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Researching visual semiotics online

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Abstract: Analyzing visual meaning online and curating digitized images are topics of increasing relevance, but many potential methodologies for doing so remain merely implicit, underthematized, or unexplored. The potential for testing and developing semiotic theory through the exploration of visual data online also requires far more careful attention. In response, this paper provides an integrated, reflexive, Peircean account of two case studies featuring research projects focused on visual data drawn primarily from sources online, relying heavily on Google Image Search as a data collection tool. The first study illustrates the comparative analysis of brand mark logos to test and refine a theory of embodied semiotics involving oppositional relations. The second study illustrates the comparative analysis of images depicting the Tibetan Wheel of Life and Yama the monster of death, in order to test the embodied grounding hypothesis for the semiotic square. Issues of hypothesis formation, research parameters, data collection, database construction, operationalization, coding parameters, open data archiving and related issues are addressed in order to further develop and encourage practices of researching visual semiotics online in the context of Digital Humanities scholarship.

Keywords: Mixed-methods research. Google Image search. Visual content analysis. Semiotic theory. Semiotic methods. Peircean semiotics.

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Pesquisando semiótica visual online

Resumo: Analisar significado visual online e realizar a curadoria de imagens digitalizadas são tópicos de crescente relevância, mas muitas metodologias potenciais para fazê-lo permanecem meramente implícitas, subtematizadas ou inexploradas. O potencial para testar e desenvolver a teoria semiótica por meio da exploração de dados visuais online também requer atenção muito mais cuidadosa. Em resposta, este artigo fornece um relato integrado, reflexivo e peirceano de dois estudos de caso que apresentam projetos de pesquisa focados em dados visuais extraídos principalmente de fontes online, baseando-se grandemente no Pesquisa de Imagens do Google (*Google Image Search*) como ferramenta de coleta de dados. O primeiro estudo ilustra a análise comparativa de logotipos de marcas para testar e refinar uma teoria da semiótica corporificada envolvendo relações de oposição. O segundo estudo ilustra a análise comparativa de imagens que retratam a Roda da Vida Tibetana e Yama, o monstro da morte, a fim de testar a hipótese fundamental da corporificação para o quadrado semiótico. Questões de formação de hipóteses, parâmetros de pesquisa, coleta de dados, construção de banco de dados, operacionalização, parâmetros de codificação, arquivamento de dados abertos e questões relacionadas são abordadas a fim de desenvolver e encorajar práticas de pesquisa semiótica visual online no contexto dos estudos acadêmicos em Humanidades Digitais.

Palavras-chave: Pesquisa de métodos mistos. Pesquisa de imagens do Google. Análise de conteúdo visual. Teoria semiótica. Métodos semióticos. Semiótica peirceana.

Introduction

The open, comparative nature of semiotic inquiry is well suited to massively interconnected, collectively constructed online world. In this virtual realm of overlapping semiospheres, context, connotation, and content are constantly shifting and visual layers of meaning negotiation prevails. Digital images, text, emoji, video, animation, layout, hypertext, and interface all interact and integrate relative to the habituated experiential aims of embodied interpreters, who are themselves acting and reacting in dialogue with the designs and ends of content creators and the interests of their financial underwriters. In the process, countless records and virtual traces are created that offer insight into natural phenomena, cultural phenomena and cognitive processes. A variety of approaches to the study of visual signs and meaning online have emerged across the past two decades, ranging from the close analysis of webpage layouts, to the automated analysis of aggregate data, and others in between (see e.g., Kress; Van Leeuwen, 2006, Cara, 2018, Margolis; Pauwels, 2011, O'Halloran, 2015). Many additional methodologies wait to be developed and/or generalized; but many of those already in use are only partially described or seem inaccessible to researchers without advanced training in computer science and proprietary software. Addressing gaps like these is important for the development of semiotic methods suitable for a wide range of researchers, including digital humanists, cultural theorists, and semioticians proper.

