Archiving the "Fabric of Digital Life"

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Abstract

This paper describes the process for establishing the "Fabric of Digital Life" archive, which is dedicated to the study of wearable media and augmented reality inventions. Fabric of Digital Life features the development of an open repository online research archive using CollectiveAccess software that tracks, catalogues, and in some cases, stores artifacts that imply future invention. The collection of this corpus will enable the analysis of inventors' writings and discourses, news articles, images, videos, documents, commercial ventures, artifacts, and events that instantiate the discourse of emerging inventions relating to reality-shifting, digital life, and digital culture. Inventions do not emerge from the hands of solo inventors, they emerge within a vast context of overlapping texts that communicate the motives of everyday people as much as they do the motives of inventors.

Keywords: Wearable computers, augmented reality, invention, digital humanities, digital rhetoric.

Index Terms: 1.2 [User/Machine Systems]: human factors K.4.2 [Computers and Society]: Social Issues; K.7.m [The Computing Profession]: Miscellaneous—Ethics

1 Introduction

The paper describes the in-progress establishment of a digital humanities collection that will be named the "Fabric of Digital Life" archive dedicated to the study of wearable media and augmented reality inventions. It will grow to be an open repository online research archive using CollectiveAccess software that tracks, catalogues, and in some cases, stores artifacts that imply future invention. The collection of this corpus will assist in the analysis of inventors' writings and discourses, news articles, images, videos, documents, commercial ventures, artifacts, and events that instantiate the discourse of emerging inventions relating to reality-shifting, digital life, and digital culture. The intent for the archive is to support the argument that inventions classified under the categories "carryable," "wearable," and "implantable" operate rhetorically across multiple discourses. Inventions do not emerge from the hands of solo inventors, they emerge within a vast context of overlapping texts that communicate the motives of everyday people as much as they do the motives of inventors.

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2 Theoretical Tradition

The Fabric of Digital Life project relates to the current trend toward the humanities-based analyses of digital culture with an orientation toward futurism, or "futurity." Other writers treat aspects of future digital culture in relevant ways: Nicholas Negroponte offers a utopian approach to new technology (Being Digital) [1]; Howard Rheingold comments on the rise of mobile communication and the future it implies (Smart Mobs) [2]; Mark Andrejevic discusses interactivity within commercially-determined systems and how digital culture is hegemonically-driven rather than liberating (iSpy: Surveillance and Power in the Interactive Era) [3]; and Steve Mann (Cyborg) [4], a famous computer wearer and social activist, discusses how interfaces might be more humanistic; Jaron Lanier warns of "digital serfdom" (You Are Not a Gadget) [5] (Who Owns the Future?) [6]. Many current critical theory approaches attend to transhumanism. Hayles defines transhumanism as "an international movement dedicated to the proposition that contemporary technosciences can enhance human capabilities and ameliorate or eliminate such traditional verities as mortality. It holds that human evolution is incomplete and, moreover, that we have a responsibility to further our evolution through technology" [7]. In fiction, William Gibson [8], Margaret Atwood [9], and Cory Doctorow [10] frame humanity's future in digital and oftentimes dystopian terms.

Working within this orientation toward digital culture, we have two goals for the archive:

2.1 Archive Goal One

The first goal is to capture, annotate and build a searchable collection in an open-source environment; in this formulation, the archive can be classified as a "digital humanities" project. Our metadata scheme contributes to a digital humanities ontology; one source explains that ontologies "are used to provide organisation and retrieval of information semantically. Thereby, similarities between information provided by an ontology are searched by means of a semantic relation rather than by matching search strings or other similar measures" [11]. The Fabric of Digital Life archive will preserve the language surrounding augmented reality technologies by charting the texts that constitute inventions before, during, and after they emerge. The Internet is a transient medium and digital preservation is embraced by digital humanities researchers in order to track and preserve this history. At the moment, popular culture artifacts across social media outlets are circulated at dizzying proportions. Further, Inventors' writing and productions in other modes (e.g., Youtube videos, blogs posts, etc.) are sensationalized and circulated during the phases of invention.

