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Leonardo, Pre-Print Articles, Vol. 52, No. 1, (Article)

Published by The MIT Press

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THE ELECTRONIC VESALIUS: EMBODYING ANATOMY ATLASES

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See www.mitpressjournals.org/toc/leon/52/1 for supplemental files associated with this issue.

Submitted: 29 March 2018

Abstract

A multidisciplinary team at Rice University transformed the Texas Medical Center (TMC) Library's collection of rare anatomy atlases into a physical-digital, human-sized atlas-of-atlases. The Electronic Vesalius installation gives these old books new life, informed by contemporary media theory and the centuries of medical and aesthetic criticism provoked by these multimedia image-texts.

Something New in the Old

Media archaeology is a method for articulating the technological conditions of possibility for human communication, and what communication technologies do in the world [1]. Siegfried Zielinski theorizes a radical, experimentally "philological" twist on the archaeological frame: "Do not seek the old in the new, but find something new in the old" [2]. Such an experimental philology liberates the history of science by transforming it into a speculative media theory in its own right: "A history of science and technology that is open, via the culture of experiment, for issues of communication and aesthetics, is one of the possibilities in the immediate future to advance theories of the media" [3].

This paper presents the theory, method and results of one such experiment, undertaken by a team of engineering undergraduates and faculty, an application programmer, and a humanities researcher in order to explore the long history and the potentialities of the media technology called anatomy atlases. The TMC Library's McGovern Historical Collections allowed us to digitize their rare anatomy atlas collection. We collaboratively designed and built a physical-digital platform in order to deliver an interactive exploration of what modern anatomy, a discipline credited (or blamed) with inaugurating modern internal medicine [4], made of the body, productively intervening in the logic of control inherent in interactive design [5].

Technical Methods and Collaborative Design

Our interactive atlas-of-atlases consists of two touchscreen interfaces and interacting components: (1) a 5'5", Plexiglas model printed with a super-high-resolution scan of the fifth table of muscles from Andreas Vesalius's 1543 *De Humani Corporis Fabrica* and CNC-cut to the image's contours (2) a network of capacitive touch sensors on the back of the print which turns the model into a visually high- but haptically low-resolution touchscreen (3) computerized communication between this network of sensors and the interactive platform that managed our digital assets and textual treatments for display on a touch-sensitive LCD screen.

We prototyped our sensor network on a display board cut-out; when we had a stable layout compatible with Vesalius's

labels, we transferred it to a CNC-cut acrylic model. The model's visuals are digital composites of 600-dpi scans we commissioned from two editions of Vesalius: the TMC's 1934 *Fabrica*, whose crisp image was printed with the preserved, original woodcuts, and the TMC's original 1543 edition, whose lower-quality image allowed us to fill a patch where the woodcut had degraded by 1934. This composite was UV printed to a 1/8" transparent Plexiglas sheet and sandwiched under another 1/8" milk-white sheet before being CNC-cut to the image's contours. To add structural rigidity and to allow easy wall-mounting, a second, 1/4" acrylic profile was added offset behind the profile, creating a freestanding model that is 5'5" tall but only 6" deep. This height allows most people to interact easily with the full model on a human scale (Fig. 1).

Fig. 1. The Body: Visually high-resolution touch interface alongside Philip Montgomery, Head of the McGovern Historical Center in the TMC Library. (Photo: John Mulligan.)

We installed a network of capacitive touch sensors on the back of the printed figure, augmenting this large-scale, high-resolution facsimile with a low-resolution touch interface layer. Capacitive touch works similarly to touch sensing on a smartphone screen, but for our project we used discrete sensors placed on Vesalius's symbolic annotations rather than covering a continuous area. Seventy-two independent sensors were attached to the Vesalius print as copper pads that were then connected to one of nine detection boards. Each sensor is activated when a user's hand crosses into its electric field. Controlling the sensors' individual thresholds demanded (1) individual fine-tuning, using a sensitivity scalar based on the size and geometry of each copper pad and the length of the wire traced back to its local detection board and (2) a reconfiguration of the model's zones of interest to keep wire traces short enough for this fine-tuning to work. Whereas Vesalius's annotations articulate bodily structures or functions, our groupings are dictated by proximity and bandwidth constraints.