In response, I select one such underthematized methodological focus in this paper: the use of online image search tools like Google Images[2] to research questions concerning human culture and cognition. My thesis and purpose in doing so is twofold: (1) to demonstrate for entry-level researchers, and for experienced researchers whose work has previously

2 google.com/imghp. As I discuss later in the paper, many researchers are already beginning to use Google Images search for carrying out empirical research, but studies that do so typically either omit semiotic theory altogether or focus their application of semiotics exclusively on social semiotics. And even the latter approaches lack systematic guides to methodology for doing so, with the notable exception of Pritchard (2020).

fallen outside the digital realm, specific ways in which systematic empirical research of visual semiotics online is already within reach, without the need for special software and/or programming skills and (2) to provide a more flexible training guide for anyone interested to apply and adapt such methods for their own ends. In the process, I provide a state-of-the-art snapshot of studies that are already using Google Images as a data collection tool, and I sketch out a step-by-step reconstruction of two of my own research projects that rely on this tool for data collection. Both cases represent ongoing research projects driven by cognitive semiotic questions—attempting to better understand and explain phenomena that arise at the semiotic intersection of anthropology, linguistics, philosophy, history, ideology, kinesiology, and embodied cognition. Both cases are also germane to the digital humanities since each necessarily entails the creation and curation of novel digital collections that may eventually be of use to other researchers.

First, it will be helpful to review the background relations and distinctions surrounding such research in order to better appreciate the ways in which qualitative research methods, like visual content analysis, map on to multimodality research, among other connections. Following this discussion, the third section of the paper provides an orientation to the cross-disciplinary literature using online image search tools for data collection and analysis. This also allows for the definition of a gradient cline of practices from the tacitly semiotic to the more overtly semiotic uses of image search tools. The two central sections of the paper then detail one case study each. In the first, I present methods used in the comparative analysis of brand mark logos to test and refine a theory of embodied semiotics involving oppositional relations. In the second, I detail methods used in the comparative analysis of images depicting the Tibetan Wheel of Life and Yama the monster of death, in order to test the embodied grounding hypothesis for the semiotic square.

I then follow up on themes that emerge from these two case studies and clarify a synthesized, step-by-step summary of methods for application to analogous research questions elsewhere. Issues of hypothesis formation, research parameters, data collection, database construction, operationalization, coding parameters, open data archiving and related issues are systematically addressed in order to further develop practices suitable for researching visual semiotics online in the context of digital humanities scholarship. In the penultimate section, I discuss issues of open data archiving, along with metadata and coding curation. The paper then closes with a summary discussion of findings and suggestions of further development.

Visual Content Analysis: background relations and distinctions

To better appreciate the relevance and situation of this methods-oriented paper, it is helpful to review a number of interrelated approaches to qualitative and mixed-methods research that intersect with theories and methods of visual semiotics and with semiotic approaches to the visual research online, with a special focus on a qualitative method known as "visual content analysis".

First, it is helpful to consider relationships between qualitative research and semiotic inquiry. Textbook surveys of qualitative research methods often pigeonhole semiotics, mapping the study of signs and meaning primarily onto (post)structuralist frameworks premised on the identification of oppositional relations between cultural concepts (see e.g., Grbich, 2013, p. 169-175). Some textbooks in applied semiotics also favor such approaches (e.g., Hébert, 2020). These approaches to semiotics are useful and valid, but they are not the sum of semiotics. General semiotics is more broadly oriented to the development of theories and methods of sign systems, meaning, and communication that address all levels of human experience and understanding. General semiotics also attempts to integrate theories and methods across disciplines, seeking valid ways of mapping between human conceptual systems and the biological dynamics from which these systems have evolved (Sebeok, 2001; Cobley, 2018). The theoretical infrastructure for this more general approach grows primarily from the thought of Charles S. Peirce (1839–1914) who integrated the logical study of sign systems with an inquisitive, open-ended pragmatist philosophy in which thought and action are necessarily intertwined. For Peirce, knowledge is always incomplete and human inquirers are always fallible; but, since everything is assumed to be related to everything else, however remotely, it is possible to discover incrementally the truth about things, especially when working in dialogue with various communities of inquiry.

