Mapping Bodies, Designing Feminist Icons

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Abstract

Bodies are nuanced, fluid, and political often combining forms of intersecting identities. Bodies, however, are frequently reduced to points, lines, and polygons on a map, are used to depict other things, or are missing from the map altogether. I draw on feminist perspectives in mapping and design to explore the depiction of bodies in map symbolization, particularly map icons. I apply a feminist semiotic approach to Maki icons to problematize the ways in which bodies are depicted, abstracted, or erased. More specifically, I analyze their symbolization, including: the presence/absence of bodily forms, the presence/absence of an embodied object, and their iconicity. My feminist analysis reveals the underlying conventions, codes, and ideologies in Maki icons that depict bodies and offers design opportunities. I argue that cartographers and designers need to rethink the depictions of bodies in icons and the role of "universal" icon sets, more broadly, through a feminist lens.

cartography, feminist mapping, embodiment, iconography, semiotics

A swimmer braving razor-sharp waves.
A police officer tapping you on the shoulder.
A misplaced stethoscope.
A square, a city, or maybe a cartographer?

Bodies are nuanced, fluid, and political combining forms of often intersecting identities that may or may not be visible. Feminists have brought bodies into academic, social, and political conversations stressing the body's entanglement with the mind, the sovereignty of bodies and choices, and the importance of embodiment and situated engagement with our worlds (Rose 1993; Haraway 1988; Sprunk 2010; Sovereign Bodies Institute 2019). Black feminist writing illuminates the complexities of bodies, intersecting identities, marginalization from multiple focal points, and simultaneous alliance and divergence between bodies (Combahee River Collective 1977; Crenshaw 1989; Nash 2019). Decolonial feminists like Mohanty (2003: 55) recognize "common difference" between bodies that simultaneously recognizes connection and alliance along with embodiment and diverging experiences. Mapped bodies, however, are frequently reduced to points, lines, and polygons on a map, are used to depict activities, or are missing from the map altogether (Rose 1993; Author 2015). Simply stated, bodies matter and need to matter more in map design.

Bodies and map icons are at the center of the descriptions above (Figure 1). They are Maki map icons designed to locate people, places, and activities in interactive maps (Mapbox 2019b). Maki is a prominent, open source mapping icon set produced by Mapbox. Icons from the set are easily downloaded and then loaded into interactive maps around the world. Swimming, police, doctor, and square are part of the larger icon set that are meant to be universally applied across contexts. A feminist lens, however, asks us to question this notion and view these icons in new ways. The swimmer, for example, appears athletic and able-bodied with prescribed and perfected form. Who is missing and why? If I want to swim, do I have to swim laps, or can I just

cool off in the water? The police officer, presumably a man, faces us directly with a hand raised in authoritative attire. How does the icon make you feel? Do you feel welcomed or uncomfortable? Who is the stethoscope portraying and how do you know it is depicting doctor without a body present? Would everyone share your perspective? The square could be anything as it removes recognizable bodies altogether. Does abstraction make this icon more inclusive? Is the square happy or powerful? What changes if I put a label on the square? These questions are feminist at their core. Map icons vividly illustrate these points and open conversation and possibilities between feminist theory and cartographic symbolization.

In this paper, I draw on feminist perspectives in mapping and design to explore the depiction of bodies in map symbolization. I argue that cartographers and designers need to rethink the depictions of bodies in map symbolization and the role of icon sets, more broadly, through a feminist lens. More specifically, I use the Maki icon set as a case study to question conventional approaches to universal icon sets and I argue for a feminist approach to icon design.

Mapped Bodies

What do I mean by "mapped bodies"? Mapped bodies as a concept feeds the imagination and produces interesting Google search results. What do I mean by mapped bodies? Bodies are mapped in a variety of ways ranging from artistic, imaginative, and unconventional renderings to more traditional mappings that use conventional cartographic techniques (Figures 2–6). Scientific illustrators, radiologists, and artists have explored body mapping in literal ways from anatomical sketches and x-ray images to life-sized mosaicked mixed-media maps (Anatomy and Physiology 2013; Nestle 2017). Bodies have also been used in mapping as anthropomorphic metaphors of power, femininity/masculinity, nature/infrastructure, and progress (Münster 1570; Life Magazine 1962; McKay 1889). Further, Chernoff face maps quite literately utilize bodies and body features to depict multivariate data—a technique that has been critiqued (Huffman 2009) and adapted to

include non-normative bodily forms like feminine and even zombie bodies (Rosenfeld 2017).

Bodies are also mapped using more conventional cartographic techniques (Figure 2–7). These techniques stem from the rise of Western academic cartography and the justification of scientific cartography in the post-war era—much of which is still valued and taught in academic and professional settings (Slocum 2009 and UCGIS 2019). Cartographers are taught to rely on the spatial dimension of a dataset to determine visual form as points, lines, and polygons. Bodies in data are then aggregated, constrained to a geographic unit, collapsed into a point or a line, or erased completely through generalization and selection (Slocum et al. 2009). Figures 2 and 3, for example, aggregate individual bodies into an ameba-shaped polygon and geographic unit, respectively. In these practices, individual points or bodies and clusters of bodies are erased as polygons appear homogeneous. Lines are frequently used to show bodies as agents in motion. A body's movement can be depicted individually as its own line (Figure 4a). Groups of bodies can also be collapsed into one flow line and can be rescaled to show the volume of bodies (Figure 4b and 4c). Bodies are similarly removed in the latter examples. It is important to note that these techniques are not overtly incorrect, malicious, or unethical. The takeaway here is that given their dimension, form, and symbolization, bodies become more or less legible when mapped.

Points are the last dimension and technique used to depict bodies in maps. Bodies can be aggregated and then collapsed into individual points in a many-to-one relationship (Figure 5). To illustrate thematic data, point symbolization can then inflate or deflate based on quantified bodies like population of a city (Figure 6). Individual bodies can also be mapped as individual points in a one-to-one relationship (Figure 7). In reference maps, point features are styled using visual variables like shape to locate specific bodies. Points are also used to locate activities, events, and places. The symbolization of bodies varies as point symbols range in their iconicity or the degree to which symbols are abstracted from reality. The police and swimming icon in the

introduction, for example, resemble bodily figures more than the square making them more iconic.

Why icons? In this paper, I focus solely on point features and more specifically, icons. Icons are extremely flexible in terms of design—ranging from iconic or pictorial shapes and abstract geometries to associative depictions. As such, bodies can be designed in a variety of ways. Icons like those embedded within Google Maps are also reoccurring and low-lying map features often at the lower end of the visual hierarchy, and accordingly are unobtrusive and often overlooked. The ubiquity of interactive maps further makes individual icons and their broader icon sets increasingly invisible. Additionally, there are a variety of icon sets that are open source and publicly available, such as the Maki icon set common for web maps (Figure 8). Icons are familiar and provide a legible entry point for participants with all levels of expertise. And last, icons are powerful symbols. They have been collective undertakings (Noun Project 2019) and have been used as productive sites of subversion (Horsky 2018) and anti-colonialism (Chief Lady Bird 2018).

