Computational Feminism

Searching for Cyborgs

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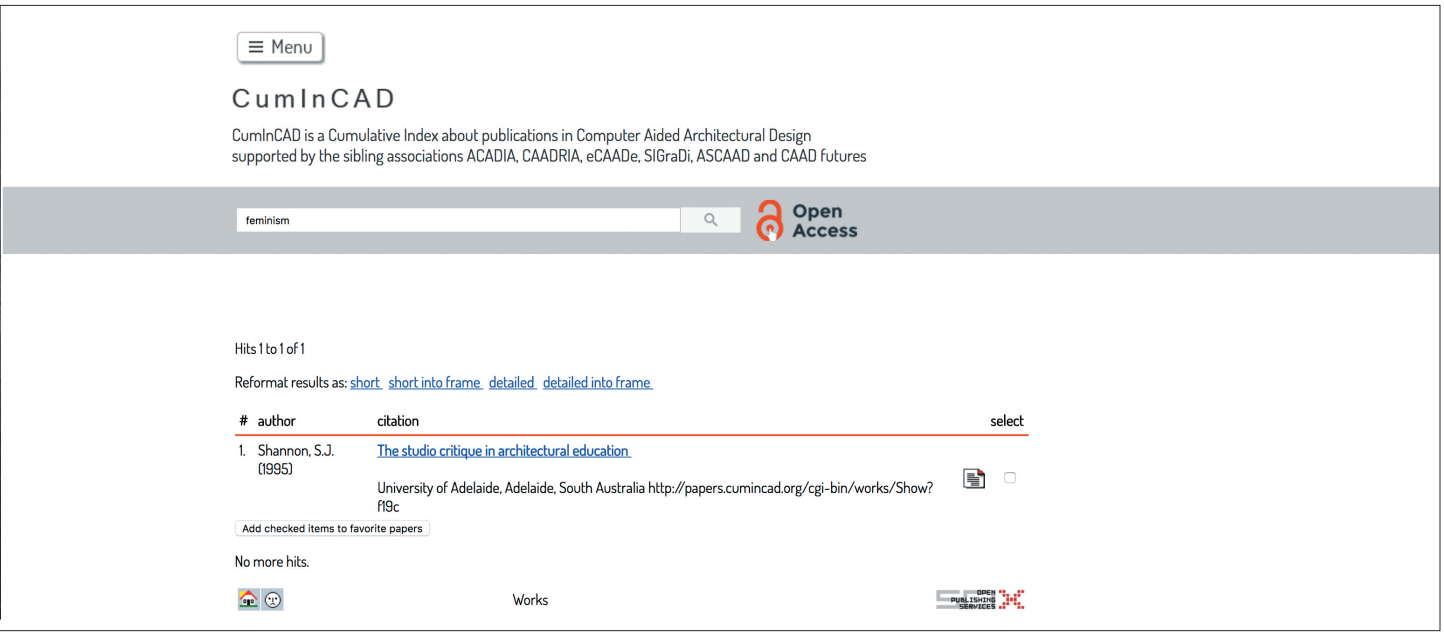

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ABSTRACT

As computational design matures, the discipline is in a position to address an increasing number of cultural dimensions: social, political, and ethical. This paper examines the gender gap in computational design and proposes an agenda to achieve gender equality. Data from architectural publications and the CumInCAD database provide metrics for measuring the segregation between feminist and computational discourse. Examples of feminist theory establish possible entry points within computational design to bridge the gaps in gender equity and representation. Specifically, the authors re-examine 1990s networked feminism in relation to the computational culture of today. The paper concludes with a proposed definition of Computational Feminism as a social, political, and ethical discourse. This definition appropriates Donna Haraway's cyborg as its symbolic instrument of equality.

1 No more hits: 22 April 2017 CumInCAD publications database search term results for 'feminism'. Screenshot by authors.

INTRODUCTION

Equality necessitates a discourse of disruption. It requires space to be made for processes, voices, and ideas where space previously did not exist. The notion of the cyborg provides this space, giving a name and agency to the in-between. A hybrid creature, machine and organism, the cyborg is a being of social reality as well as science fiction. In the following account, a new kind of cyborg occupies a particular and unexplored space that both critiques and expands the field of computational design. This disruptive cyborg is the foundation of Computational Feminism. As a popular trope of feminist scholarship, the cyborg allows a thing to be "both/and"—a condition that resists the binary nature of computational ones and zeros. The cyborg embraces emergence and ecologic processes and challenges the modernist rhetoric of precision and predictability in architectural design.