2.2 Archive Goal Two

The second goal is to identify and plot the rhetorical connections that exist between the collected artifacts. The governing theoretical model for the content is "digital rhetoric." Fabric of Digital Life will complement this tradition by driving an investigation of specifically wearable media and the discourses that mediate the framing of our digital future in this domain. It devises an approach to the rhetoric of emerging media by drawing on the rich scholarly tradition of Kenneth Burke's rhetorical theory to support the humanities-based methodology [12]. Rhetoric, the study of persuasion, is a theoretical approach that can identify how transformation in digital culture can occur. For example, what persuasive tactics does Google use to convince the public to embrace Google Glass over a smartphone using social media, promotional events, and narrative-based YouTube videos? Fabric of Digital Life contributes to an ongoing humanities-based research agenda that has produced recent relevant publications arguing for a recasting of invention as a rhetorical process [13], [14].

3 Analytical Value of the Archive

Specifically, the project will concentrate on seeking out, collecting, archiving, cataloguing and analyzing discourses instantiated by the inventors. The archive will be used for the long-term documentation and storage of digital texts as well as providing open access and preservation of digital content, where copyright allows. The research will also address commercial and cultural artifacts, including advertising, newspaper and magazine articles (*Nature, Science, Popular Mechanics*, etc.), blogs, Facebook pages, and other social media venues. It will analyze artistic and political projects including films, poetry, novels, events, and performance art in order to bring a wider field of inquiry to the study of invention. It will trace the connections between these artifacts.

Embedded in the practices of the devices that we currently use lie evidence of future trends that need critical attention now. As digital cultural participants, we are constantly hailed to augment our lives with software applications ("apps") that run on smart devices, iPods, iPads, iPhones, Blackberrys, Androids, and other consumer components. Many promise a future that will change our lives significantly. For example, a new mobile app called SkinVision claims to detect early signs of melanoma [15]. The website sells potential buyers on how SkinVision "is an important and necessary step towards the future of skincare." Much more subtle is the implication that it will alter the future of humanity in the prevention of cancer. Another example is "Meta," a prototype for what the website describes as "an amazing pair of stereoscopic glasses combined with super low latency gesture tracking" [16]. The accompanying video shows a character projecting images onto surfaces in his home and using his hands to manipulate the interface. While the spoken text does not address it directly, the dramatization uses visual rhetoric to persuade us that the character is enjoying an augmented everyday life in a seemingly utopic manner that has not been possible with current or previous technology. In the predictive mode, the video implies that the character will use his imagination in a manner that is novel and immersive, a break from his current lifestyle. This character's actions and interactions with the interface allude to films such as *Minority Report*, *Avatar*, and *Iron Man* by way of mimicry rather than direct reference. These examples of textual and visual rhetoric illustrate not only commentary on products, but commentary on humanity, casting humans in a future that must be framed in order to make this kind of technology desirable. These transhumanist threads are subtle but manipulative.

The importance of this research lies in the fact that justifications for wearable media reveal value systems: they divulge a great desire for human empowerment over limiting physical, social, and political conditions. Yet, they also reveal motives that sometimes play on fear, the inclination toward surveillance or the inclination to treat humans as inadequate. Media emergence functions as a continuum; the grounds for future personal, wearable devices lie rooted in the practices and language that surround our current and everyday smart gadgets.

4 Structure of the Archive

In building of the archive, we have tracked inventions that fall under the subject area for several years; however, in order to work toward a metadata model we chose several exemplary case studies including one that focuses on Rob Spence, Eyeborg inventor [17]. Spence has spent several years creating a wireless prosthetic camera eye to replace his own damaged eye (see Figure 1). Interacting with many other contributing inventors in the pursuit of his invention, Spence serves as an important exemplary figure. As a filmmaker himself, he consistently documents the Eyeborg using television and film references to reveal what the Eyeborg can actually perform [18]. But these video documents also reveal his ambitious plans and future projections for it. Spence is regularly interviewed by major news sources and individual journalists who interpret Eyeborg and cast it into filmic scenarios in order to explain the invention to the public. Our project will not only collect the texts that describe his inventions over the years, it seeks to identify the rhetorical threads that operate across these texts.