Mapped Bodies in Theory

Feminist geographies have embraced critiques of representations (Rose 1993), vision (Mulvey 1989), science (Harding 1986), and objectivity (Haraway 1988; Elwood and Leszczynski 2018). Feminists have long recognized the importance of bodies. Many have questioned and disrupted a binary distinction between the mind and body—a distinction that previously prioritized the masculinized mind over the feminized body. Feminists acknowledge the limits of the perceived body or what is visible and celebrate complexity, difference, and the many intersections of identity. Bodies and our corresponding identities are ever changing and as trans feminist scholar Joy Ladin (2014) writes, these changes or permutations are "expressions of a single self." Too often, certain types of bodies are marginalized, and feminists call attention to the margins and

those not fitting into default assumptions. Further, all bodies are positioned somewhere and are situated in a particular context. Positionality and situated knowledge shape our understandings of the world and in turn, directly influence our approach to the things like research, mapmaking, and icon design.

Feminism is not new to cartography. The depiction and representation of bodies, particularly the depiction and simplification of bodies in maps, have been scrutinized by feminist writers. Rose (1993, 31) writes that individual bodies are frequently left unspecified, undifferentiated, and "colorless" in many cartographic depictions. As a result, bodies appear homogeneous and silence the experiences of and interactions between bodies. Feminist cartographers have responded to critiques by recognizing the experiences of bodies and everyday spaces that are conventionally left off the map (Kwan 2002; Brown and Knopp 2008; Lucchesi 2018 and 2019; Ferzoco 2018). Pure universal objectivity in geographic data, map design, and process have been questioned and problematized (Hill et al. 2016; Gieseking 2018). Feminist mappers have expanded notions of data to include qualitative data, qualitative methods, and mixed method approaches (Knigge and Cope 2006) that present bodies in more nuanced and captivating ways (Pearce 2008; Kelly 2015). Feminist theory has revolutionized map symbolization and cartographic process by embracing situated (Knigge and Cope 2006), embodied (Nestel 2017), and collective process (Elwood 2006; Kelly 2016).

Today, feminist mapping expands beyond the disciplines of geography and mapping. Feminist perspectives in design are gaining exciting momentum in related fields like feminist data visualization, data feminism, and design justice—all of which are emphasize bodies in some capacity. D'Ignazio and Klein (2016), for example, poignantly state "bring back the bodies" in their seminal text on data feminism. The authors emphasize a need to bring bodies that are missing and suppressed in data back into the conversation as well as the workplace. They critique

data collection as a means of extraction and examine the privacy ethics of quantifying bodies into data. D'Ignazio and Klein among others support transparency in data and design recognizing the subjectivities baked into data (Bivens and Haimson 2016). Costanza-Chock (2018) and the Design Justice Network challenge the design process by recognizing intersectional bodies (Combahee River Collective 1977; Crenshaw 1989).

Despite exciting work in feminist design, there remains room to question and grapple with bodies and map symbols to explore alternative possibilities. Bodies in maps do not have to be homogeneous and silenced: they can be *powerful* and *colorful*.

Understanding Mapped Bodies

Semiotics is the study of signs and sign systems used in a number of disciplines (Nöth 1995). Cartographers have utilized semiotics to better understand map sign systems through symbolization (MacEachren 1995). Maps use cartographic language and visual variables to translate, express, or abstract the complexities of space into graphic symbols, including icons. Semiotics can be understood from varying perspectives and models. In this paper, I rely on the triadic sign model (Nöth 1995; Chandler 2002), a system translated to cartography and vision most notably by MacEachren (1995). The triadic model differentiates an existing object from the mental conceptions and graphical depictions assigned to the object itself. The triadic model, as applied to map icons in Figure 9, uses referent, interpretant, and sign-vehicle to parse the object, the mental conception, and graphical depiction, respectively.

Iconicity is the graphic relationship between a sign-vehicle and its referent. More simply stated, iconicity is the degree to which a sign is abstracted from reality. Peirce identified three sign relationships to describe the relativity of signs: symbolic, iconic, and indexical (Chandler 2002; Figure 10 and 11). In symbolic relationships, the sign-vehicle or icon is abstracted enough that it

no longer resembles the referent. The icon must then be learned or is perhaps a cultural convention. In iconic relationships, the sign-vehicle or icon resembles the referent. Icons are culturally recognizable and relatable. When the sign-vehicle or icon mimics the referent exactly, it illustrates an indexical relationship. In other words, a lexical sign is a "piece" directly torn from the referent or object in the real world. Iconicity is important to mapping bodies because it frames the ways in which bodies are illustrated in icon designs.

Similar to other modes of communicating, maps and even more so, icons appear intentionally neutral (Muehlanhuas 2012 and 2013). New spatial media like interactive maps are being used in Western society at unprecedented levels (Crampton 2009: 91). Although digital map divides continue to persist, society is consuming maps more than ever and is naturalized to the medium, the processes behind the medium, and what is being communicated by the medium. Chandler (2002: 3) writes "the more frequently and fluently a medium [such as mapping] is used, the more transparent or invisible" it becomes. If the medium itself—the map—is becoming naturalized, then what can we say about the tiniest pieces of the map, the 11x11 pixel icons placed on top?

Embodied Semiotic Analysis

A feminist semiotic approach unravels the composition of individual icons and their depiction of bodies as well as the broader Maki icon set to better understand "social effects of an image's meaning" (Rose 2012: 108). Or, simply put, how the icon set works in the world. The analysis aims to expose their underlying meanings as well as the bodily norms prescribed in icon design. Compared to other critical visual methodologies, the semiotic approach is highly qualitative and not clearly defined. In this paper, I adapt Rose's (2012: 133) framework on how to 'do semiology' to conduct my feminist analysis (Box 1).

Maki Icons

Mapbox is a mapping company that provides a series of open source products and tools for map design, spatial analysis, navigation, and geocoding and aims to change "the way people move around cities and understand our planet" (Mapbox 2016a). With the exception of Google Maps, Mapbox is arguably the most prominent mapping resource for online mapping and is extensively utilized by popular media outlets like the *Washington Post* and social media platforms like *Facebook* (Mapbox 2019c). Mapbox launched Maki (Figure 18) in 2013 to help cartographers design 'better' map icons for the web (Maki 2019b). The Maki icon set is continuously updated and documented on Github (Mapbox 2019). The icon set currently consists of 144 map icons at two sizes: 11x11pixels and 15x15pixels. Maki uses specific design principles to provide a "high quality, consistent, and comprehensive" icon set (Maki 2019b). The goal of these design principles is to create bold, generic shapes or silhouettes that are recognizable across cultures. Once downloaded, each icon can be customized with the visual variables—color, texture, size, shape, etc.—and inserted to a web map (Slocum et al. 2009). Each icon is styled for clarity and easy viewing across web platforms, most notably mobile devices. Icons are built from "geometric building blocks" with solid, block fills and rounded edges (Maki 2019b). Maki attempts generic, yet relatable and understandable icons. Given their small size and constrained style guides, Maki icons operate as frequent and low-level features that appear inconspicuously.