Background

In 1844, Marx wrote that between women and men: "it is possible to judge from this relationship the entire level of the development of mankind" (quoted in Hearn 1991, 227). Today, technology is taken as an indication of society's development. Technology is a broad term but used here to indicate computational tools and methods specific to architecture. This paper advances the argument that technology is a gender equity issue. Technological changes have everything to do with who benefits and who does not; whose opportunities increase and whose decrease; who creates and who accommodates. That being said, it is impossible and intellectually dangerous to claim a general theory of inequity as caused by technological change. However, in pursuit of specificity, we can explore the relationships between feminist scholarship and computational design in architecture as a means of explicating the relationships between technological change and gender inequities. For example, in her essay "Parametric Schizophrenia," Peggy Deamer describes certain stereotypes of those who attend computational design conferences and participate within the field:

> ...parametric conferences are populated by young hipsters dressed in black, showing images of their digitally fabricated screens or rendered bas-reliefs; BIM conferences by older, suit-and-tie office-types explaining diagrams of complex buildings, hospital HVAC systems being a particular favorite. (Deamer 2015, 179)

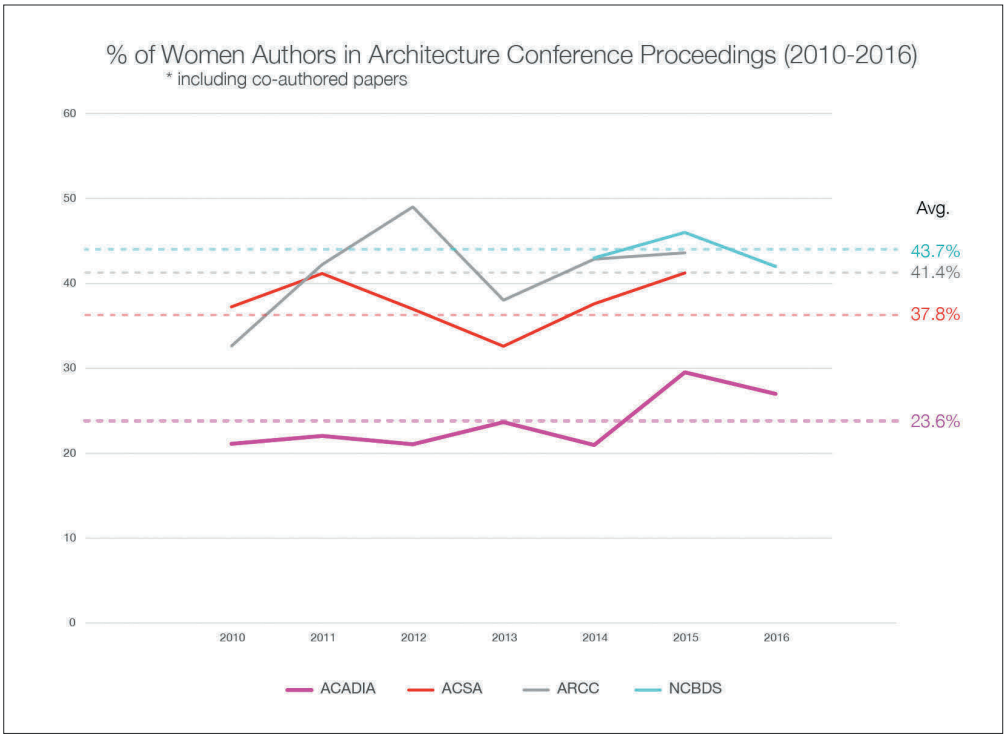
While doing so, she implies that these stereotypical figures are nearly all male. It is well-documented that, as a discipline, architecture has been slow to fully record, acknowledge, and incorporate the work of women (Chang 2014). As computational culture evolves, this shortcoming becomes increasingly apparent. Within the discipline, digital technology is an emerging source of architectural influence: those who control the process of design through technology control architecture and, by proxy, the built environment. This topic matters because architecture is imbued with values and ideas that both reflect and exert tremendous influence over the patterns and quality of our lives.

