

IT and Democracy

An Analysis of the Power of Digital
Images to Strengthen the Public Sphere
and Decision-Making Process

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Virtual Environments (VEs) open new possibilities for journalism. The advanced technology, which still resides mostly in laboratories, only requires adaptation and the imagination that can enable journalists to think *with* technology. The literature of VE theory shows the possibility exists to create alternative worlds that invite the public to share knowledge necessary for rational policy decisions. Our research has looked at using head-mounted displays to tell news stories, and we have worked with a multi-user 360° panoramic display. A project is now under way to use immersive techniques to model port expansions in Southern California. We will also seek to find ways to distribute this visual information across individual, community and institutional audiences.

1 Introduction

“To envision information – and what bright and splendid visions can result – is to work at the intersection of image, word, number, art.” Edward R. Tufte¹

Computer-generated immersive virtual environments (VEs) often inspire hyperbole, especially when viewed in their “what-if”, hypothetical or counterfactual modes, where anything seems possible. If long-dead pop singers can be revived to belt out favorites, we can re-create Bach to perform a lost cantata or rerun the Titanic voyage with a timely rescue. Thoughts of such excesses, though, make journalists nervous as they ponder what piece of VEs they might adapt to tell news stories. Theorists like Jean Beaudrillard and Paul Virillo would no doubt warn them against it, since “information machines” have ready capabilities to reconfigure reality as hyper-reality and plunge news presentations into fiction. What good is an improvement if it corrupts and delegitimizes a medium?

Nevertheless, for several decades the tide of media culture has been behind digital images. “They have become central to every activity that connects humans to each other and to technology – mediators, progenitors, interfaces – as much reference

¹ Tufte, Edward R. (1990) *Envisioning Information*. Graphics Press: Cheshire, Connecticut, p.9.

points for information and knowledge as visualizations of human activity.”² This expansion of media forms, which Burnett calls the “ecology of images,” has opened new possibilities for journalism far exceeding the advances that have enabled personal computers to accommodate such applications as streaming audio and video, blogs and community forums. The development of powerful technologies that can create both immersive *and* interactive augmented realities in a third dimension has been jelling in laboratories, academic and industrial, for more than at least two decades. Products have migrated into a wide variety of contextual habitats, from military and astronaut training to theme parks and stroke rehabilitation. “The birth of a new technical object is never a linear process,” wrote Massumi. “It is knotty, a mangle-prone emergence across a threshold of surprise.”³

Journalists have known since the mid-1990s that the news audience wanted a very different product, one that is more central to their lives.⁴ That news organizations basically failed to respond to that demand takes us to the situation today, a scene of industry decline and indecision. Media historian Paul Starr⁵ depicts the evolution of American media as a series of constitutive choices, created by the use of new technical systems and forces imposed by social and economic institutions. As decisions are made, early “choices bias later ones and may lead institutions along a distinctive path of development” Such paths form a cumulative, branching pattern as news organizations resist or accept change, adapt to audiences’ expectations or perish. This essay explores how visual information presented in immersive VEs could be an important path towards making journalism more useful and relevant in today’s culture of complex topics, such as climate change, terrorism, macroeconomics and globalization. The advanced technology exists, albeit mostly in labs; it only requires adaptation and the imagination that can enable journalists to think *with* technology.

The underlying concepts of sense immersion and illusion have mutated and evolved through many iterations, most likely beginning with the imagery and atmosphere of Paleolithic caves, where shamans used “dissociation and other experiences of altered states of consciousness” as a means of achieving sensations and experiences of other worlds.⁶ Today’s panoramic displays, CAVEs and helmet-

² Burnett, Ron (2004) *How Images Think*. The MIT Press: Cambridge, Massachusetts, p. xiv.

³ Massumi, Brian. (2002) *Parables for the Virtual: Movement, Affect, Sensation*. Duke University Press: Durham, North Carolina, p. 215.