It is important to note that the Maki icon set is just one example of a publicly available icon set and this analysis could be easily applied to the Google icons or National Park icons, among others. I choose to Maki for two reasons. First, Mapbox is a leader in the cartography community and has an expansive presence in online interactive maps. Second, the Maki designers are open to feedback and encourage cartographers and designers to "push" or upload new designs to the company's Github page. This openness supports a collaborative and

community-oriented design approach that I hope to draw on and expand.

Maki Icons as Signs

After selecting the Maki icon set as a case study, I downloaded and previewed all 144 icons. I narrowed the sample to 38 by selecting icons that are used to depict bodies or people directly, utilize bodies in their symbolization—whether or not it is necessary, or could be used to indirectly or abstractly depict bodies (Figure 12). I then analyzed the narrowed icon sample by sign-vehicle, referent, and iconicity. I then used visualization techniques to understand the relationships working within a specific icon as well as broader trends across the icon set.

As I went through the icon set, I noticed surprising relationships and differences between icons and their symbolization of bodies. I created a schematic of these relationships to organize the icons. Figure 13 shows a *sign-vehicle* continuum based on the presence and absence of a bodily form in the icon itself and Figure 14 further places icons along this continuum. The police icon, for example, includes the bodily form of a policeman within its symbol. The stethoscope, in contrast, is a non-bodily symbol and is placed at the inverse side of the continuum. Similarly, geometric shapes such as squares, circles, or triangles would also be placed on the left side of the schematic. If geometric shapes like squares are used to depict bodies, they have been abstracted so that the body is unrecognizable. Whereas, the silhouettes of a tooth and a heart reside somewhere in the middle of this continuum. Although associated as parts of the body, they do not depict the body in its entirety.

Next, I explored the *referent* or the object of reference using a continuum (Figure 15). As a proxy, I am using the name that Mapbox has given to each icon as its corresponding referent (Figure 16). It is important to note that the written form of these words are themselves signs and I am relying on Mapbox's designations. As a result, this is not a perfected proxy. I created a referent continuum in Figure 15 where bodily referents are located on the right side of the

continuum and referents that do not refer to bodies are on the left. In Figure 16, police, doctor, dentist, and hairdresser are directly related with specific working bodies. Lodging, playground, and toilet are locations or objects. Swimming, along with skiing, are verbs and show action, not specific bodies.

I combined Figures 13 and 15 to better understand the bodily relationships between sign-vehicles and referents (Figure 17). I then placed the Maki icons within this cartesian grid (Figure 18). From this schematic, I identified four types of bodily relationships. Beginning in the bottom right corner of Figures 17 and 18 and working clockwise, these paired relationships, include: 1. *body–body*, 2. *not a body–body*, 3. *not a body–not a body*, and 4. *body–not a body*. In each pairing, the first word designates the sign-vehicle and the second word depicts the referent. The police icon, for example, is a *body–body* pair. Its sign-vehicle utilizes a bodily figure to depict its referent of a police officer. The sign-vehicle of the stethoscope icon does not include the body but does refer to a bodily referent (a doctor). As such, the stethoscope is an example of a *not a body–body* pair. The square does not refer to a body in its sign-vehicle or its referent making it a *not a body–not a body* pair. Last, the baseball icon is *body–not a body* as it uses a body in its sign-vehicle even though its referent (baseball) suggests an activity, not a specific body. Each bodily relationship is discussed in detail in the next section.

To explore the *iconicity* of the Maki icons, I placed the embodied icons along an iconicity continuum. Figure 10 from above graphically depicts the degree a symbol is abstracted from reality on a continuum and places Maki icons along this spectrum. Additionally, I added a third, vertical dimension to the Cartesian organization in Figures 17 and 18. By adding this third dimension to sign-vehicle and referent relationships, I was able to dive deeper in understanding Maki icons and bodily icons as signs (Figures 19 and 20).

Feminist Discussion

The next step in Rose's guide to semiotic analysis is the exploration of signs in connection to "wider systems of meaning" (Rose 2012: 133). "Systems of meaning" address conventions and codes embedded within all signs. Codes are particular sets of conventions that "are specific to particular group of people" (Rose 2012: 128). No sign goes untouched by societal or cultural codes. Furthermore, codes build ideologies that legitimize unequal distribution of power and reinforce dominant groups over marginalized groups (Rose 2012: 106). Due to their vast distribution and consumption, the Maki icon set is intentionally designed to be universal, relevant, and relatable across cultures (Maki 2016a). As such, I unravel the conventions, codes, and ideologies that are ingrained in Maki's depictions of the body. I analyze the four sign-vehicle and referent pairings in Figure 20 using icon examples (*body–body*, *not a body–body*, etc.). I describe each prototype icon and revisit its individual placement in the bodily sign cube (Figure 20). I then describe the semiotic relationship within the individual icon and within the Maki icon set. Last, I examine the conventions, codes, and ideologies embedded within each icon using feminist theory as a guide.

Body–Body

Maki's police icon illustrates a clear bodily form (Figure 21). The figure's arm is lifted to shoulder height and is bent at the elbow forming a 90-degree angle upwards. The body is wearing a hat. The hat extends at a sharp angle away from the head and is flat on top. A sash crosses the body's chest from the upper shoulder to the hip.

The police icon is the only *body–body* Maki icon (Figure 20). It uses a body in its sign-vehicle while simultaneously referring to a body, specifically a working police officer, in its referent (Figure 21). The icon does not perfectly depict the referent of a police officer at a lexical or realistic level nor is the icon abstracted into uncertainty at the symbolic level. The police icon is

an iconic symbol that works on the denotive level. In other words, the icon is not a schoolteacher. It is clearly a police office. How do I know? The icon fits in my Western imaginary and is relatively easy to decode as the details in its design are enough to distinguish its body from civilian bodies (Rose 2012).

Power is at the core of the police icon's design. First, the police icon is the only *body–body* icon in the Maki icon set. By designing a sign-vehicle that directly personifies its referent, the police icon is privileged above the rest. The police icon is arguably unmistakable in interpretation and is also the most detailed bodily icon of the set. On the scale of abstract to iconic in Figure 10, the police icon marches towards iconic and further distinguishes itself as important and powerful. It is one of two icons with noticeable clothing. The second is the figure in a dress in the bathroom icon. The police figure is not only wearing a hat, but also a decorative diagonal sash. Both give priority and power to this icon. Its detailed design and the presence of a body creates unquestioned power.

