On the Visual Agency of Manufacturing Models

Sobre la capacidad de acción visual de los modelos de fabricación

Introduction

There was the true contemporary, San Narciso had no boundaries. No one knew yet how to draw them. [...] For it was now like walking among marionettes of a great digital computer, the axes and lines twisted above, hanging like balanced mobiles right and left, thick, maybe endless. Behind the hieroglyphic streets there would either be a transcendent meaning, or only the earth.1

With the entrance of an increasingly paranoid Oedipa Maas into the fictional planned city of San Narciso in the dystopian ending to Thomas Pynchon’s The Crying of Lot 49, the media theoretician Friedrich Kittler concludes his 1994 "Stuttgarter Rede zur Architektur." In light of architecture’s ‘digital turn,’ he writes that "cities, even if or even more so when named after Narcissus, are no longer reflections of the so-called human, but, of microelectronics."2 He expects neither augmented authorship nor potency from the infinite promise of computer-aided technologies, but increasing redistribution among techniques and practices, calling for a reconfiguration of architectural agency as a media system: ‘CAD for design, not only representation’3 reads a note below his manuscript—yet, as I asked today, would he not add manufacturing to his list?4

Ever since the digital turn in architecture, the discipline has not only been reviewing its logbook, but has been debating whether this was a slight bend, a blind curve or a complete turnaround. Optimistic and positivist rhetoric argues that the ‘image act’ by Horst Bredekamp, an understanding in which models and mean-}

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Abstract

Assuming that rapidly altering agencies and media of digital fabrication are only beginning to resonate in transdisciplinary research, innovation may emerge outside perspectives of efficiency and optimization. With a background of cultural technique research on the construction of drawing and distributed authorship, this paper proposes to read manufacturing models through the art historical notion of the ‘image act.’ Approaching the visual agency and suggestive power of this rather disparate topic, it suggests that authors pay renewed attention to the underlying conditions of their practices, corrective relations between the physical and digital and notions of brilliance and uncertainty. This is conceived as a tentative inquiry into the ontological foundation of digital workflows—eventually attempting to shift the discourse on CAD/CAM from ‘possibility’ to ‘constraint’ space.

Keywords: image act, CAD/CAM, digital ontologies, vagueness and brilliance, physical-digital interferences

Resumen

Al asumir que los rápidamente cambiantes agentes y medios de fabricación digital apenas están comenzando a hacerse sentir en las investigaciones transdisciplinarias, la innovación puede surgir fuera de lógicas de eficiencia y optimización. Con una base de investigación en la técnica cultural sobre la construcción del dibujo y la escritura distribuida, este artículo propone leer los modelos de fabricación a través de la noción de ‘acto de imagen’ proveniente de la historia del arte. A partir de un acercamiento al potencial visual y al poder sugestivo de este tema —bastante disperso—, se sugiere que los autores presten renovada atención a las condiciones subyacentes de sus prácticas, a las relaciones correctivas entre lo físico y lo digital y a las nociones de brillantez e incertidumbre. Esto se concibe como una exploración tentativa sobre la base ontológica de los flujos de trabajo digitales, que eventualmente intenta cambiar el discurso sobre CAD/CAM y levantar del espacio de la ‘posibilidad’ al de la ‘inexención.’

Palabras clave: acto de imagen, CAD/CAM, ontologías digitales, vaguedad y brillantez, interferencias físico-digitales

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This is how graphic construction functions as an intersection of knowledge and the ability to realize, practices of making [...]. And a kind of inventiveness, which cannot be anticipated but only developed occasionally alongside its emergence.14

The literary and art historian Jutta Völterhowe delineates how the operations and practices of drawing are constructual per se, as they are developed and construed on paper. Arguably, this is especially relevant for graphic thinking. “Because construction eliminates all that which is not truly relevant for the purpose of realization.”15 This is followed by explorations of how every physical realization encompasses epistemic operations, as they involve a change of media, shifts in scale and dimension or differences from an original sketch or concept. These notions of construction, from auxiliary lines to water lines, and their related actions of translation and alteration read as an archaeology of drawing and materialization.16 In his summary of a project that approaches the ‘digital turn’ from a media-archaeological standpoint, the architect and critic Mirko Zardini demands these altered agencies of his readers:

In all fairness, a fifth actor should be added to this list: an inanimate actor who takes different forms and names: machine, computer, manual, software, code, script, etc. This technological constituent – sought, found, tested, modified and even invented by the architects themselves in order to realize their ultimate vision – assumed a life of its own and made the production of these projects possible.17

Both cases hint at multiple agencies which are embedded in their respective workflows. Clearly, manufacturing models revolve around this relationship between drawing and construction and may be a catalyst to approaching CAD/CAM from a cultural technique perspective. Their curves and codes are drawn and written to translate numbers into physical artifacts. As they have to take the material properties and constraints of machinery and data into account, they negotiate the constitutive aspects of digital production workflows. At the same time, we need a broader conception of drawing, one that extends beyond the physical constraints of drawing and materialization.18

Image Activity of Manufacturing Models

In his phenomenology of the visual agency of the ‘image act’, Bredekamp distinguishes between the ‘digital turn’ from a media-archaeological standpoint, the architect and critic Mirko Zardini demands these altered agencies of his readers:

The following tentative analysis invites the reader to understand the models, scripts and notations of CAD/CAM-driven manufacturing as processes of invention, through their own potency, empowering those enlightened observers who fully recognize this quality. Images are not passive. They are begetters of every sort of experience and action to perception. This is the quintessence of the image act.19

Breedekamp differentiates between three modes of production: schematic/body, substitutive/exchange, intrinsic/form) through which images become active: the schematic image act draws on the relationship between the image and the life created from those living things or evoking vigor through representations of the body (tableaux vivants, cell microscopy); the substitutive image act refers to the mutability and relationship of the physical body with its image, charged with religious or destructive acts (iconoclasm, relics); while the intrinsic image act describes instances in which forms acquire agency through their material presence enabling or forcing the spectators to reflect on themselves. Putting the latter at the core of his theory,20 Breedekamp presents models as being one of the most effective instances of the intrinsic image act in terms of its irresistibility as form.21 The scripts, models and codes of CAD/CAM-driven processes arguably share this suggestive power – in spite of or because of their abstract, projective character. This may also challenge the critics of their passivization as mere instruments of architectural realization. As they are developed and construed on paper, the digital turn includes a passage from a static to a dynamic form of representation which is not fixed, but can be altered and modified as they are created. This may also answer the critique of their passivization as mere instruments of architectural realization. As they are developed and construed on paper, the digital turn includes a passage from a static to a dynamic form of representation which is not fixed, but can be altered and modified as they are created. This may also answer the critique of their passivization as mere instruments of architectural realization.

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A difficult task: Fragment of Remote Impressions by Thomas Pearce and Gary Edwards, 2019. Photograph by Thomas Pearce. Source: Pearce and Edwards, “Remote Impressions,” 3.

Photo: Courtesy of the Artists.

Brilliant Models and Physical Correctives

For the boon of its sparkling clarity is accompanied by the danger of its power to seduce. By virtue of the compelling influence of their construction, models may become fetishes in the fields of research that in reality amount to material, they may gain authority over the reality they are describing. To us, it is also an example of how a physical reference may reveal an alternate, corrective pathway to those fetishes of modeling.