While many types of inequality exist with respect to technology and architecture, such as race and class, this paper will focus on the specific aspect of gender inequality. As technology is now essential to the practice and discipline of architecture, the ability to create with and shape technology is critical. In some respect, the lack of women specializing in design technology is unsurprising given that the practice combines fields that have historically been lacking in gender equity: management, information technology, computer science, and architecture. The goals of this paper are (1) to reveal gender inequality as an attribute of the current practice of computational design and (2) to begin to address gender inequality by moving beyond the anecdotal and into a constructive research agenda. This paper temporarily extracts gender equality from the history of queer theory, the experience of non-white women, and intersectionality (the interconnection of race, class, and gender). This extraction does not intend to deny these issues but rather aims to create a well-scoped and focused analysis that can provide methodologies for more comprehensive future research.

Context

Architecture has yet to fully acknowledge that its gender equity problem also extends to those who engage with technology. A reason for this could be that there is no direct evidence that such a gap exists; for many in the profession the truth of this proposition is unsubstantiated and remains wholly anecdotal. While the current evidence may be anecdotal, the presence of this gender gap is supported, in part, by an examination of papers from the Association for Computer Aided Design in Architecture (ACADIA). In the years from 2010–16, 26 percent of all co-authors were women and only 8 percent of papers had women as the first or sole author (Figure 2).

The gender of the authors and participants is not the only asymmetry; rarely are issues of feminism or women in architecture addressed in technology-based architectural scholarship. CumInCAD is a cumulative index of publications about computer-aided architectural design and includes bibliographic information and abstracts (not full text), drawn from approximately 12,300 records from journals and conferences such as ACADIA, ASCAAD, CAADRIA, eCAADe, SiGraDi, CAAD futures, DDSS, and others (CumInCAD 2017). Simple searches of the available databases demonstrate this imbalance: one entry relating to "feminism," seven entries reference "women" or "female," and thirteen entries for "gender." The database is not,



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2 The graph indicates the number of papers authored or co-authored by women in a selection of popular architecture conferences. Gender was identified by the pronouns used in author biographies. ACADIA has approximately 20% fewer women co-authoring papers than ARCC (Architectural Research Centers Consortium) or NCBDS (National Conference on the Beginning Design Student) and 15% fewer than ACSA (Association of Collegiate Schools of Architecture). This percentage has changed very little during the last decade. Data collection and graph by authors.

however, void of other political or social ideologies; search terms such as "political," for example, flagged sixty-one articles (Figure 1).

Our findings suggest that a gender imbalance exists in the field of computational design. This imbalance is not unique to the field. Indeed, it is reflective of architecture as a whole. Women in the United States are historically underrepresented in the building professions, constituting 15–18 percent of the workforce in architecture, 4.5–13.7 percent in engineering, and 2.6 percent in construction (Beverly Mills 2015). In academia, gender participation in technology is difficult to determine. At the authors' institution, while 49 percent of architecture students are women, on average they make up only 19 percent of the students in technology electives and seminars. While the number of women participating in architecture is not at parity with men, the number of women participating in technology in architecture appears to be lower still.

Although increasing numbers of women trained as architects during the twentieth century, women in the twenty-first century still remain largely outside the power hierarchies of the profession. This gender imbalance may at last be successfully challenged in the twenty-first century through the mechanism of technological agency. In 1992, a trend that Mario Carpo calls the "digital turn" began, marking the integration of computation into architectural design (Carpo 2012). Twenty-five years into this turn, architecture has been transformed by new technologies that offer disruptive potentials in material practice.

It is the suggestion of the authors that one of the most fundamental disruptions necessary within technology-based architectural scholarship is the integration of discourses about ethics, and specifically related to gender. These dialogues coalesce into a new speculative space that we term Computational Feminism. Feminist theory has a long and sometimes-conflicted relationship with technology and digital media. The next section introduces several theoretical frameworks that address the evolution of the relationship between technological and feminist discourses since the 1970s.

Though feminist scholarship has paid great attention to technology and its impacts upon a rapidly changing society, conversely technology (we use the term broadly), and specifically computational design, have not shared this interest. Feminist scholarship can play a role here as it is interdisciplinary by its very nature. When feminist scholars began to explore women's roles in culture and society, and the ideologies that shape women, these investigators were forced to draw upon many disciplines—among them, history, psychology, sociology, anthropology, and literature—all of which were and are engaged in similar pursuits. While feminist scholarship can make no claim to moral superiority in this regard, it can bring a perspective to this pursuit that widens and disrupts disciplinary viewpoints.