The figure's body language appears with an upright and bent arm recognized by many as the 'stop' gesture. The icon appears authoritative and dominant. It is almost as if the icon is tapping the viewer on the shoulder. Its body language translates to a message of control and surveillance. A white woman in academia coming from a Western lens, however, presents one specific context. While I feel safe with this depiction, another person in another context might feel uncomfortable or threatened. Context is critical in icon design. The singularity of icon design illustrates one context from a presumed universal perspective. A feminist design perspective approaches context and the police icon in two ways. First, the feminist perspective could reject the universal approach altogether and instead call for a more inclusive and perhaps, an abstracted design. Alternatively, Maki could make space for endless designs that fit varying perspectives and contexts. Second, the Maki designers could provide their own context for the

icon situating the design they have presented. They could acknowledge the unparalleled power in its design. They could explain their design rationale and workflow as well as the implications of the arm raised at a ninety-degree angle.

Not a Body–Body

A stethoscope is used to symbolize the referent of a doctor (Figure 22). The stethoscope is positioned in the upright direction with a slight bend or curve in its tubing. Its drawn in isolation. The stethoscope is not draped across the shoulders of a doctor. There is no body in its sign-vehicle even though the icon refers to a specific referent, a body trained in medicine, predictably Western medicine. As a result, this icon illustrates a *not a body–body* pair.

The stethoscope is iconic, recognizable and quickly associated with doctors, but is not denotive like the police icon. The doctor icon is connotative in that it carries a higher-level meaning. Connotative signs are culturally specific and take more time to understand, but their meanings can be learned over time (Rose 2012). More specifically, the doctor icon is a metonymic or associative icon where its sign-vehicle (stethoscope) is related to the body's occupation but is not in fact the body itself (Rose 2012: 120). In a similar way, the hairdresser icon is iconic and is removed from the embodied physical form of the hairdresser (Figure 23). The scissor is a metonymic cultural convention associated with getting your hair cut (that is, if you have hair) and does not represent the physical body of the hairdresser. Metonymic icons contrast with synecdochal icons like the tooth depicting a dentist (Rose 2012: 121). The tooth sign-vehicle symbolizes a bodily referent but is only associated with the part of the body (Rose 2012). Here, I differentiate metonymic icons as tools associated with a specific occupation and synecdochal with a piece of the body that represents the whole. The tooth falls in between the doctor and police icon on the sign-vehicle continuum (Figure 14).

The doctor and hairdresser icons (and to some degree the dentist icon) disembody their

referents by removing the body completely. Disembodiment in the sign-vehicle distills the body into an inanimate and associative object. Feminist perspectives in design emphasize embodiment and by removing the bodily form, engagement with the body is lost. In the words of D'Ignazio and Klein (2019), the bodies are in-fact missing. The *not a body–body* icons distill the body into inanimate objects, specifically objects related to one's occupation, and neglect the complexities of embodied experiences.

Feminist theory, however, also recognizes pluralism and connected difference. The doctor, hairdresser, and dentist icons embrace pluralism by removing the bodily figures altogether. The associative icons push beyond specific bodies and expand the visual imaginary perhaps making the icon more inclusive. The point here is not to prioritize one feminist principle (embodiment) over another (pluralism). Instead, it is critical to weigh context in either scenario. If a bodily figure is added to the icon, how is that body portrayed? How specific can you be in its depiction? Further, if you abstract the icon into an associative icon, how do you recognize the complexity and nuance of the bodies defined by the icon? In choosing associative icons, context completely matters. The stethoscope implies Western medicinal practice, the scissors implies a particular type of haircut, and the tooth implies accessibility of healthcare including dental. It is critical to recognize the limitations of choosing culturally specific designs and recognize the situated experience of the designers behind the design.

Body–Not a Body

The swimming icon shows water with series of jagged angles (Figure 25). Above the water, there is a bodily figure. The figure's head is above water. One arm reaches upward out of the water and bends at the elbow. With this upward motion, the chest and shoulder rotate up and out of the water.

The swimming icon is one of fifteen Maki icons that utilizes a body in the sign-vehicle of

a non-bodily referent (Figure 25). The referent, swimming, is an activity and sport that does not refer to a specific body. The sign-vehicle is iconic, showing detail in the body's active posture and contextual elements like extremely chopping (and potentially dangerous) waves in the water. The swimming icon is also connotative and culturally specific. The icon illustrates specific and prescribed bodily movements. The bodily figure knows how to swim. The body is not drowning. The figure appears athletic by conventional notions, able-bodied, and is presumably male.

Icons falling within the *body–not a body* group, particularly the swimming icon, sparked my initial inquiry of the Maki icon set. By using body sign-vehicles to symbolize non-body referents such as swimming, toilet, basketball, etc., certain bodies are privileged in relationship to the referent. The soccer icon, for example, assumes a normative physical capacity in its actions (Figure 26). Additionally, the body's posture and perfected positioning suggest that the body is in its prime. The body does not look like a child and does not look like an older individual. Although the icon is meant to be recognizable and identifiable across cultures, this type of signage, limits the scope of inclusion. The mapped bodies become mechanized and disregard bodily difference and various, complex identities in favor of constructed, prescribed bodies.

The toilet icon performs in a similar way. Figure 27 depicts a stereotypical, female-identifying body in a triangular, stiff dress and the figure on the right depicts a stereotypical, male-identifying body with a broad, rectangular chest. As a pair, the bodies note and reinforce binary gender differences and prescribes who, in what form, is allowed to use particular toilets. The icons assume a binary and heteronormative relationship between female- and male-identifying bodies. Together, the bodily figures in the toilet icon define the rules of the bathroom. The toilet icon along with similar renderings are everywhere and I am not the first to critique it. The important piece is that while the toilet icon is problematic, similar conventions are applied to all *body–not a body* icons. They all illustrate places or activities (referents) using bodies as their sign-

vehicle. The question is, are the bodies needed? Could associative techniques like a toilet, waves, a basketball, or a soccer ball be used for the bathroom, swimming, basketball, and soccer icons? By redesigning these icons as associative, binaries would be disrupted, and the icons would become more flexible and inclusive in their depictions.

Not a Body–Not a Body

The square icon differentiates itself as a geometric icon with a solid black fill (Figure 28). The square is not a bodily sign-vehicle and its Maki referent is not a body. The square is abstract and inversely related to the police icon in terms of iconicity (see Figure 10).