⁴ Jack Fuller, president of the Tribune Publishing Company, said in 1996: “People are looking for more coherence, not less. ... Part of the challenge of those who pioneer the new medium will be to devise ways in which it can meet the audience’s yearning for a sense of meaning. This will require journalists to embrace and master the lessons of rhetoric, because their task is nothing less than to create a whole new mode of expression and persuasion.” Quoted in Booth, Wayne C. (2004) *The Rhetoric of RHETORIC: The Quest for Effective Communication*. Blackwell Publishing: Malden, Massachusetts, p. 132.

⁵ Starr, Paul. (2004). *The Creation of the Media: Political Origins of Modern Communications*. Basic Books: New York, New York, pp. 1-2.

⁶ Lewis-Williams, David. (2002) *The Mind in the Cave; Consciousness and the Origins of Art*. Thames & Hudson: London.

and-glove VE technologies, while experimental, give us evidence to demonstrate that immersion of the senses and the resulting concept of *presence* has “great practical relevance to the design and evaluation of media products and computer interfaces,” especially in entertainment; telecommunications, including computer-supported collaborative work (which I will come back to later); education, and health care.⁷ It is tempting to add “journalism,” but as Lee warned, the conceptualization, much less the mediation, of *virtual presence* is fraught with unresolved issues, starting with a common definition. For the purposes of this paper, I will go with what Rheingold called a “form of out-of-body experience.”⁸ Lee suggested that the generalization of *presence* into something like the sensation of “being there” leaves flexibility for researchers to investigate various presence-related phenomena that do not necessarily include transportation into a VE, such as haptic feedback and the sensation of touch.

This proved to be an important consideration in our research, since presence is only half of the VE equation and the other half is less troublesome for journalists, the multimedia presentation of information in mixed realities. Theorists also describe this duality as creating an in-between space, a fourth dimension or boundary between the Self and the (alleged) Other. It has also been described as the *affect* generated by two-sided worlds. Massumi defined affect as “the simultaneous participation of the virtual in the actual and the actual in the virtual, as one arises from and returns to the other. ... (It) is nothing less than the *perception of one’s own vitality*, one’s sense of aliveness, of changeability (often signified as ‘freedom’).”⁹

Since VEs can encompass both presence and *perception* – the subjective interpretation of sensory stimuli – this allows immersive and interactive augmented realities to exist simultaneously. The viewer can toggle seamlessly from authentic virtual spaces to the parallel world of multimedia and textual information, both having real-life counterparts and ontological validity, but are approached by the user from different perspectives. These conditions enable preconscious and imaginative processes to oscillate from 3-D immersion to interactions among embedded information, including text and multimedia representations of events. The VE becomes both opaque and transparent. “At times the structure arrests the eye at the surface of its materials, reflecting the background and the spectator’s image, while at others it lets the visitor’s glance reach into the world that lies beyond its walls.”¹⁰

What makes VR application development in journalism so distinctively important is that it represents more than a non-linear extension of existing imaging

⁷ Lee, Kwan Min. (2004) Presence, Explicated. *Communication Theory* 14 (1), pp. 27-50.

⁸ Rheingold, Howard. (1991) *Virtual Reality: The Revolutionary Technology of Computer-Generated Artificial Worlds – And How It Proposes to Transform Society*. Touchstone: New York, New York.

⁹ *Ibid.*, pp. 35-36 (Emphasis his.)