A general approach to semiotic inquiry, then, attempts to be methodologically open (seeking to integrate instead of isolate), theoretically aware (probing critically and reflexively), logically rigorous (being tied in some way to systematic sign theory), and practically oriented (allowing new results of thought, observation, and experiment to change one's behavior and beliefs). In fact, many approaches to qualitative inquiry are vaguely or partially semiotic without registering the connection. This is true, for example, of Grounded Theory approaches (Glaser; Strauss,

1967), hermeneutic methods (Bernstein, 1983), phenomenological inquiry (Groenewald, 2004), ethnographic inquiry (Wolcott, 2008), content analysis (Krippendorff, 2004), and methods of triangulation (Webb *et al.*, 2000). Indeed, such approaches often influence each other or are found to overlap substantially when compared.

Such approaches are also often independently compared to detective work, and it is here that a unifying theme emerges. A successful detective must pursue an open line of inquiry by following up on clues (many of which will be false leads) to build a case with mounting evidence until some testable conclusion can be reached. The level of inquiry that guides this process more than any other is something Peirce classifies as "abductive reasoning", otherwise known as "guesswork". And this is the overarching theme which situates qualitative inquiry within C. S. Peirce's general semiotic: a point made best by Thomas Sebeok in an essay comparing Peirce to Sherlock Holmes (Sebeok; Umiker-Sebeok, 1983).

With these connections in mind, the embattled distinction between quantitative and qualitative research becomes inconsequential. A blend of quantitative analysis is often useful at some level in a qualitative study, and in the case of quantitative research, the admission of qualitative guesswork (qua conceptualization, mediation, interpretation, etc.) is inescapable if the findings in question are to mean anything at all. This is just as true of visual research methods as it is of methods that focused on text and speech. Nonetheless, the quant/qual distinction remains influential in the description and classification of visual research methodologies (see, e.g., Lobinger, 2017).

Of the many methods one might use to study phenomena in the visual domain (see e.g., Margolis; Pauwels, 2011), the method most germane to this paper is known as "visual content analysis" (vca). Bell (2004, p. 10) defines vca as "the explicit, quantifiable analysis of visual content as a research method". vca is a mode of empirical research based on patterned observations that lead to classifications of categories that can be explicitly defined (i.e., "operationalized") between a set of images that belong to some pre-defined common class. Observed patterns are then tabulated, quantified and compared in order to test, refine and generate hypotheses relevant to one's research questions. vca is often used, for example, to analyze trends in magazine covers. Numerous longitudinal studies of magazine covers use vca to discover and interpret evidence for cultural shifts (Bell, 2004; Wu, 2015; O'Halloran, 2015, p. 402-403) by paying attention to such variables as light and colour, proxemics, cloth-

ing choices, footwear, and the interaction of text and image in order to better understand specific cultural dynamics. Depending on the scope of a given question and the size of a given dataset, VCA approaches range from mechanized/algorithmic processing (O'Halloran, 2015; Worring; Snoek, 2009) to manual analysis of more manageable datasets (e.g., Bell, 2004; Wu, 2015).

VCA is a semiotic method, but systematic links with semiotic theory are often neglected by researchers who apply the method and by the qualitative methodologists who describe it. Notably, from a Peircean semiotic perspective, the method relies on the successful comparative observation of visual iconic signs: patterns of observed resemblances between things. According to Peirce (1903, CP 2.276–277), materially grounded icons such as those in the visual field can be distinguished from more general iconic signs by being designated "hypoicons". These, in turn, can be further subdivided into a threefold relation between image, diagram, and metaphor: i.e., the image itself, its diagrammatic relations, and its meaning potential. For purposes of VCA, diagrammatic relations are focal: the intra- and interrelationships between part–whole membership sets. Other links between semiotic theory and VCA (see Hunter, 2015) include the analysis of connotative vs. denotative meaning (following Barthes, 1964, 1970) and the integration of Peircean semiotic to explore aspects of connotative meaning as iconic (resemblance-oriented), indexical (cause/effect-oriented), and symbolic (convention-oriented) meaning in a given image.