Squares, circles, and other geometric shapes can be used to represent a range of geographic features, including bodies. They are connotative in that they do not directly depict their referent. They are metonymic and must be learned because they carry a higher-level meaning (Rose 2012). Specificity typically comes from a legend or a map label directly identifying the icon. When depicting the body, the square completely removes the body as part of its sign-vehicle. The square could be a police officer, a swimmer, or maybe a cartographer. The square is flexible in its abstraction.

When depicting the body, the square completely removes the body as part of its sign-vehicle. Despite the square's ambiguity, geometric icons like the square can also be powerful. Unlike the police, stethoscope, and swimming icon, the square removes any presumption or bodily prescription. By lacking iconicity and relatability, specific techniques of the mapped body are removed. Similar to Haraway's cyborg body (1991), all binaries are removed when the icon is completely abstracted. Similar to the cyborg, the square blurs binary differences between reality/fiction, mind/body, man /woman, black/white, able/disabled bodies, young/old, etc. Squares and cyborgs suggest "a way out of the maze of dualisms in which we have explained our bodies and our tools to ourselves" (Haraway 1991, 181). The square simultaneously recognizes

ambiguity, difference, and partial connections. They "offer a way out of binaries and solid identities, a path to…fluidity of the subject" (English and Kim 2013, 222). In other words, the square resists categorization altogether. Through abstraction, the square might offer inclusive and disruptive design possibilities!

Cyborg squares also poses a series of important questions. Are there design scenarios where the body is necessary? Are there ways that bodied icons connect to us and draw us in more than abstract shapes? Can you see yourself in a square? Can squares be emotive or are they emotionally sterile? Design context is the only way these questions can be truly answered.

Feminist Icon Design

Feminist theory asks us to rethink bodies in icons as well as the role of the icon set. While using icon sets, cartographers and icon designers must always question their choice of symbols and assess their hidden meanings and potential impacts. This is particularly important for bodily symbols, especially when they are provided for easy download out-of-the-box. In using an icon set like Maki, understanding your selection is imperative, but it is equally important to explore the iconography and research the organization providing it. Who are the stakeholders involved? Do they have documentation supporting their workflow? Have their icons changed over time and if so, how? Who is included in the design process and who is included in the icon depictions? What assumptions are baked into their designs? Do they provide multiple icons for the same thing? Feminist icon selection requires intentional, reflective, and transparent decision-making.

Designing individual icons with bodies brings feminist theoretical principles like power, context, embodiment, binaries, and empowerment into practice. Power is central to feminist theory and icon design. Feminist theory aims to reveal, question, and challenge power structures that are too often invisible and marginalizing. Power was particularly evident in the design of the

police icon. The direct relationship between its sign-vehicle and referent (*body–body*), its detail, and posture exemplify societal power structures through its design. A feminist redesign of this icon could examine this power dynamic further or could subvert its power altogether. Figure 29 illustrates alternative design solutions centered on power. The first uses multiple bodies to convey a sense of over-policing and control. The second uses abstract, "x" symbols to tally up encounters with police. The final icon uses a target to expose police power and challenge policing practices in light of police violence.

Cartographic design and the symbolization of bodies in maps are situated practice. Map design is contingent on our context, experience, and positionality. The cartographer decides what to map (and what not to map) and how to convey that information or story. Reflexivity requires us to critically assess the impact of our positionally and be transparent about our decision-making process. The smallest map elements are similarly situated, yet icon sets like Maki are meant to present icons that fit across all mapping contexts. This is perhaps the largest tension within my feminist semiotic analysis. Icons that depict bodies, use bodies to illustrate activities, or substitute bodies with inanimate objects reflect the assumptions and perspectives of the designers that created them. Bodies matter too much to fit across all design contexts.

Feminist icon design further re-conceptualizes icon sets like Maki as a whole which begs the question, what would a feminist icon set include? A feminist icon set blends and expands existing icon set models. As an example, Maki utilizes a Github page to track changes to their icons and solicit icon ideas and edits from a larger audience. The public is asked to "push" changes to their Github archive. While impressively open, there are several barriers to contributing towards the Maki icon set. Github and its "push, pull, clone, commit" jargon are daunting feats for many novice-users. Submitting icons with Maki's specifications requires design "know-how" and technological resources to create pixel-perfect designs in 11x11 or 15x15 pixels.

A feminist icon set could make crowdsourcing easier by incorporating a more user-friendly platform for gathering icons and ideas in whatever form they are designed, whether that is digital, sketch, or descriptive icons. An inclusive, user-friendly platform would empower a broader collective of mappers and designers further supporting icons that relate to more people.

Most recently, Maki has included alternative options for two of their icons (see park, alt park, entrance, and alt entrance in Figure 8). The "entrance" icon is the only Maki icon related to bodies that provides a secondary option. Icon platforms like the Noun Project provide a more pluralistic approach. The Noun Project website allows you to search an icon of choice like "park" and the website gathers numerous design interpretations from various designers. You can then download and incorporate icon designs with attribution to the website and original designer. A feminist icon set could similarly collate a gallery of icons for all referents, not just those related to bodies. This pluralistic approach would in the words of D'Ignazio and Klein (2016) would "move [the icon set] away from its current emphasis on 'objective' presentation in favor of designs that facilitate pathways to multiple truths." Further, a feminist icon set could contextualize each icon submission making space for design explanations, usage, and reflexivity. Who created it and why? What is the icon meant to portray? What does the icon do well and what are its limitations? What design contexts has the icon been used in? A feminist icon set would prioritize context over product, supporting a wider and more inclusive swath of bodied icons available to us.

Conclusion

Icon design needs feminist theory. Feminist icon design poses new questions and design possibilities that prioritize feminist principles, like power, context, embodiment, binaries, and empowerment (D'Ignazio and Klein 2016). In this paper, I apply a feminist semiotic approach to Maki icons—a prominent open source mapping icon set—as one way to understand and

problematize the ways in which bodies are depicted, abstracted, or erased. More specifically, I analyze the techniques utilized in their symbolization, including: the presence/absence of bodily forms, the presence/absence of an embodied object, and the iconicity of a given icon. And while semiotics offers one framework that is arguably too modularized, provides an entry point for understanding the intersection between icon design, bodies, and feminist theory. My feminist analysis reveals the underlying conventions, codes, and ideologies in Maki icons that depict bodies. I argue that cartographers and designers need to rethink the depictions of bodies in map symbolization and the role of "universal" icon sets, more broadly, through a feminist lens.

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Tables

Box 1 (Gillian Rose's Guide to Semiology):

1. Decide what the signs are (see Maki Icons section)
2. Decide what they signify in themselves (see Maki Icons as Signs section)
3. Think about how they relate to other signs (see Maki Icons as Signs section)
4. Explore their connections to wider systems of meaning, from codes to ideologies (see Feminist Discussion section)
5. Return to the signs via their codes to explore the precise articulation of ideology and mythology (see Feminist Icon Design section)

Figures with Captions

Figure 1: Swimming, police, doctor, and square are four icons included in the Maki icon set.