Figure 1: Rob Spence with an early edition of his Eyeborg implant. (With permission. © Rob Spence. All rights reserved.)

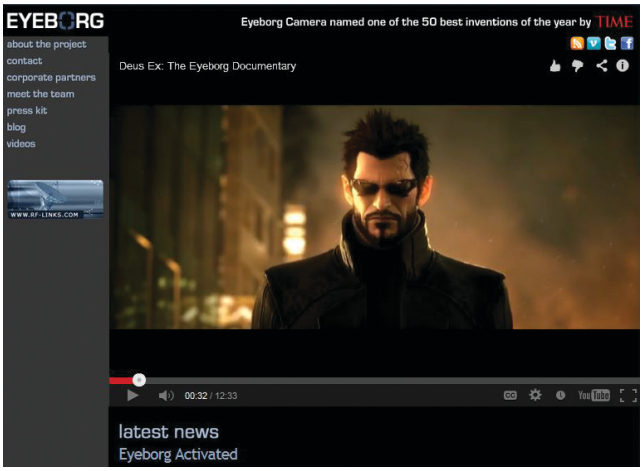

Figure 2: "Deus Ex: The Eyeborg Documentary" (With permission. © Rob Spence. All rights reserved.)

Based on the notion of literary allusion, the Fabric of Digital Life Project intends to identify how inventions either directly or indirectly reference cultural artifacts in an web of emerging innovations. The project uses three categories to distinguish between the discursive positions an artifact may inhabit. Current *inventions*, such as Rob Spence's Eyeborg, make direct and indirect *allusions* to previous inventions and popular cultural artifacts, such as the *The Six Million Dollar Man* television show (1974-1978) [19], and the video game *Deus Ex: Human Revolution*. For example, Spence is the director and writer of "Deus Ex: The Eyeborg Documentary" (Figure 2) [18], a film which explores the technology behind current prosthetics, but the film draws a direct parallel between Spence and the fictional game character Adam Jensen to explain how Eyeborg might work in the future. In turn, other inventors and enthusiasts *respond* to inventions using social media and other venues. As the Fabric of Digital Life Archive classifies artifacts, it will plot and preserve these linkages, creating a web of discourses that can be subjected to further analyses.

By identifying these allusions and responses and how they operate rhetorically to persuade the public that a particular innovation is relevant, valuable, or groundbreaking, we can chart how technology unfolds in culture. The Fabric of Digital Life Archive will attend to three guiding principles:

1) To address future media now rather than when they solidify into mass social practices. Provocative, political, and transhumanist, statements orient the public to accept future practices long before they exist without appropriate exploration and theorization.

2) To address how media constitutes both humanizing, societal benefits, as well as dehumanizing, societal consequences, at the point of emergence. The research will identify and question the early values attached to these devices, treating them as cultural products rather than only technological ones.

3) To attend to discourses of inventions. Far future media inventions (some of which are simply ideas) are products of discourse long before they emerge as artifacts. Far future media become intimately intertwined with digital ecologies and "constellations" [20].

5 Invention and Supporting Rhetorical Resources

The word *inventio* or *invention* comes from the rhetorical tradition and both Aristotle and Cicero write about it [21]; *invention* is used to name the process by which a speaker devises an argument or an act of persuasion. It might be thought of as the "discovery" of the argument. In vernacular terms, invention also means the product of the imagination. It suggests *inventiveness*. Recently, digital humanities as a field has envisioned invention in light of the digital turn. For example, Gregory L. Ulmer offers *Heuretics: The Logic of Invention* [22] and *Internet Invention* [23] to come to terms with the creative explosion in digital media. The Fabric of Digital Life archive will build on the idea that invention is a discursive or even a community-based process governed by rhetoric. Carolyn Miller puts it simply when she writes that "Discourse is rhetoric -- or rather it *has* a rhetoric" [24]. It is the rhetorical thread that the archive will capture, track and analyse. Explained in the first author's book *Ready to Wear*, Burke provides a rhetorical model based on orders in language to guide the ongoing development of the archive:

> I construct a model of theoretical resources by adapting Burke's terms for "order" (*Rhetoric* 183–89)—the "positive," "dialectical," and "ultimate"—as a triad, and relate them to key rhetorical events and instances that occur in the language of emergence surrounding inventions. Burke's triad exposes the transformative nature of rhetoric. It offers three orders, or hierarchies, namely, a positive order instantiated by terms of a material nature, a dialectical order instantiated by terms referring to the realm of ideas (i.e., clash and compromise between signifying entities), and an ultimate order instantiated by terms that act as a seemingly sovereign, organizing, and authorizing principle over the whole set of terms. Transformation occurs as each order conveys the social, consequential functions of texts within contexts from one order to another. [13]

The long term goal for the archive is to identify these "transformations" to explain how society is persuaded by an invention. The triad of terms helps to show how the language of invention functions in material terms (physical technology, e.g., *Layar browser software, LED screens, etc.*), while operating in terms of a conversation (e.g., *They claim that augmented reality gestural interfaces are better than voice commands.*), while creating ideological assumptions or "ultimate orders" that underlie the whole. The notion of transhumanism is one such ultimate order. The point for the archive is to begin creating a corpus to reveal rhetorical action.

6 CollectiveAccess

The Fabric of Digital Life Archive will use the open source cataloging and archival software CollectiveAccess [25] to implement and maintain this Digital Humanities collection. The project will start by accepting content from contributors within the Digital Life, Media, and Culture Lab at UOIT. As the project grows, we will extend invitations to other Digital Humanities scholars to expand the contributor pool. Future growth options include allowing the public to submit to the archive and developing a spider service to crawl the web for content.

Determining the appropriate software for our needs presented a challenge. Archival programs that are better suited to the Digital Humanities (such as Omeka [26]) offer less robust solutions for classification and storage while institutional repositories (such as DSpace [27]) offer strong preservation and classification options but struggle with discovery and presentation. Although we initially felt that the affordances provided by DSpace's classification and preservation technologies overrode the difficulties presented by its list-centric design, we determined that DSpace was not a viable long-term option based on its Java

architecture and the number of customizations that the project required.

We found the CollectiveAccess family of applications to be a fitting solution for our requirements. The Providence module provides strong tools for cataloging, managing, and preserving digital-born and physical artifacts while the Pawtucket module delivers a compelling user experience including searching and browsing of the archive, a timeline view, and curated exhibits. CollectiveAccess is designed to be highly configurable, which allows us to adapt the software to our needs. The following sections deal with how we have implemented the archive's goals through the user interface, data model, metadata, and relationship information.

7 User Interface

In keeping with the values of a Digital Humanities archive it is important to this project that the archived materials be as accessible to the public as possible. Providing public access to curated exhibits in addition to archival material is core to the goal of identifying the rhetorics that drive the adoption of new technologies. The user interfaces are implemented through the Pawtucket module and are designed to draw users into exploring the collection (see Figures 3 & 4). We plan on using Pawtucket's timeline feature to plot the emergence of new technologies over time. Additionally, CollectiveAccess's submission process has been designed for repository managers and librarian professionals, and not for students or the general public. We are overhauling the submission workflow to be more user friendly for student volunteers and the general public to use.