¹⁰ Ryan, Marie-Laure. (2001) *Narrative as Virtual Reality: Immersion and Interactivity in Literature and Electronic Media*. The Johns Hopkins University Press: Baltimore, Maryland.

technologies, such as news gaming, GIS mapping and animated statistical graphics that represent information in abstract ways. VEs derived from rich databases managed by sophisticated algorithms have the capability of both back-casting and forecasting virtual reality in the form of deliberative arguments centered on probable outcomes. This inductive approach represents a media genre that could be employed to extend knowledgeable public argument as a way of sharing in the creation of, critique of and implementation of public policies that will determine the future. The possibility exists of creating imaginative worlds that invite the public to share actively and communally the knowledge necessary for wise and timely public policy decisions.¹¹

Immersive VEs offer access to acts of common spectatorship, according to some theorists, because of their “appeal to the brain’s disposition after millions of years of evolution to internalize space, time, and number from the external world ...,” a finding that “suggests that across very different cultures one sees ‘common foundational sets of abilities.’”¹² Colors, numbers, signs, shapes and movements form the basis for commonality. Since many sensory experiences are shared by most human beings, VEs offer journalism a means to build structures that engage viewers in universal and cognitively stimulating ways.

The potential for deliberative argument in virtual spheres provides a welcome alternative to the “instant antagonism” of reality TV, the *ad hominem* attacks that occupy much of cable news and the bare-knuckles social practices of contentious political blogs, each of which is “designed to succeed by means inimical to knowledgeable choice and active participation.”¹³ Given the diminishing participation of traditional journalism in the public sphere – and the increasing marginalization of journalism in the construction of consensus for the future – cultural theorists now look to digital technology as having the potential to create ways to “develop communicative forums and decision-making procedures to moderate the people’s passions and allow ‘cool reason’ to rule.”¹⁴

Manovich has described how the evolution of viewers participating in VEs represents an essential shift in the use of imagery: “The new media image is something the user actively *goes into*, zooming in or clicking on individual parts

¹¹ For a stinging assessment of the failure of traditional mass media to go beyond a view of life “where the trivial and mundane eternally interchange with the tragic and spectacular by the hour,” see: Goodnight, G. Thomas. (1982) *The Personal, Technical, and Public Spheres of Argument: A Speculative Inquiry Into the Art of Public Deliberation*. Journal of the American Forensic Association, Volume 18, pp. 214-227.

¹² Stafford, Barbara Maria. (2007) *Echo Objects: The Cognitive Work of Images*. The University of Chicago Press: Chicago, Illinois.

¹³ *Ibid.* Goodnight, p. 215.

¹⁴ Aune, James Arnt. (2008) *Democratic Style and Ideological Commitment*. Rhetoric & Public Affairs, Vol. 11, No. 3, p.482.

with the assumption that they contain hyperlinks Moreover, *new media turn most images into image-interfaces and image-instruments.*¹⁵

Artists such as Jeffrey Shaw carried this concept of entering the image further by experimenting with space and time in real-world settings closely tied to the specificity of a site or a context and often inviting the direct intervention of the audience.¹⁶ Shaw, with gusto, carried virtual reality into a new territory, combining both immersive and augmented elements with spectator involvement. He was one of the first to experiment with panoramic perspectives using digital technology. For him, the computer screen functioned like a cinema camera, because the viewer could pan in any direction over the surface of an image and zoom into the details. In one famous experiment, Shaw constructed *The Legible City*, a 3-D image whose virtual size was six square kilometers. The viewer could interactively travel through this space by riding a stationary bicycle in front of a large video projection screen. The 'real-time' interaction of the bicycle allowed the bicyclist complete freedom to move anywhere in the virtual image space. (The complexity of this arrangement indicates the difficulty of obtaining empirical data from observations of users of mixed-reality VEs.)

To conclude the theory part of this essay, we can follow the logical progression of a technology that fosters self-awareness, participation and cognitive stimulation as that leads to concepts of the role of the citizen within the public space. Scholars of visual culture see new media technology as enabling a trend back towards Jürgen Habermas's ideal public sphere, an arena characterized by "the critical judgment of a public making use of its reason."¹⁷ DeLuca and Peeples have defined the criteria for effective public discourse: "The public sphere assumes open access, the bracketing of social inequalities, rational discussion, focus on common issues, face-to-face conversation as the privileged medium, and the ability to achieve consensus."¹⁸

This describes well the attributes of immersive VEs, which are, at once, dramatic and empathetic. Aristotle said rational discourse required "elegance."¹⁹ The ground rules of VE rhetoric encourage cooperation, civility and compassion, or, as

¹⁵ Manovich, Lev. (2002) *The Language of New Media*. The MIT Press: Cambridge, Massachusetts. (Emphasis his.) p. 183.