Figure 2: Aggregation is used in this example to group a sample of points into a polygon that approximates the extent of their distribution. If the sample of points represented individual bodies, the individual bodies would be lost to a shaded, homogenous gray polygon.

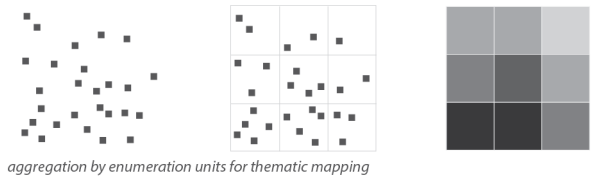

Figure 3: Aggregation is used in this example to group a sample of points into predetermined enumeration units or polygons (like counties). The number of points in each unit can then be counted and shaded as a choropleth according to each unit's value.

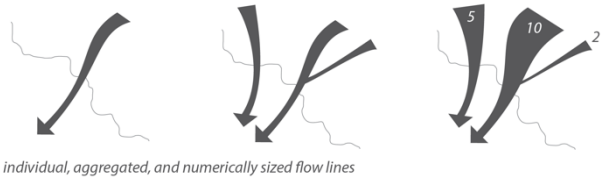

Figure 4: Flow lines are another way of depicting bodies. The single flow line illustrates the movement of one, individual body. The second example shows the movement or paths of many bodies collapsed into single flow lines. The last example resizes the flows lines based on the volume of bodies moving along that path.

Figure 5: In this example, a sample of points or bodies are collapsed into a single point. The "many" individual bodies are erased into "one" point.

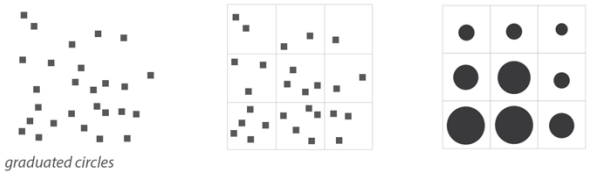

Figure 6: Similar to Figure 3, a sample of points or bodies are grouped into predetermined enumeration units or polygons. After the number of points are counted and assigned to each unit, the points are collapsed into a single point before being rescaled according to their numeric data.

Figure 7: Points can also be depicted to show a one-to-one relationship. In this example, each shape could directly illustrate one individual body.

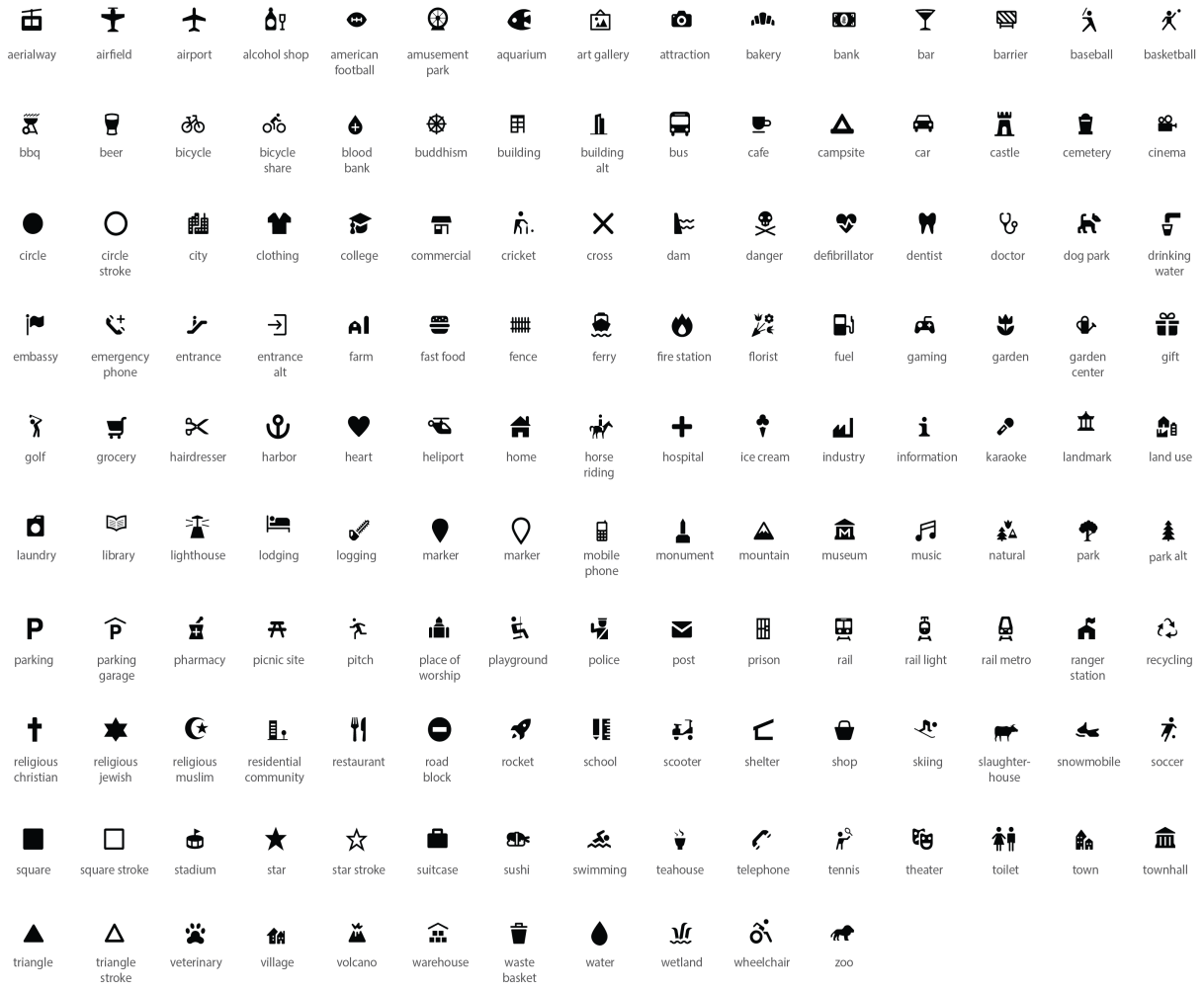

Figure 8: Maki is an open source icon set available for download and use in interactive maps. The icon set consists of 144 icons available at two sizes: 11x11 pixels and 15x15pixels. Icons were reproduced here following "CC0 1.0 Universal" status (Maki 2019).