Visual image analysis is not the exclusive focus of VCA however. Practitioners are usually just as interested in text and context, insofar as they relate to an image in question and its broader set. Because of this, VCA is a semiotic enterprise in another sense as well: i.e., by attending to relationships between different styles of communication. While many researchers have begun calling such research "multimodal", following Kress (2010), others hold that this term is too ambiguous (Zlatev, 2019) or argue that it should be reserved as a description of the sensory modalities (sight, hearing, taste, touch, smell) as distinct from modes of communication (Stampoulidis, 2019). In line with such critiques, it would be more accurate instead to refer to VCA as a "polysemiotic method". Nonetheless, the term "multimodality" is still very much in vogue and on the move (Wildfeuer, 2019); so it cannot be easily discounted or discarded.

Following the advent of personal computers and the public accessibility of images online, VCA has come to be focused on predominately digitized visuals, which has led to its relevance for "multimodal digital se-

miotics" and "multimodal digital humanities" (O'Halloran, 2013, 2014, 2015; Ravelli; Van Leeuwen, 2018). As O'Halloran (2015) points out, multimodal (i.e., polysemiotic) approaches to digital research and data curation hold much promise for the ongoing development of the digital humanities, as do semiotic applications in general. I return to this point later in the paper. For the time being, it will be helpful to further situate VCA in the context of applied semiotics and image search applications online.

Applied Visual Semiotics and Google Images Search

Google Images search is already in widespread use as an empirical research tool in projects exploring questions from media/culture studies, the digital humanities, and many other fields besides. In this section I provide a brief survey of the ways in which online visual search engines like Google Images are being used for large-scale empirical analyses across an array of disciplines. I then situate such work within the domain of applied general semiotics and provide a sketch of visual content analysis as a semiotic method when using Google Images as a data collection tool.

Google consistently leads other online search engines with a market share of more than 70% (NMS, 2020), making the Google Images search tool a popular choice for browsing, searching, and researching images online. While its most common use is for ad hoc image searches and image browsing, systematic research applications are now flourishing. Even so, few published studies used the tool as a methodology prior to 2015.

In order to capture a snapshot of the methodology as it is emerging, I undertook a standard bibliographic database search to identify research studies using the key term "Google Images" and "Google Image search". I then manually controlled for studies referencing the search engine in a non-methodological capacity. This resulted in the identification of 24 published journal articles that use the search engine as a key component of their visual research methodology. The results point to a genuinely nascent methodology, with all studies but one being published between 2014–2020. The earliest study known to adapt Google Images search for a visual research methodology is Rodriguez e Asoro (2012).

This set of 24 articles represents a dozen or so different fields, including agriculture, general biology, computer science, geography, health and medical sciences, intercultural relations, linguistics, maritime studies, marketing, neuroscience, and sociology, with many studies involving

interdisciplinary inquiry. Research questions are also diverse, including topics involving critical race studies (Maneri, 2020), border tourism (Hunter, 2015), political cartoons (Dolatabadi; Tari, 2019), reproductive health (Chatterjee, 2018), otoscopic image display (Crundwell *et al.*, 2015), otoscopic diagnosis (Livingstone; Chau, 2020), midwifery (Bowden, Sheehan; Foureur, 2016), representation of trans surgery (Marshall *et al.*, 2018), burn diagnosis (Pridgen *et al.*, 2019), public perception of occupational therapy (Walsh, 2018), directional bias in sagittal brain representation (Wiseman; Owen, 2017), comparative-linguistic conceptualizations of morality (Yu, Wang; He, 2016), genetic engineering (Rodriguez; Asoro, 2012), *in vitro* meat production (Stephens; Ruivenkamp, 2016), spatial patterns of phenotypic traits in wild animals (Leighton *et al.*, 2016), interspecific animal behaviour in the wild (Mikula *et al.*, 2018), variation in fish coloration during breeding season (Atsumi; Koizumi, 2017), anti-branding communication (Kucuk, 2015), gender arrangement in high profile social organizations (Velasquez, 2016), machine learning of object categories (Liu, Shi; Shi, 2014), machine learning of agricultural categories (Wspanialy, Brooks; Moussa, 2020), machine learning of ship detection and classification (Kim *et al.*, 2018; Lorencin *et al.*, 2019), and river bank erosion (Bandyopadhyay, Ghosh; De, 2014).