BETWEEN FEMINISM + TECHNOLOGY

The following frameworks question the content, methodology, epistemology, and values of both fields: computational design and feminism, in search of overlaps: both/and. Technological determinism argues that the features of technology determine its use and it is the role of society to adapt and benefit from technological change. The counterargument, drawn from social determinism, is that society is responsible for technological development and deployment, as well as the distribution of technological benefits within a society. Computational Feminism relies upon the narrative of social determinism—that society, and in this case the discipline of architecture, constructs the how, why, and who of technology.

1970s–1980s: Techno-Feminism

Techno-feminism emerged in the 1970s out of feminist movements within the sciences. The movement explored three forms of technological meaning: technology as a form of knowledge, the social obligation to understand, create, and use technology, and its expansion beyond the verbal and mathematical to that which required visual and tactile interactions. Early Techno-feminism focused on implications of technological artifacts upon the lives of women, specifically women's work. Technologies such as word processors in offices were the focus of early research, as these machines replaced or altered labor that was specifically female. Housework became the repository for domestic technologies perceived as liberating women: programmable washers and dryers, robotic vacuums, and the like. At the same time, feminist perspectives tended to view most new technologies as destructive and oppressive to women: because men dominate technology, it is in some sense inherently patriarchal.

In the eighties, feminists began to reject the notion of equitable treatment in technology, dismissing its neutrality and exploring its gendered character. Arguing that Western technology is inherently patriarchal, the feminist critique evolved from asking the "woman question" in technology, and began to explore the "technology question" in feminism, addressing the masculine domination and control of women and nature. Rather than a neutral technology, feminists argued for technology based on women's values (Wajcman 1991). In Joan Rothschild's preface to a collection on feminist perspectives on technology, she writes: "Feminist analysis has sought to show how the subjective, intuitive and irrational can and do play a key role in our science and technology" (Rothschild 1983).

As an evolution of Techno-feminism, Computational Feminism recognizes that technologies are not neutral and that the creation of new and different technologies by women is one way that technology can represent gender, rather than rejecting or ignoring it. In particular, computational processes and artifacts authored by women might enhance the subjective and intuitive—a process-driven or indeterminate technology that serves as a counterpoint to methods and devices that have control as a mechanism or objective. At the same time, female computational designers can take up the mantle of "women's work" as a positive, rather than a pejorative, and reconnect with craft traditions such as weaving, sewing, and ceramics through digital fabrication and robotics.

1990s: Cyberfeminism

Cyberfeminism emerged at multiple discreet locations in the 1990s and addressed the changing conditions of the Information Age. Posed to challenge again the political and social conditions of feminism, cyberfeminism developed as a range of interventions in response to the notion of society as a networked condition. Cyberfeminist agendas were vast, ranging from patriarchy-smashing video games, feminist virtual spaces, and the recovery of shadow histories of feminist technologists. The *Cyberfeminist Manifesto for the 21st Century*—produced by the VNS Matrix, a collaboration between Josephine Starrs, Julianne Pierce, Francesca da Rimini and Virginia Baratt in Adelaide, Australia—was a multimedia project that vividly expressed the emerging political position of cyberfeminism. The Manifesto saw new technology as an opportunity to disrupt society's patriarchal norms, and to have fun doing it. At the same time, Sadie Plant, a cultural theorist in the United Kingdom, began to use the term "cyberfeminist" to describe her academic focus on technology in Western society (Reiche and Kuni 2004).

While Computational Feminism connects with ideas about feminine technology and the democratization of access, it also supports and promotes alternative, subversive, and counter-agendas towards the diversification of computational design. As discussed in a later section, the notion of the cyborg, as both a hybrid of human and machine and a post-gendered condition, factors largely in the ambit of this proposed and latest wave of feminism.