According to current critics of architectural discourse, “the clichéd immu- na-
as limitations but potential for authenticity. They stand in line with other examples, where experiments with error driven processes have revealed the prospects for innovation of glitches and imperfection.\footnote{Friedrich Kittler, “Denk- und Werkzeuge. Ein Entwurf,” in Barbara Wittmann, ed., Werkzeuge des Entwerfens (Zurich: Diaphanes, 2018), 107–109.}

The more precise and reliable we consider the model to be, the more it blends with its object. This process generates its own form of indeterminacy and ambiguity because it is no longer possible to distinguish the two. [...] What appears to be exact,faithful and isomorphic has the peculiar qualities of ambiguity, uncertainty, or non-determinism.\footnote{Mirko Zardini, “Eight Million Stories,” in Andrew Goodhouse, ed., When the Digital Meets the Architect (Berlin: Birkhäuser, 2015), 111–112.}

In continuation of Biedekamp’s 'image art,' the art historian Reinhard Wendler labels such tendencies to confuse model and subject as the 'brilliance problem' of modeling, referring to the moment when 'an (over)determination on the part of the model begins to blur the borders constituting their difference. From science to the arts, Wendler follows historically contingent interplay and transitions between certainty and uncertainty, precision and impression, which he frames as a cultural technique. In an uncertainty principle, even in experimental science, strategies need to remain conscious of the respective degrees of certainty or uncertainty in their work, embracing – in a way – their margins of error. If they do not, their endless hunt for precision and exactitude runs into a dead end at the very moment when the represented and its representation collapse into one, as illustrated by Jorge Luis Borges’s famous 1946 short story. Some have raised concerns about how the infinite promises of digitalization and error can blend into the very moment when the represented and its representation collapse into one, as illustrated by Jorge Luis Borges’s famous 1946 short story. Some have raised concerns about how the infinite promises of digitalization and error can be conflated into one. If one reverts back to Parajáco, he states that “the more elaborated and specialized the ontology, the less suitable the software becomes for the early stages of design where ambiguity can be more productive.” Such bias toward openness also prevails at the other end of the spectrum, in which manufacturing data is permeated by the digital ontologies of its generation, storage and translation – and in which the conscious embedding of process and material-based factors gains growing importance for speculative, open-ended contemporary practices.\footnote{Kittler, “Introduction,” in Branko Kolarevic, ed., Architecture in the Digital Age: Design and Deconstruction (Cambridge: MIT Press, 2012), 78–107.}

Column 21 by Bastian Beyer and Daniel Suárez may serve as an example of such a work. Its authors install a multi-actor fabrication system which exposes the textile biome of a hand-woven jute structure to bioprocess treatment with wax and calcium chloride. In line with the structural simulation and optimization of these processes, this designed conglomerate conver- ters from a textile to a compressive system, as it solidifies into a column (see image on this page) through biochemical reactions – realizing what Wendler frames as an “optimized uncertainty”\footnote{Bruno Latour, “Why Do Architects Read Latour? An Interview with Bruno Latour,” in Andrew Goodhouse, ed., When Is the End in Sight? Understanding the Architecture of Indeterminacy (London: Birkhäuser, 2016), 11–27.} in a structurally complex material hierarchy and performance. In its blending of transdisciplinary and temporal knowledge, the resulting workflow “operates between and utilizes the inherently different domains of binary and biological computerizations.”\footnote{Bruno Latour, “Why Do Architects Read Latour? An Interview with Bruno Latour,” in Andrew Goodhouse, ed., When Is the End in Sight? Understanding the Architecture of Indeterminacy (London: Birkhäuser, 2016), 11–27.} Very clearly, then, their approach favors the distributed and the complex over self-contained and determined logics – setting the stage for a tensile to a compressive system, as it solidifies into a column (see image on this page) through biochemical reactions – realizing what Wendler frames as an “optimized uncertainty” in a structurally complex material hierarchy and performance. In its blending of transdisciplinary and temporal knowledge, the resulting workflow “operates between and utilizes the inherently different domains of binary and biological computerizations.” Very clearly, then, their approach favors the distributed and the complex over self-contained and determined logics – setting the stage for a tensile to a compressive system, as it solidifies into a column (see image on this page) through biochemical reactions – realizing what Wendler frames as an “optimized uncertainty” in a structurally complex material hierarchy and performance. In its blending of transdisciplinary and temporal knowledge, the resulting workflow “operates between and utilizes the inherently different domains of binary and biological computerizations.”

Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively.\footnote{Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively. Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively. Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively. Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively.} He encourages us to conceive of related work as a technological and computational proof of concept, renovating baroque complexity and working toward multifaceted or voxelated structures and spaces. Or to go back to Schönfeld and Kraft, “Anything goes: it appears as if one could build virtually anything – and if one had to exhibit such technological potency, such capacity to realize the most intricate forms.”\footnote{Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively. Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively. Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively. Carpo gives three answers to his own question: an exposure to rising computational capacities, the detachment of such excess and ornament from its postmodern provenance and the unfiltered look of Big Data, which we are only beginning to visualize, literally and figuratively.} In order to avoid such pitfalls of brilliance, authors of CAD-driven processes may acknowledge how the scientific quest for brilliance and the architectural quest for precision both imply their respective logics of fetishization. This application of the ‘image art’ suggests both how comprehensively handle an excessive amount of information in comparable ways, detaching matters of interest from the analog world. All of a sudden, the open question of an ‘archaeology of the digital’ may then soon become a question for an archaeology of the author, if not its prophecy. Through a cultural technique perspective, such forms of encapsulated knowledge on the part of developers and programmers necessarily result in a redistribution of agency and authorship – a situation designers can only face by being technologically informed and critically aware of the uncertainty they face. Designers can only face by being technologically informed and critically aware of the uncertainty they face. Designers can only face by being technologically informed and critically aware of the uncertainty they face. Designers can only face by being technologically informed and critically aware of the uncertainty they face. Designers can only face by being technologically informed and critically aware of the uncertainty they face.
See Béatrice Proust, “Counterpoints: Why We Need Architecture of Tolerance.” Architectural Design 84 (2014), 192–203. 34. Norbert Palz, “Das Verschwinden des Architekten: Forschender Ausstellungskatalog Martin-Gropius-Bau Berlin (Leipzig: Seemann, 2014), 18–20.

See Bernhard Siegert, “Wasserlinien. Der gekerbte und der glatte Raum als Agenten der Bildung,” in Horst Bredekamp and Wolfgang Schäffer, eds., Bildung bildet Forschen. Ausstellungskatalog Martin-Gropius-Bau Berlin (Leipzig: Seemann, 2014), 18–20.

See Billy Too, “The Values of Precision and Productivity more Deutcher Modelle in der Gestaltung,” in Horst Bredekamp and Wolfgang Schäffer, eds., “Moderne der Unsicherheit. Experimente zur Verschränkung physischer und digitaler Formfindungsprozesse,” GAM 10 (2014): 196–206.

See Reinhard Wendler, “Zu einer Unschärferelation der Modelle,” 134–136.

See Norbert Palz, “The Ghost of Architecture,” in Jürgen Weidinger, ed., Proceedings-ecaadesigradi2019_619. Proceedings of ECAADe and XXIII SIGraDi Joint Conference. Zurich: Park Books, 2019, 107–127.

See Marc E. Himbert, “A Brief History of Measurement,” Zeitschrift für Medien- und Kulturforschung 18-3 (2020): 261–272. doi:10.2307/j.ctv13xpsvw.1. 36. See Frank Bauer, “Architektur after Drafting,” in Ekkehard Drach, ed., Das Verschwinden der Architekten. 133–136.

See Davina Potratz, “Image Acts: A Systematic Approach to Visual Agency,” Berlin: De Gruyter, 2019.

Bredekamp, Horst. “Bildaktive Gestaltungsformen von Tier und Mensch.” In Horst Bredekamp, Wolfgang Schäffer, and Nikolaus Dohi, eds., “vergold geschaffen stossen. Ausstellungskatalog Martin-Gropius-Bau Berlin (Leipzig: Seemann, 2014), 17–26.

See Reinhard Wendler, “Zu einer Unschärferelation der Modelle,” 140–141.

See Horst Bredekamp, Image Acts, 242.

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