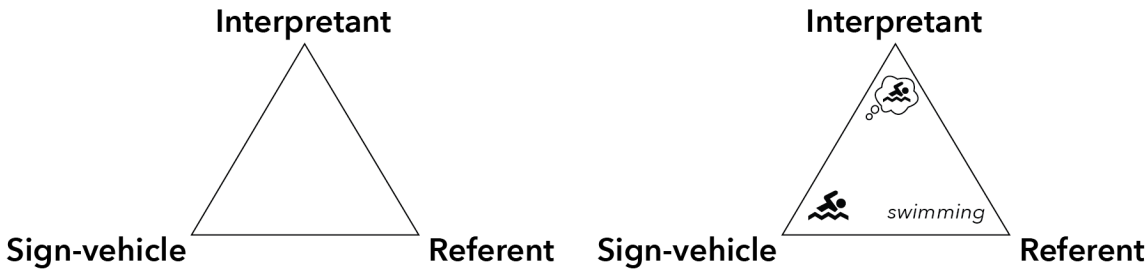

Figure 9: Triadic sign model includes a referent, interpretant, and sign-vehicle. In this example, the referent is the object (swimming), the interpretant is the mental conception of the object, and the sign-vehicle is the graphic depiction, in this case the swimmer's body.

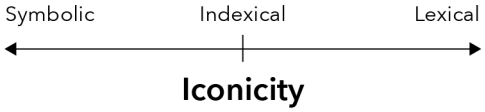

Figure 10: The iconicity continuum is used to show the level of abstraction and the level of detail in given icons. Symbolic icons are heavily abstracted compared to lexical icons that are a 'piece' torn from reality. Indexical icons show very mimetic or iconic shapes.

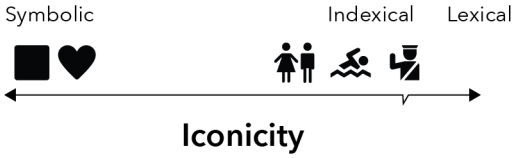

Figure 11: The square and heart icons fall towards the symbolic end of the continuum. A majority of the icons illustrate indexical designs. In this paper, I argue that the police icon is the most detailed and indexical icon within the set. None of the Maki icons show lexical relationships in their designs.

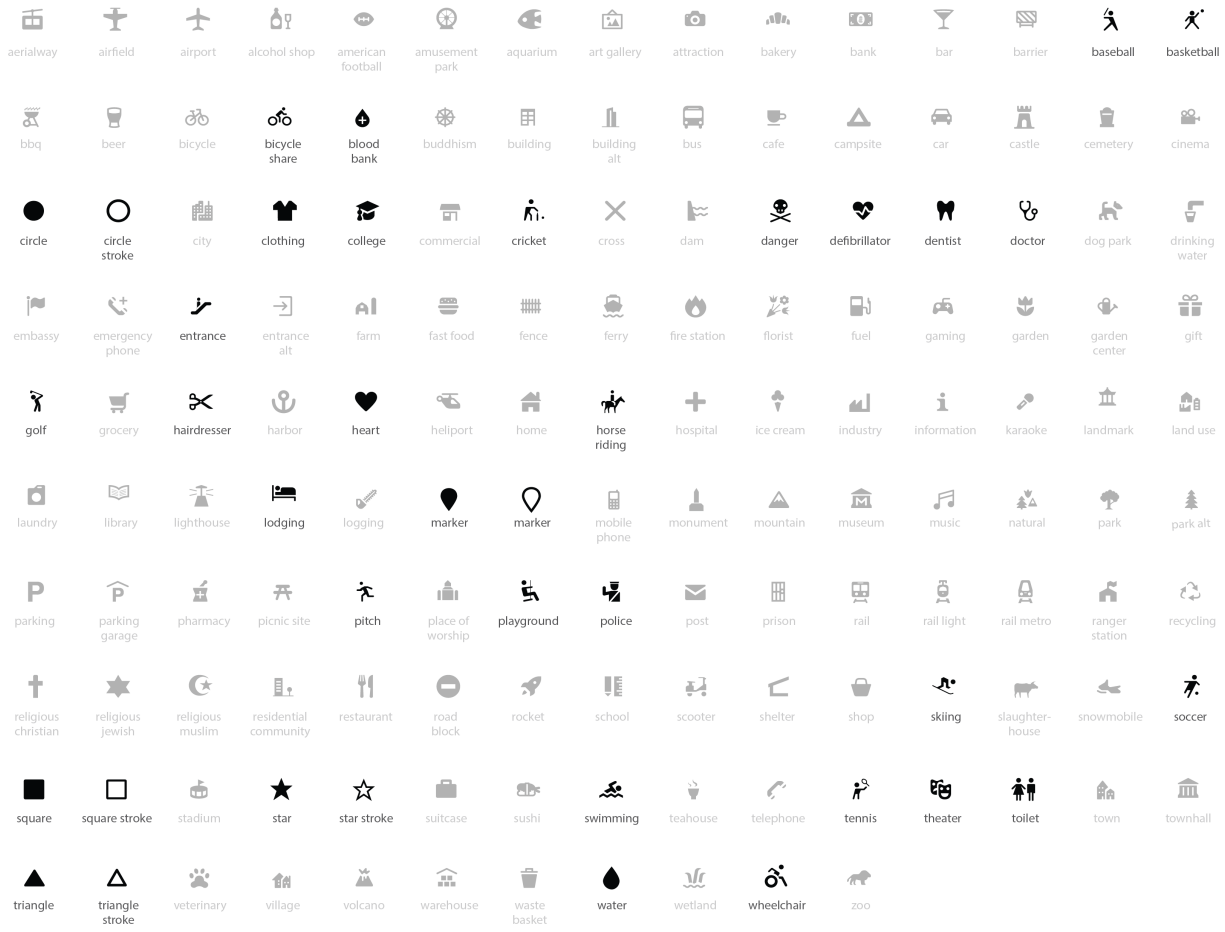

Figure 12: Maki icons that depict bodies directly, utilize bodies in their symbolization, or could be used to indirectly or abstractly depict bodies are highlighted in black. These 38 icons were used in my feminist semiotic analysis.

Figure 13: The sign-vehicle continuum specifies the degree to which a body is present or absent within the graphic symbol.

Figure 14: The police officer is placed on the right side of the sign-vehicle continuum because a body is present within its design. The stethoscope is inversely placed along the continuum because it lacks a body. The tooth and heart icons are placed somewhere in-between.

Figure 15: The referent continuum notes whether or not a referent (object) relates to bodies. I rely on Maki's designations for each icon's referent.

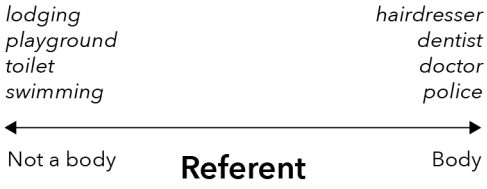

Figure 16: Lodging, playground, and toilet do not directly refer to specific bodies. In contrast, hairdresser, dentist, doctor, and police refer to bodies, specifically working bodies.