¹⁶ Abel, Manuela (ed.) (1997) *Jeffrey Shaw – A User's Manual: From Expanded Cinema to Virtual Reality*. ZKM: Karlsruhe, Germany, p. 21.

¹⁷ For a refutation of Habermas's assumption that deliberative rationality is *subverted* by visual display, see: Robert Harriman and John Louis Lucaites. (2003) *Public Identity and Collective Memory in U.S. Iconic Photography: The Image of "Accidental Napalm."* *Critical Studies in Media Communication*. Vol. 20, No.1, p. 35.

¹⁸ DeLuca, Kevin Michael and Jennifer Peeples. (2002) *From Public Sphere to Public Screen: Democracy, Activism, and the "Violence" of Seattle*. *Critical Studies in Media Communication*, Vol. 19, No. 2, p. 28.

¹⁹ Quoted in Perelman, CH. and L. Olbrechts-Tyteca. (1969) *The New Rhetoric: A Treatise on Argumentation*. University of Notre Dame Press: Notre Dame, Indiana, pp. 16-17.

Vanessa Beasley has put it, “a sense of universal ‘citizen dignity’ is understood as a moral imperative, in the traditions of Rousseau and Herder.” She said that the imagined community “must be called into being by a rhetoric that activates certain rational commitments to other people who one does not know.”²⁰ John Dewey saw communication as a means of moral development by “eloquent” citizens who share a common experience.²¹

At the risk of being a techno-utopian, I would side with French communication theorist Pierre Lévy, who sees digital technology as being a means of creating a new model of citizen: “open-minded, cooperative subjects capable of initiative, imagination and rapid response.”²² My optimism is not without reservation. Coercive regimes that employ instruments of censorship and detection of online dissent, such as in China and Iran, demonstrate the abilities of elites to control public discourse and suppress free speech. The freedom of cyberspace and the independence of virtual worlds cannot be considered a certainty. Orwell showed us how readily tools that are developed to represent truth and support democracy can be converted to their opposite.

2. USC VE Research: 2001-2009

To demonstrate how visual technologies can promote public participation and rational decision-making, I will draw on some of the multidisciplinary research on VE applications that has been conducted at the University of Southern California. I have had the chance to observe the work of colleagues from other disciplines and consider possible applications of their research to journalism.²³ To understand what is taking place in computer science labs, envision a graduate student at an array of screens, rapidly creating an information-rich *and* realistic 3-D environment, such as a model of the USC campus or downtown Los Angeles. The work goes quickly, taking as little as a half day to convert a 2-D aerial photo of a city into an interactive 3-D version, complete with facades and accurate architectural details.

²⁰ Beasley, Vanessa B. (2008) Democratic Style: An RSVP. *Rhetoric & Public Affairs*. Vol. 11, No. 3, pp. 466-470.

²¹ Greene, Ronald Walter.(2003) John Dewey’s Eloquent Citizen: Communication, Judgment and Postmodern Capitalism. *Argumentation and Advocacy*. 39, p.189.

²² Lévy, Pierre. (1997) *Collective Intelligence: Mankind’s Emerging World in Cyberspace*. Plenum Trade: New York, New York. p.1.

²³ Pryor, Larry. (2006) It Feels Relevant: Biological Tactility in the News Media. *Online Journalism Review*. <http://www.ojr.org/ojr/stories/060925pryor> Accessed on 5/9/09. Posted: 9/24/06. This essay looks at how the body-brain link created by immersive visual technology affects viewers in deeper ways than print or television and what this might mean for online journalism.