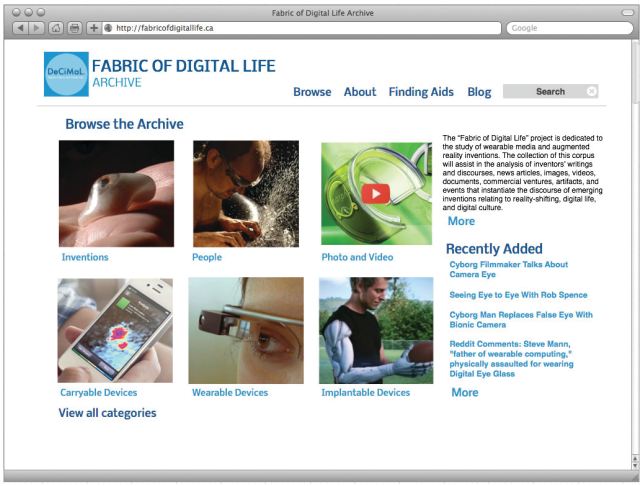

Figure 3: Proposed homepage for the Fabric of Digital Life

("Self-portrait, double-exposure (flash and blur) taken while playing 45-jet hydraulophone (camera activated remotely from pedal division of hydraulophone)" Creative Commons image by Glogger; "Augmented Reality" Creative Commons image by Leonard Low; "Eyeborg" and "Deus Ex: The Eyeborg Documentary" With permission. © Rob Spence. All rights reserved; "Google Glass Detail" Creative Commons image by Azugaldia; "Mediated Reality Running on IPhone" Creative Commons image by Glogger.)

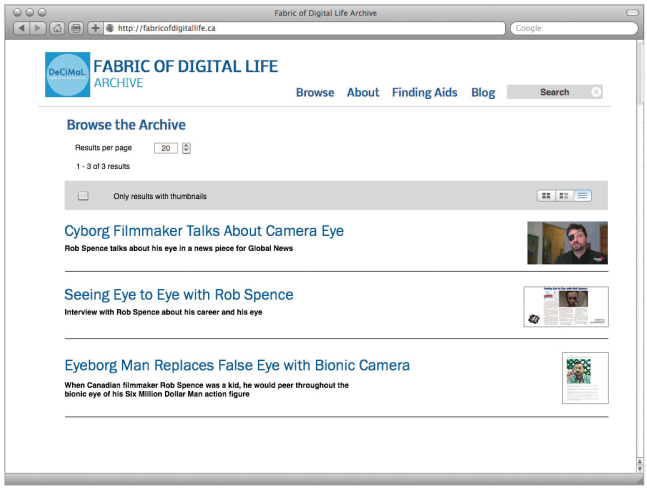

Figure 4: Proposed search results for the Fabric of Digital Life

8 Data Model

CollectiveAccess uses a fourteen item data model to reflect the world within which our collection exists. Included in this data model are items that manage information about people and places as well as items for cataloguing digital and physical artifacts and building hierarchical data structures. This multi-dimensional approach allows us to build a rich archive that contextualizes the artifacts we collect in relation to key events across the lifespan of an invention. Building a context-rich archive will allow us to develop detailed histories of innovation across which we can track how rhetoric is being used to transform digital culture.

Because the rhetoric of invention occurs organically and is not easily constrained within artificially imposed categories, we needed to develop a hierarchical structure to the data model that would provide efficient organization while allowing researchers to discover and plot linkages between disparate resources. Central to our hierarchy is the Burkian-inspired concept that an invention consists of more than the physical technologies from which it is derived. Inventions are conceptualized and communicated long before they become physical artifacts. For example, the Nokia Morph [28] future-visioning video describes a nanotechnology device that changes shape according to how it is being used. Although it may never be created as a material device, the *idea* of a morphable electronic device is an invention that has a traceable impact on other emerging technologies, societies, and broader culture. In this way, the idea of an invention provides the motivational impetus for development as an invention takes on multiple forms through its lifetime (from the birth of the idea, through design, implementation, and eventual death).

We will use the "Idea of an Invention" to organize the archive by forming individual collections around case studies based on a singular concept surrounding a new or emerging invention. Organizing the archive in this fashion allows us to efficiently catalog the many artifacts an invention may generate over its lifetime. These case studies will focus on particular and emerging augmented reality inventions, technologies, or trends. For example, we are building a Google Glass collection. In this collection we archive the emergence of Glass from the company's "One Day..." Youtube promotional launch video [29] to technical and news articles as well as user responses and satire. As technology advances, the idea of a past invention may rhetorically motivate future inventions. We are able to represent this rhetorical development of invention in the data model by plotting objects

into multiple collections. Objects will consist of a digital artifact, or the digital representation of a physical artifact that is related to augmented reality and can be categorized as "carryable", "wearable", or "implantable" technology.