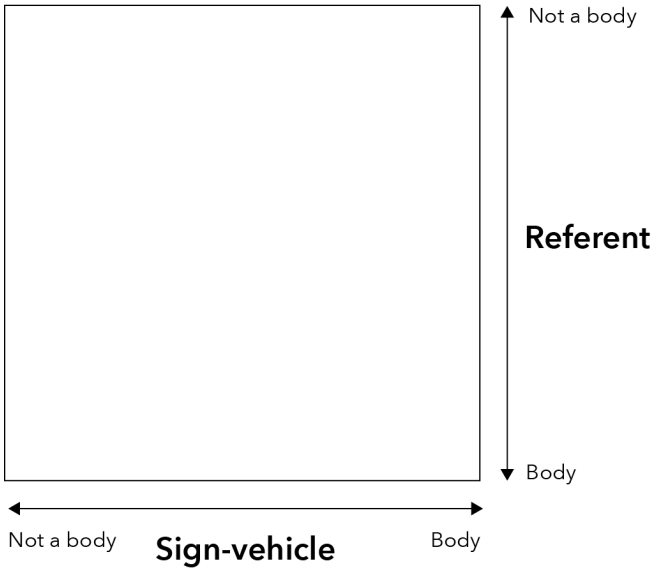

Figure 17: The cartesian grid combines the sign-vehicle and referent continuums. The corners of the grid present sign-vehicle and referent pairings that I refer to throughout my feminist semiotic analysis: *body–body*, *body–not a body*, *not a body–body*, *not a body–not a body*.

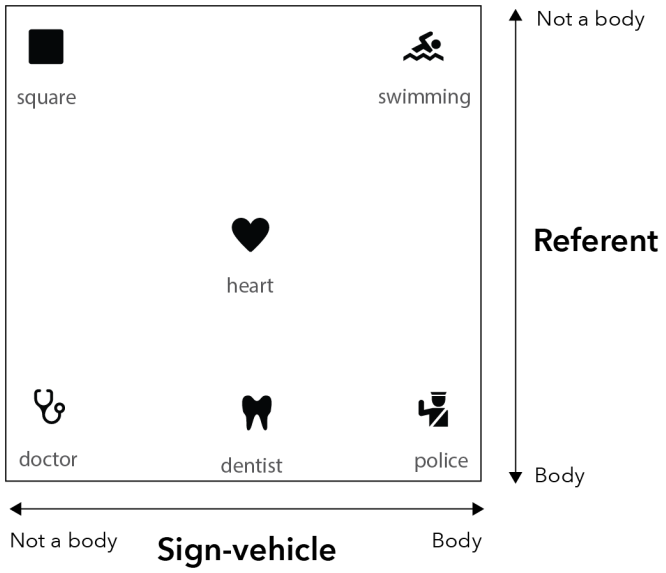

Figure 18: Maki icons are placed within the cartesian grid in this example. Specific icons in the corners illustrate particular sign-vehicle and referent parings like *body–body*, *body–not a body*, *not a body–body*, *not a body–not a body*. The police icon, for example, refers to a body in its referent and incorporates a body as its sign-vehicle. As such, this icon is a *body–body* icon.

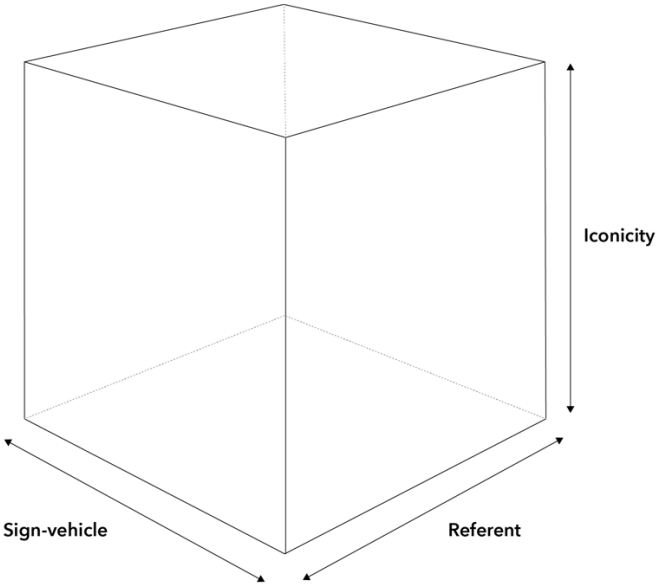

Figure 19: This three-dimensional cube presents the conceptual framework for feminist semiotic analysis by combining the cartesian grid in Figures 17 and 18 with the iconicity continuum in Figures 10 and 11.

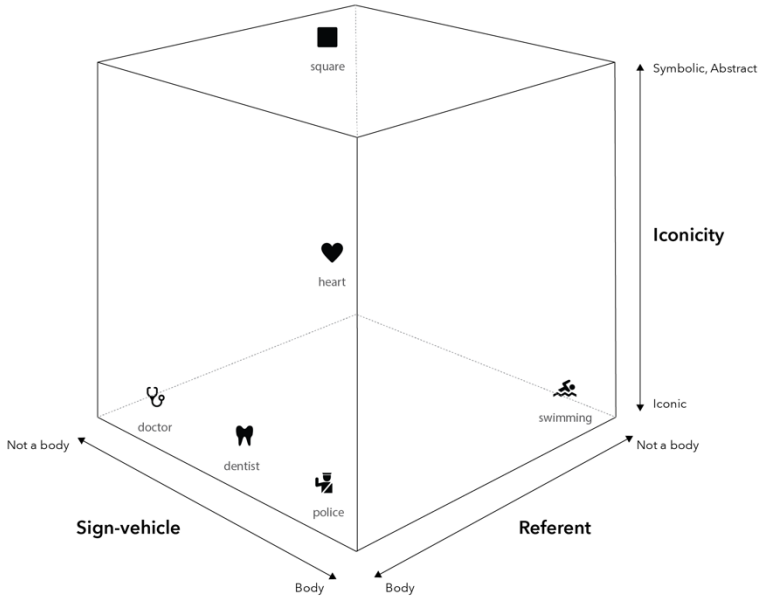

Figure 20: Icons are placed within the conceptual framework for feminist semiotic analysis. I use this framework as an organization tool and visualization method to better understand the relationships between icons, bodies, and feminist theory.

Figure 21: Maki police icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 22: Maki doctor icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 23: Maki hairdresser icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 24: Maki dentist icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 25: Maki swimming icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 26: Maki’s soccer icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 27: Maki’s toilet icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 28: Maki’s square icon reproduced following “CC0 1.0 Universal” status (Maki 2019).

Figure 29: Alternative icon designs for police that draw on and subvert power.