He or she is working with the Viterbi School of Engineering's Geospatial Decision Making (GeoDec) system,²⁴ software that can accurately integrate satellite imagery; three-dimensional models; textures and video systems; road data; maps; point data, and temporal data. The system also includes a glove-based user interface, which allows intuitive interaction. With more work, the resulting image is, at once, a realistic 3-D environment having the attributes of presence, combined with the "hidden" information of augmented reality that waits to be selected. It allows the viewer to query the system for specific information, initiate a live video of vehicle and pedestrian traffic or shift the point of view. The user can "get information about the location that can then facilitate decision-making," Cyrus Shahibi, the lead scientist in the GeoDec team at USC, told IEEE conferees. "Such a system has applications in several domains, including urban planning, emergency response, online real estate, simulation and training, computer games and army intelligence." Our research team added journalism to the list.²⁵

Our collaborative efforts, so far, have been inconclusive. From a methodological standpoint, we began in 2001 by drawing on the equipment and software being developed at the Integrated Media Systems Center (IMSC), an NSF research center within the engineering school. This included access to a 360° high-resolution (>3K x 480) panoramic video system built by IMSC. It has an array of five video cameras connected to five computers that allow viewing of real-world scenes over a combined (electronically-stitched) 360° of horizontal arc. During playback, users can view the panoramic images either on a computer screen, using the arrow keys, or by wearing a head-mounted display (HMD) and a head-tracking device that allows viewers, as in video games, to turn their heads freely to observe desired portions of the panoramic scene. We began testing basic forms of visual content, such as a streaming 3-D video ride down a mountain road with the 360° camera in the back of a pickup truck (shades of Cinerama, complete with motion sickness!).²⁶

Full interaction, at that time, was limited, but user feedback about the panoramic system, based on extensive responses by 45 subjects (students in a class at the Annenberg School for Communication) in an experiment, proved to be positive. The content consisted of a two-minute news story shot in Skid Row in downtown Los Angeles with a broadcast reporter/narrator delivering a factual story on the plight of the homeless. While it was difficult both to control for novelty effects that interfered with viewers' attention and to deal with the intervening variable of presence, we did find through a battery of questionnaires that the added

²⁴ For more information on GeoDec, see Cyrus Shahibi, "GeoDec: Enabling Geospatial Decision Making." Delivered at the 2006 International Conference on Multimedia and Expo. Available at <http://www.isi.edu/integration/papers/shahabi06-icme.pdf>

²⁵ Rizzo, Albert A., Kambiz Ghahremani, Larry Pryor and Susannah Gardner. (2001) Immersive 360-Degree Panoramic Video Environments: Research on Creating Useful and Usable Applications. In: Jacko, J. & Staphanidis, C. (eds.) Human-Computer Interaction: Theory and Practice. L.A. Erlbaum: New York, New York. Vol. 1, pp. 1233-1237.

²⁶ This video is available at <http://imsc.usc.edu/research>, along with other examples of IMSC's research.

information available in the panoramic conditions did not impair long-term memory retrieval but did impact initial recall. Subjects who saw the story in a conventional TV perspective, with the reporter framed in a traditional stand-up delivery and with the perspective locked, had better memory retrieval of the audio content and recalled many of the story's details and statistics. The HMD viewers with 360° capability showed a contextual understanding of the Skid Row scene, and subsequently related in debriefings a subjective version of the scene that had few of the factual details given by the narrator/reporter but in a qualitative sense called up the emotion and drama of such a gritty urban scene. The perspectives created two versions of the same story, as theory predicted.