9 Metadata and Relationships

Central to our goal of identifying and plotting the rhetorical connections between artifacts is the development of metadata descriptors and relationship attributes. Metadata is widely used to describe digital resources and enable future organizing and retrieval. CollectiveAccess complements its metadata cataloguing with a sophisticated relationship system that allows us to plot hierarchical connections between records.

In addition to representing artifacts using the Dublin Core element set, we have developed eleven metadata terms specific to this project. Following Burke's terms for "order", these custom metadata terms were developed according to the "positive," "dialectical," and "ultimate" triad. Positive terms describe physical attributes of the resource; Digital Humanities metadata typically function to positively describe abstract "data". In this category, our custom terms include whether the devices are designed to be carryable, wearable, or implantable, the Augmented Reality/Mixed Reality technologies being described, and the bodily location(s) that interact with the technology. To add a layer to meet the digital rhetoric goal, the archive will isolate how technologies aim to augment aspects of humans based on value systems. Dialectical terms describe a resource by the ideas and value systems that they either claim overtly or imply subtly. We have chosen to describe these terms as gerunds to acknowledge that rhetorical motive is communicated through action. For example, the Jawbone UP wrist-worn fitness tracking system website (jawbone.com/up) states "the wristband tracks your movement and sleep in the background. The app displays your data, lets you add things like meals and mood, and delivers insights that keep you moving forward." But Jawbone also uses values in the tagline "Know Yourself. Live Better" and "Once you know yourself there is only one way to go, UP." Here Jawbone makes a claim that its product is for *living better* or *knowing the self* in addition to other product claims such as *sleeping better* or *getting healthy*. Finally, as the most difficult to identify and describe, ultimate terms will require in depth post-hoc analysis because they involve language that is ideological or akin to Barthesian myth. We anticipate the development of a taxonomy of ultimate tropes and metaphors (e.g., "the future is imminent") that we can use to retroactively classify resources.

To plot the rhetorical connections between artifacts we use metadata and relationships to identify the discursive positions a resource inhabits and their direct or indirect references to other resources. Resources are classified using metadata according to whether they are an invention, the object of an allusion (usually made by an invention), or a response to an invention. Using CollectiveAccess's relationship feature we then connect related resources and describe these relations according to the action of literary allusion. For example, an "invention" resource (e.g., Rob Spence's Eyeborg) would be connected to an "object of allusion" resource (e.g., *The Six Million Dollar Man*) with the relationship being described as "isAlludedTo." The relationship is reciprocated at the "object of allusion" resource with the relationship described as "isAlludedBy." We anticipate that building these relationships through the archive will allow us to plot a web of invention that will demonstrate how the rhetoric of current inventions are motivated by past inventions and popular culture's responses to those inventions.

10 Conclusion

The Fabric of Digital Life Project faces many ongoing challenges during these first phases of development, including software development, working with institutional IT infrastructures, information architecture, and the content ontology. At the same time, the Digital Humanities community is rich with research sites working toward similar goals. While the first phase of the project is to build a collection and identify rhetorical connections, the second phase will be to integrate it and collaborate with other centres internationally. The Fabric of Digital Life is associated with RESAW (Research Infrastructure for the Study of Web Archived Materials) a European initiative based in Denmark seeking to bridge the gaps between the fast growing number of web archiving institutions. RESAW aims "to intensify international collaboration between institutions that hold a significant part of 21th century cultural heritage and a fast growing range of research communities and individual researchers for whom these archived materials are of increasing importance" [30].

Digital Culture is exhibiting rapid change and, oftentimes, change is promoted in favour of "bettering" humans. The Fabric of Digital Life project will address the emergence of wearable media and augmented reality inventions using a novel methodology in order to contribute to a study of transhumanist rhetoric. It will also contribute to the growing web of digital humanities archives materializing internationally.

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