As discussed above, all such studies are implicitly semiotic; though the vast majority (71%, n=17) make no explicit reference to (or application of) semiotic theory, with few even managing to frame discussions of their methodology in terms of content analysis (two exceptions being Walsh (2018) and Rodriguez e Asoro (2012). And while the remaining seven studies attempt to address semiotic questions overtly, approaches vary. Four (Bowden, Sheehan; Foureur, 2016; Chatterjee, 2018; Maneri, 2020; Stephens, Stephens; Ruivenkamp, 2016) apply principles of multimodal discourse analysis drawn from Social Semiotic theory (Kress, 2010); one study applies semiotic theory drawn from both Barthes and Peirce (Hunter, 2015); one engages in semiotic discussion with no clear application of specific theories (Kucuk, 2015); and one applies conceptual metaphor theory from cognitive semantics (Yu, Wang; He, 2016). The final instance can be counted as a cognitive semiotic theory.

These findings represent the current state-of-the-art in using Google Images search as an empirical research tool. Approaches tend to vary widely between sources, and most studies appear to be theoretically under-informed. Furthermore, as Pritchard notes, due to "Space restrictions in typical empirical publications [...] methodological accounts are often

too brief to serve as a guide" (2020, p. 297). In response to these gaps, Pritchard (2020) proposes a structured, systematic methodology for researching web images informed by "compositional, reflexive and semiotic analysis". She refers to the approach as "combined visual analysis" (CVA). Pritchard's CVA methodology arises from, and is focused on, a human resource management context. In this context it is "pertinent to ask how HRM can be seen via the images used in its representation and what this means for the representation of people at work." The resulting methodology is shaped by this focus in ways that enable systematic discussion but limit broad applicability. This focus also influences Pritchard's selection of social semiotics as a theoretical paradigm. She recommends that this specific approach to semiotic analysis should be applied as a third-stage layer of interpretation, preceded by two earlier stages of categorization and thematic analysis, each of which asks specific questions (2020, p. 299):

1. Compositional Category: What are these images of?

2. Compositional Theme: How are these images constructed?

3. Semiotic Analysis: What might these images mean?

Under each stage, Pritchard recommends that a four-part process of "Readiness", "Recognition", "Refinement", and "Reflection", should be undertaken, covering everything from data collection and categorisation to critical analysis and reflexive questioning.

Pritchard's CVA approach is admirably systematic and may work well for those with research questions and temporal limits similar to her own. For broader research questions, with more exploratory aims, and more open-ended, longitudinal time frames, a similarly systematic guide to alternative approaches would be useful. Since it is impossible for any methodological description to account for all project variation, a comparative account is more likely to flesh out and illustrate which aspects of such an approach are more flexible and which are less-negotiable. For this reason, I discuss two empirical case studies in the following two sections. Both represent ongoing research projects, and both are focused on diagrammatic part-whole relations within and between images. Both studies are also focused on cognitive semiotic questions, asking what stylized depictions of human bodily forms can tell us about the evolution and meaning of human cognition. In the process, I identify a three stage, nine-step iterative process that allows for both open exploration of complex datasets and rigorous empirical testing:

1. Abduction
    a. Questions & Hypotheses
    b. Observations & Conceptualizations
    c. Revisions
2. Deduction
    a. Data Parameters & Operationalization
    b. Data Collection & Input
    c. Revisions
3. Induction
    a. Database Development & Coding
    b. Database Analysis & Interpretation
    c. Revisions

