the recorded image typified by Andre Bazin [2] and Sergei Eisenstein [7, 8]. Bazin argued that film's primary function is to *reproduce* reality, while Eisenstein argued that film enables us to *construct* realities. Bazin's views can't account for active and constructive role both of the filmmaker as a constructor/selector of images and the viewer's role as an interpreter of them. Mediated experiences are not then mimetic representations of an objective reality, they are poetic constructions of realties. Experiences are not captured, copied, and transmitted, they are *made* by our active and constructive selection and then reception of the data, even when those data are recordings of the physical world.

Choosing what data to record, when to record them, and from what points of view, and then choosing how to play back, sequence, visualize, and interact with the data are all aesthetic choices. All recordings of data are selective recordings; all visualizations of data are selective visualizations, and hence fundamentally aesthetic enterprises. Therefore the design of experiential systems requires an understanding informed by theories of the phenomenology of aesthetic experience and how the formal systems of texts help shape those experiences.

5.3 Applying the Phenomenology of Mediated Experience

Theories of the aesthetics of the reception of mediated experiences provide us with guidelines and questions to consider when analyzing, evaluating, and designing experiential systems. We can now see how our earlier question about how we select, structure, present, and manipulate data so as to facilitate the construction of certain experiences in various minds as questions for which aesthetic theory and practice can provide helpful conceptual frameworks:

- *Point of View:*
  In sampling data for an experiential system how does the selection of which data to sample and the spatial and temporal frequency of sampling affect the construction of related experiences by the user?

- *Gaps:*
  Even if we could sample exhaustively, what data is better filtered out so as to facilitate the users' constructive activity of forming an inner mental model?

- *Flow of Experience:*
  How can we structure the flow of interaction with data to support the construction and modification of mental models?

- *Form and Style:*
  How can the presentation and manipulation of data by the user leverage formal organization of the data to establish patterns of experience?

- *Context:*

How can we structure the formal system of the data in relation to the norms and conventions of related systems and the user's own background be present in a way that enable experiential system to be aesthetically satisfying for a different users?

The answering of these questions will of necessity require active dialogue and close collaboration with people from outside of the traditional multimedia research community—specifically, media practitioners, theorists, and historians.

6. CONCLUSIONS

In this paper we have attempted to provide theoreticians and practitioners in the multimedia research community with the beginnings of the philosophical grounding required to understanding fundamental issues in experiential systems design. We have argued that experiences cannot be captured, stored, or transmitted, only the data which occasion experiences in human minds can. Relevant work in communications theory and the phenomenology of lived and mediated experience provide us with frameworks for understanding how to structure data so as to affect the experiences that human minds create when they encounter these structured data. In sum, we have offered a different set of questions to investigate, inherently *aesthetic* questions, which should inform, and be informed by, the technical challenges our research community has traditionally addressed.

7. FUTURE WORK

To continue the investigation begin in the paper will require a paradigm shift in multimedia research away from purely technical concerns satisfied with incremental progress within established paradigms to a radically interdisciplinary approach to research, design, and development. To facilitate such a paradigm shift, we will have to questions and be willing to change basic components of our work: our methodologies, objects of study, and the composition of the research community for experiential systems. This reorientation will be challenging, but the technologies we can develop and the experiences they may be able to facilitate will be worth the effort.

8. ACKNOWLEDGMENTS

9. REFERENCES

[1] Armstrong, P.B. Phenomenology. in Groden, M. and Kreiswirth, M. eds. *The Johns Hopkins Guide to Literary Theory and Criticism*, Johns Hopkins University Press, Baltimore, Maryland, 1997.

[2] Bazin, A. *What is Cinema?* University of California Press, Berkeley, 1971.

[3] Bordwell, D. *Narration in the Fiction Film*. University of Wisconsin Press, Madison, 1985.

[4] Bordwell, D. and Thompson, K. *Film Art: An Introduction*. McGraw Hill, New York, 2003.

[5] Davis, M. and Travers, M. A Brief Overview of the Narrative Intelligence Reading Group. in Mateas, M. and Sengers, P. eds. *Narrative Intelligence*, John Benjamins, Amsterdam, 2003, 27-38.

[6] Descartes, R., Spinoza, B.d. and Leibniz, G.W. *The Rationalists*. Doubleday, Garden City, New York, 1961.

[7] Eisenstein, S.M. *Film Form: Essays in Film Theory*. Harcourt Brace Jovanovich, Publishers, San Diego, 1949.

[8] Eisenstein, S.M. *The Film Sense*. Harcourt Brace Jovanovich, Publishers, San Diego, 1947.

[9] Gadamer, H.G. *Philosophical Hermeneutics*. University of California Press, Berkeley, 1976.

[10] Iser, W. *The Act of Reading: A Theory of Aesthetic Response*. The Johns Hopkins University Press, Baltimore, Maryland, 1978.

[11] Iser, W. The Reading Process: A Phenomenological Approach. in *The Implied Reader: Patterns of Communication in Prose Fiction from Bunyan to Beckett*, The Johns Hopkins University Press, Baltimore, Maryland, 1974, 274-294.

[12] Jain, R. Experiential Computing. *Communications of the ACM*, *46* (7). 48-55.

[13] Locke, J., Berkeley, G. and Hume, D. *The Empiricists*. Anchor Books/Doubleday, New York, 1990.

[14] Manovich, L. *The Language of New Media*. The MIT Press, Cambridge, Massachusetts, 2001.

[15] Merleau-Ponty, M. *Phenomenology of Perception*. Routledge & Kegan Paul, London, 1962.

[16] Reddy, M. The Conduit Metaphor: A Case of Frame Conflict in Our Language about Language. in Ortony, A. ed. *Metaphor and Thought*, Cambridge University Press, Cambridge England; New York, NY, 1993, 164-201.

[17] Saussure, F.d. *Course in General Linguistics*. McGraw-Hill, New York, 1983.

[18] Tompkins, J. *Reader-Response Criticism*. The Johns Hopkins University Press, 1980.

[19] Varela, F.J. The Specious Present: A Neurophenomenology of Time Consciousness. in Petitot, J., Varela, F.J., Pachoud, B. and Roy, J.-M. eds. *Naturalizing Phenomenology: Issues in Contemporary Phenomenology and Cognitive Science*, Stanford University Press, Stanford, California, 1999, 266-314.

[20] Winograd, T. and Flores, F. *Understanding Computers and Cognition: A New Foundation for Design*. Ablex Publication Corp., Norword, New Jersey, 1986.