2000s: Fourth-Wave Feminism

Fourth-wave feminism arose from the growing pains of a maturing information society. An attempt to capture the specific feminism of the contemporary world, it includes analysis of body shaming, online media, online misogyny, intersectionality, social media technology for communication and online petitioning and organizing, and explores the sharing of individual experiences as a method for achieving a collective voice and political legitimacy. An architectural example of the latter is the energization of gender discussions caused by the rejected petition to the Pritzker Architecture Prize that demanded recognition for

Denise Scott Brown as an equal in her work with Robert Venturi (Women in Design 2013). With respect to fourth-wave feminism, Computational Feminism embraces social justice, which is often missing in narratives about technology today. Equality is one component of Computational Feminism, but it also includes the application of technology towards just ends for the benefit of all and not only a privileged few. Simultaneously, Computational Feminism advocates for the exploration and production of joy and pleasure as opposed to advocating for economies of optimization and bravado expressions of virtuosity. Rather than serve profit or novelty for its own sake, Computational Feminism gives space to experiences of collectivity and wonder.

2010s & Now: Computational Feminism

A renewed interest in feminism's relationship to technology can be seen in books such as *The Politics of Parametricism: Digital Technologies in Architecture*, conferences such as the recent Architecture Humanities Research Association's *Architecture & Feminisms*, and the work of organizations such as Equity by Design (EQxD 2016; Parlour 2016; ArchiteXX 2016).

In an effort to find a conceptual entry point the authors offer the following definition, built upon the conceptual frameworks of twentieth-century feminism:

> Computational Feminism is a transdisciplinary field which grew out of the first twenty-five years of the digital turn. It continues to develop new theories on how politics of gender and other identity markers are interconnected to resulting processes of technical change, and the power relations of the globalized, material world. It is a descendant of the 1990s discourses of *technofeminism* and *cyberfeminism* that emerged in relationship to the development of network conditions and theories in architecture and urbanism.

Naming an idea gives it power and provides it with the opportunity to exist. Thus, Computational Feminism initiates an alternative discourse that advances the field of gender equality while harnessing the tools of computation as tools of social and economic equality.

Materializing Cyborgs

Feminist discourses manifest different visions of cyborgs as a tool for testing the relationships between humans and technology. In 1985, Donna Haraway, who challenged notions of feminist focuses on identity politics, urged feminists to move towards a post-human condition beyond the limitations of traditional gender, feminism and politics. Specifically, "The cyborg does not dream of community on the model of the organic family, this time without the oedipal project. The cyborg would not recognize the Garden of Eden; it is not made of mud and cannot dream of returning to dust" (Haraway 1990). Haraway's cyborg is the "illegitimate child" of every binary: dominant society and oppositional social movements, users and used, human and machine, subject and object, "first" and "third" worlds, male and female. In *Zeros + Ones: Digital Women + The New Technoculture*, Sadie Plant reclaims technology for women in her depiction of Ada Lovelace, the disputed creator of programming who is historically absent from computational discourses. Epitomized in Lovelace, Plant's cyborg "did everything topsy-turvy, certainly thought to have come into the world feet downwards," highlighting the female creative process, and that the absence of these processes was necessary for the unspoken language of early programming (Plant 1997). Plant's cyborg focuses on the necessity of women's language, and serves as a keystone of the cyberfeminist agenda. Emerging technologies and methods provide an alternative to determinism and efficiency while offering new forms of expression. For example, the computational-feminist-cyborg celebrates the free-flowing language of autonomous robotic construction, exemplifying Lovelace's creative processes.

CONCLUSIONS

> "...this is a revolutionary agenda, for today very few people—women or men—control our tools and our work..."
> Joan Rothschild, Machina Ex Dea

Women's relationship to technology is complicated, contradictory, and itself a social construct. It provokes fresh possibilities for feminist and computational scholarship, and perhaps even action. In the twenty-five years since the digital turn, advances in technology have delivered unprecedented possibilities to architects, enabling new expressions, performance, materials, fabrication and construction processes. However, during this time, more attention has been paid to the "how?" of architecture's digital technology and less to the "why?" As computational culture evolves, the moment has come for a new digital turn. Now is the time to pause and reflect upon which discourses are missing from the narrative of computational design and which are necessary to navigate the future of the discipline and its technology. Specifically, computation is missing an ethical narrative, a discussion of the social and political ramifications of developing technologies and the inequalities resulting from their rapid advancement, both intentional and unintentional.

As digital technology permeates the social fabric, these questions become increasingly urgent to architecture's sphere of concerns and responsibilities. What do we want the next twenty-five years to be? What is the next digital turn? *Computational Feminism* is a provocation towards a more just and inclusive field and a

framework for making space, disrupting entrenched conventions, and considering gender inequalities within the narrative of computational design.

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IMAGE CREDITS

All images by the authors.

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