These initial findings also confirmed the theoretical analysis of media critics such as Mark B.N. Hansen, who has described the new media experience as “qualitatively different from ... the cinematic image. ...” since the image can no longer be understood as a fixed and objective viewpoint of ‘reality.’”²⁷ At a qualitative level, if not at a quantitative one, we found that the panoramic news experience corresponded to the theoretical division between, on the one hand, the traditions of participatory media, the emotional and sometimes frightening experience of the open-air Tudor theaters-in-the-round of the 1590s or the intense theater of “catharsis” of early Greece. On the other hand, the traditionally framed broadcast perspective fit the rival tradition of the immobile audience in the more politically correct theaters of 17th Century Europe, where architectural controls divided performers from an audience that was required to remain silent and have no impact on the outcome of the story. Our student subjects' exclamations of wonder in our laboratory (Usually a rousing “Wow!”) when they first found they could control the point of view within the panorama, when using one of two warm-up immersive videos – a USC pre-game football scene, with the band and cheerleaders, and part of a Duran Duran concert at the House of Blues. (These were intended to dull the novelty effect, but that was difficult to measure.) The exuberance of the 15 HMD-equipped subjects demonstrated more than the data on the effects of presence that 360° panoramas can give viewers new forms of spectacle that are engaging and fun.

In open-ended follow-up interviews, the HMD-wearing subjects said they felt they had entered a space that existed between their physical bodies and the panoramic Skid Row street scene, populated by residents in tents along the sidewalk. A long food line had formed across the street at the entrance to a rescue mission on a hot, Saturday afternoon. More than one Skid Row resident at the scene was not pleased that we were digitally recording, including one tall man who froze into a hostile pose near our camera, which was in the middle of the street. Some of our subjects remained fixed on him, almost totally neglecting the panoramic capability. They said the man made them nervous; they felt guilty looking at him, since they had the sensation of using a two-way mirror that allowed them to spy on him without his being able to see them. More than one subject said it felt as if they were voyeurs. Their reactions were emotional and immediate, in keeping with what media

²⁷ Hansen, Mark B.N. (2006) *New Philosophy for New Media*. The MIT Press: Cambridge, Massachusetts, p. 8.

theorists would have predicted. Glorianna Davenport described how virtual technology and its capability for “remote telepresence” can emulate “selected aspects of an audience’s physical co-presence.”²⁸ This cognitive subjectivity also supports Burnett’s position that digital technology creates the foundations for different ways of thinking.

We had no illusions that a mass audience would wear 3-D head gear, but our initial experiment gave us confidence that this form of assessment deserved to be used in a more natural setting that would take into account the sociability of an audience, such as a family gathering in a home environment or in collaborative work environments. We wanted to explore how digital narratives are capable of expanding the social engagement of multi-viewer audiences while, at the same time, offering intensive narrative immersion in a complex news story. We saw a need to move beyond the isolation imposed by HMDs.

Two members of our research team, Albert (Skip) Rizzo, a psychologist at the USC Institute for Creative Technologies, and Ann Page, a sculptor and new media scholar at the USC Roski School of Fine Arts, collaborated to build a “Panochamber,” a 10-foot diameter immersive, interactive video and audio panoramic multi-viewer display system. It consists of a support structure, a five-channel video server, and a pentagonal arrangement of five HDTV plasma screens. The system is capable of displaying 360-degree panoramic high resolution computer graphics or composited digital video images to several people simultaneously using a user-friendly selection tablet or other 3-D interactive navigation devices. The subjects stand within the chamber and can view such scenes as a panorama of the landscape of Mars (*Gratis* NASA’s Jet Propulsion Laboratory), manipulate objects that circle the space or fly a plane through rugged terrain.

We have found that a panochamber display expands the boundaries of visualization by combining elements of physical and virtual spaces into mixed realities. The 360° model differs from a strategy of unconscious immersion, such as viewing with an HMD, since it promotes awareness in an interactive communication space and offers social, cultural and linguistic dimensions. In that sense, the panochamber is similar to CAVE and hologram environments and other hermetic image strategies. So far, our work with the panochamber has been to use it as a demonstration space for various forms of 3D immersive content and as a teaching tool for graduate students and for several Fine Arts classes, including an interdisciplinary course between art and engineering team-taught by Rizzo and Page that addresses creative thinking in the manipulation of media and the communication of ideas. We are planning new configurations for the panochamber, such as a 180° display and a home viewing setting. Research would include observation of collaborative interactions, as well as measurements of presence and its impact on memory retention in a multi-user setting.