Instead of somehow relegating semiotics to a third phase, this model is semiotic through and through, and each stage is also interwoven, virtually and actually, with every other stage. For this reason, the Peircean Abduction-Induction-Deduction schema is particularly fitting. According to Peirce, whether they are involved in logical abstraction or empirical inquiry the triadic categories are always interdependent in spite of their irreducibility. The repetition of "Revisions" at each level is as much an acknowledgement of the necessary interweaving of the three modes of inquiry as it is an acknowledgement of the Fallibilist nature of inquiry in general: a process requiring ongoing interpretation and reinterpretation in relation to processes of infinite semiosis.

Case Study 1: comparative X-Posed Brand Marks

Primary Phase: Abduction. The first case study grows out of broader interests in the exploration of open-ended, interrelated questions surrounding embodied semiotics, symmetry theory, and the nature of oppositional relations in human cognition. Among the many miscellaneous notes related to these topics that I continue to file away informally in a general database[3] for possible future exploration, I began to incidentally amass a small but curious collection of brand-mark logos featuring sym-

3 I personally tend to use Microsoft OneNote for this purpose until a collection becomes unmanageable—a good sign that a more formal, systematic research project is called for.

metrically (or quasi-symmetrically) designed human figures doing full body X-poses, also known as "spread-eagle" formation. I didn't know what to make of these tokens but found them intriguing and potentially worth looking into further down the road. As the collection grew incrementally from 2011–2014, based on chance discoveries, a number of questions began to emerge regarding variations and contextual associations. Some tokens were sub-divided at the waist; others were subdivided along the sagittal plane; others were fully integrated; some featured props or internal design elements (see Figure 1).

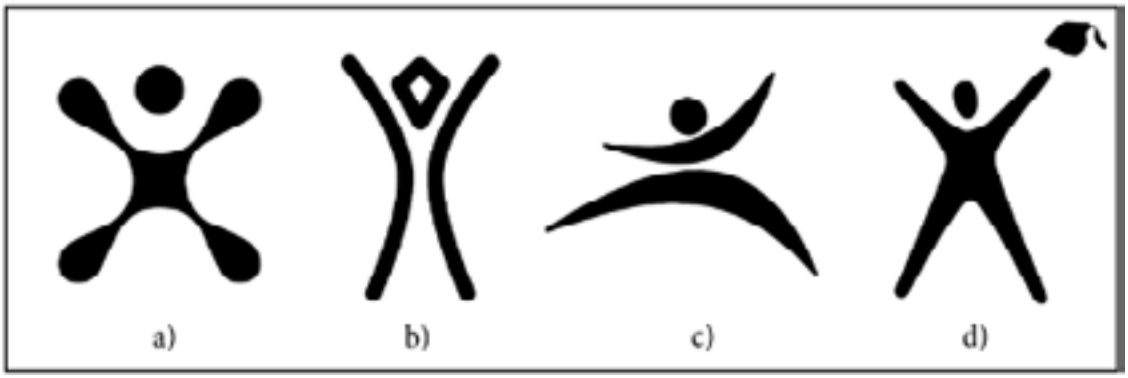

Figure 1. X-posed logo exemplars: (a) Cingular Wireless logo (2000-2008: United States); (b) Burning Man logo (Nevada, USA) Jump4Joy logo (Netherlands); (d) Avid logo (USA).

Would a larger sample reveal tendencies in favour of one or another of these design elements? Would these preferences map onto contextual semiospheres in some way? Then there were questions of the semiospheres themselves: What kinds of businesses used these logos? Did the logos have dominant thematic or semantic fields? Were certain kinds of corporations or services represented more than others? I decided that a more formal study featuring a larger sample set of these designs was in order. The research tool of choice? Google Images. The goal? To build a database of 100 to 200 exemplars suitable for statistical cross-tabulation for generating, testing, and refining hypotheses related to these representations of human embodied form. The database in question remains open, but most data under discussion in this section I added during an intensive two-year period of research, from 2015–2016.[4]