Interfacing the physical features and the digital data was completed by establishing communication protocols between the systems. A signal registered on a physical feature is first channeled through a local bus before being filtered through an

Arduino and finally sent to a Raspberry Pi. The Pi then uses Flask SocketIO to convert the electric signal to a digital database call that pulls an indexed record and assets to update the adjacent LCD touchscreen. The platform handles inputs from both touchscreens, serving data through an SQLite database run on a Python server. The front-end user interface is managed using AngularJS and JavaScript SocketIO. Our digital interface allows users to select body parts on a color-coded model, read descriptions with internal hyperlinks, and view thumbnails or full scans of comparison illustrations (Fig. 2). This display system can be run on most computers in a virtual environment [6].

Fig. 2. The Parts: Computer interface showing entry on the ribs, with a detail of a siren's rib selected in the image carousel.

Interactivity and Objectivity

Interactive displays do not uncritically operationalize the logic of control but rather participate in the historically evolving discourses and media technologies of “objectivity,” as Orit Halpern has shown: “Objectivity was redefined in terms of the production of algorithms, methods, and processes that facilitate interaction based upon the assumption of an infinitude of stored information” [7]. This radical informationalization redefined objectivity toward affective subjectivation and away from the strategies of epistemological standardization documented in Lorraine Daston and Peter Galison’s study of scientific atlases’ aesthetics of observerless observation, or “knowledge that bears no trace of the knower” [8]. The specific archival remediations undertaken in producing our physical/digital atlas-of-anatomy-atlases both qualifies Daston and Galison’s framework of observerless objectivity and thematizes for users the related logics of control and informational infinitude inherent in interactive design (including ours, of course).

Anatomical atlases can naturalize the violence of objectifying the human body; there is perhaps no better example of “observerlessness” than the fascinating trope of “self-demonstration,” which depicts bodies flaying themselves [9]. Interactive design allows us to see something old in the new here, as in Daniel Garrison and Malcolm Hast’s stunning 2014 *Fabrica*, which attempts, with design choices like visual callouts and extensive indices, to “follow along the lines of Vesalius’s hypertextual approach of constant cross-referencing in a way he would have done had he had the means to do so” [10].

But “observerlessness” cannot account for the strange sympathies these objects evoke. Take William Hogarth’s conflicted

feelings about anatomical beauty: “As the skin is taken off the parts are too distinctly traced by the eye, for that intricate delicacy which is necessary to the utmost beauty . . . they lose in the imagination some beauty, which they really have, by the idea of their being flayed” [11]. Atlases envision a complete, coherent body of knowledge; so too with anatomy atlases, but their concern with the problem of embodiment makes them uniquely reflective as to how we make ways of knowing and structures of feeling visible and touchable. And so we would extend Garrison and Hast’s invocation of hypertextuality to suggest that an interactive atlas-of-anatomy-atlases has the potential to find something new in the old.

With respect to our interface design, digital remediation of numerous anatomy atlases, with intertexts, secondary sources, and original commentary, puts digital interactivity’s aesthetics of informational infinitude and atlases’ aesthetics of completeness into meaningful patterns of interference. No single view of the body can be authoritative, and yet the textual treatments highlight curious transhistorical resonances and historical dissonances that weave these various parts into an open network of bodily knowledge. With respect to intended user experience, scaling a 12” illustration of a flayed body to a touch-sensitive life-sized facsimile productively fries the user’s sense of control over this body of knowledge by capitalizing on the genre’s historical potential for sympathetic readerly identification; this reanimated corpus responds to a user’s touch, but design choices are hard to ignore when they literally make a body talk. Our hope, then, is that this media-archaeological experiment speculatively operates as a useful aesthetic intervention in the sense of completeness/infinitude and the logic of control that inform interactive design.

Acknowledgments

Rice’s Humanities Research Center and the Andrew W. Mellon Foundation supported this project financially.

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