²⁸ Davenport, Glorianna, et al. (2000) Synergistic Storyscapes and Constructionist Cinematic Sharing. IBM Systems Journal. Vol. 39, Nos. 3&4, p. 468.

1.1 Proposed Model of Ports Infrastructure

Our research is also focused on a project that seeks to define and test immersive technology that would aid urban residents in understanding the functioning of their cities. As decision makers contend with ever-increasing population pressures, information about existing and proposed infrastructure projects becomes more vital to the public's well-being. Traditional media methods of disseminating such information no longer function reliably, if at all. Communities most impacted by massive construction projects have little data on which to evaluate public policy options, to make their voices heard or to rally support for or against a project. New digital technologies, employing "as-if" scenarios, offer ways to gather and display complex information that can help clarify the long-term benefits and costs of commitments to infrastructure systems.

The project will focus on using GeoDec and other information software to visually represent the existing ports of Los Angeles and Long Beach, as well as the planned expansion of the ports; the storage and transshipment of goods, and the impacts, benefits and costs of these activities, such as rail lines and switching yards adjacent to residential areas. We also plan to address user-centered questions about visual journalism, 3-D graphics and presentations of augmented reality.

As a practical example, the Los Angeles area has numerous freeway and bridge projects under consideration or in various phases of environmental review. We will model a 20-mile stretch of the Long Beach Freeway (I-710) from the ports to the I-10 near downtown Los Angeles that is slated for expansion. Considerable data can be derived from a \$5-million state and federal environmental review process is now under way. If expanded, the I-710 would have 10 lanes, including elevated truck lanes to accommodate more port traffic. As of spring, 2009, no major newspaper in the region has written an article with maps showing the impacts of this proposed expansion on the 18 communities through which the I-710 passes. If launched, the I-710 expansion would be one of the largest public works projects in the nation. Yet few Southern Californians know about the massive planned freeway expansion or the accompanying rail extensions.

We are aware of the limitations to this approach. A comprehensive quantification and display of urban patterns may never be sufficient to define causal links between economics, politics, government and urban growth. But spatial and temporal digital presentations can be an important first step. Spatial relationships can turn data into statistical summaries that help identify and interpret patterns within the data. Waskan has said that an effective model "acknowledges the central role played by inference in the explanatory process. It satisfies the intuition that we get that 'Aha!' sensation, the feeling of genuine understanding and enlightenment, only when we are able to infer that the event or regularity in question was to be expected given the other things that we know or believe about the system in

question and ... it leaves room for the possibility of multiple, competing explanations.”²⁹

This project will use the twin ports of Los Angeles and Long Beach as the basis for building prototype analytical tools to create and display data. The ports and related goods distribution lend themselves to this study for several reasons, first because of the immense size and impact of their operations, but also because they are highly computerized, digitally based systems that yield large quantities of metadata. The many layers of digitized activity make these systems a “mash-up” coder’s dream: transportation corridors associated with diesel emissions and lung disease; ship passages with air pollution levels; port activity with jobs; rail yards with indoor air quality of nearby schools; cargo handling with energy consumption and carbon releases. The possibilities abound. By experimenting with combinations of parameters, the programmer/journalist/policy-planner can work with such a model or template in ways that could be applied to a wide variety of infrastructure projects.

News stories and recent research done on the ports, including by researchers at USC, have focused on singular aspects of their functioning. News coverage of the ports has been sporadic and lacks the coherence of traditional in-depth journalism. Community organizers and activists who keep neighborhoods informed about the ports have inadequate information and limited ways to display and disseminate it. They lack the digital assets to capture reality. Much of the needed expertise continues to reside in engineering school laboratories. A key challenge, therefore, is for our multidisciplinary team and the graduate students within our various units to develop digital assets that will capture the flux and non-linearity of large-scale infrastructure systems such as the massive transportation of imported goods through Southern California and then across the country. A second goal would be to find ways to distribute this information across individual, community and institutional audiences. Third, a number of pragmatic and user-centered questions surround the value of interactive digital graphics, and these need to be addressed scientifically.

We will contact and work with local communities affected by the two ports and develop a strategy for distributing visual information and data to these stakeholders, such as with sophisticated, immersive PowerPoint presentations and multimedia displays for local audiences, including at schools. The goal will be to construct various communication vehicles to reach residential populations most impacted by the ports and by movements of goods and large-scale warehousing near homes. We recognize the difficulty of relying on computers to reach constituencies that may not have home access to the Internet or, for cultural reasons, prefer other media. Kiosks in community centers and church or labor union meeting rooms, DVDs with advanced graphics and PowerPoint presentations and other technologies that encourage audience interaction and discussion may be more important pathways for knowledge than the Internet.

²⁹ Waskan, Jonathan A. (2006) *Models and Cognition: Prediction and Explanation in Everyday Life and Science*. The MIT Press: Cambridge, Massachusetts. p.229.

Finally, we will engage with a number of questions that deal with communications and journalism, such as: What is the role of text in communication? Will the choice of multimedia assets, augmented reality and 3-D perspectives result in a lack of transmission of a logical, comprehensive story line? Will users be able to recall key points of the represented infrastructure system and its impacts in a meaningful manner? Will users construct a story that rivals or is superior to the one intended? Will users exposed to sophisticated digital visualizations be more likely to act on that information, such as by voting or by participating in community efforts to approve, mitigate or stop a proposed project?

Our over-all goal is to create a generic immersive model that would be useful in education about – and analysis of – a wide variety of urban infrastructure projects, from freeway routing to the location of power plants, high-tension power lines and mobile communications towers. The visual information and the schemata, vocabularies, ontologies and databases developed in this project would allow the public to more fully participate in infrastructure decision making.

2 Discussion

Throughout this essay I have tried to keep a focus on the epistemology of immersive virtual environments, the relationship of the “real” and the “virtual.” Our research looks at how VEs can interpret and re-create reality, an exercise of human imagination to forge virtual realities that embody meaning. But journalism is basically an industrial enterprise. It offers a credible version of truth and an accurate report on timely activities for a price. And even advocates of industrial VR applications acknowledge that this technology is a creature of engineering. Heim explains the problem of “reality loss”: “No engineering drawing ever reproduces the world pure and simple. A drawing always appears in a working context. A reality loss, then, means that some measurable inaccuracies can be found to lead the project astray despite every effort to produce an accurate model – where accuracy means reliability in the context of use.”³⁰

How much inaccuracy, or to put it another way, fiction, in an immersive system is tolerable or admissible in the journalism context? Journalism personifies the textual tradition, a legacy of objective logic inherited from Newton and Descartes. But both theory and empirical investigation confirm that visual culture has shifted to an oral tradition in a revival of rhetoric and preference for the verve and fluidity of VEs. Alternative realities make possible the satisfaction of using images to think. If journalists acknowledge the authenticity and potential of visual culture and accept a new relationship towards the written word in a subordinate role within the realms of mixed reality, they can become the great enablers of public discourse in this new century. As the historian Robert Rosenstone has advised, we would do well to recall Plato’s assertion that “when the mode of the music changes, the walls of the

³⁰ Heim, Michael. (2000) *Virtual Realism*. Oxford University Press. p. 130.

city shake. It seems that to our time is given this vital question to ponder: if the mode of representation changes, what then may begin to shake?”³¹

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³¹ Rosenstone, Robert A. (1988) History in Images/History in Words: The Possibility of Really Putting History Into Film. *American Historical Review*. V.93,5 (December) 1185