Secondary Phase: Deduction. Prior to beginning the Google Image search process—or, rather, part and parcel with the early process of doing so—it was necessary to define what should and should not constitute a suitable exemplar; otherwise, the objects under investigation would have no grounds for valid comparison and any resulting studies would lack ori-

4 During a crucial four-month stretch of data collection in 2016, my efforts were aided by Sean Murray, a MA research assistant funded by the Ryerson-York Graduate Program in Communication and Culture.

entation and focus. The deductive process in question is often discussed as "operationalization". As I describe in a preliminary write-up on findings from the database (Pelkey, 2017b, p. 67), two key criteria emerged for operational screening of individual cases in this regard: One functional, the other structural:

1. Functional Criterion for Inclusion: Actual Usage. *The logo in question must be in actual use by a functioning, registered organization (whether for-profit or not-for-profit, presently or historically), as either a product brand mark or corporate brand mark.*

2. Structural Criterion for Inclusion: Singular Posture Type. *The logo in question must include a solitary (one and only one), spread-eagle human form, including identifiable representations of head, arms and legs, with arms raised and legs parted at obtuse angles relative to the vertical axis of the torso.*

These criteria allowed for the inclusion a range of valid cases while setting clear screening limits for excluding non-valid cases from the database. The first criterion excluded the endless supply of mere stock graphics or concept designs available online while helping to ensure that each logo being compared would be situated within its own semiosphere of associations, allowing for robust comparisons of actual semiotic variables. The second criterion defines the posture itself and distinguishes it from related postures or multiple performances of the same posture within a single logo.

Data collection proceeded hand-in-hand with the definition of these criteria during its early stages, requiring the exclusion of some data that had initially been included. Once operational screening criteria were clearly established, Google Image searches also became increasingly systematic. Early searches used linguistic keyword searches such as "X logo", "happiness logo", "pain logo", following up on semantic domain clues generated from collected data. As particular professions began to surface, these were added to keyword searches, including "extreme sports logo" and "chiropractor logo". Since the goal of the database was to identify and as many valid exemplars as possible, there was no reason to artificially define search strings in advance. Instead, new thematic findings generated new potential search strings. As the database grew, keyword searches transitioned to reverse image searches, allowing Google's image matching algorithm to search for images with visually similar features. Carrying out searches in a private browsing mode with cookies disabled proved

to be important for ensuring new search criteria were not being filtered through earlier search criteria. This process proceeded until no new valid images were being returned in search results. Using these methods, the database grew to include more than 200 exemplars. Metadata collection proceeded hand-in-hand with the addition of new cases to the database, with all information being added to a single spreadsheet, inclusive of with the following potential variables:

1. Logo Code: A unique abstract identifier for each case that matches the filename of its namesake
2. Logo Name: A shorthand term or phrase to identify the represented company or product
3. Domain 1: An upper-level thematic domain for classifying the logo relative to others
4. Domain 2: A thematic subdomain for classifying the logo relative to others
5. Primary URL: The original, principal access URL situating the logo in its contextual website
6. Date: Specifying when the logo was added to the database
7. Status of Use: Whether or not the logo has been discontinued in spite of historical usage
8. About Us URL: Web link to the About Us page describing the company or product in question
9. Country of Origin: Nation state in which the company using the logo is located
10. External URL: Any auxiliary website with relevant information about the company or product
11. Slogan/Tagline 1: Brief phrase used in marketing the product or company online
12. Slogan/Tagline 2: Secondary marketing slogan (if applicable)
13. Executive Summary: Longer statement of company/product values and purpose

14. Logo Name: Proper name used by company to identify and discus its logo (if applicable)

15. URL About Logo: Web link to page discussing logo directly (if applicable)

16. Notes: Any additional points of clarification or context useful for interpretation

Tertiary Phase: Induction. The third interrelated phase of inquiry involves actual data analysis: the testing of hypotheses and interpretation of results. This requires the selection of codeable variables from existing data and metadata, and further classification of figures based on observable features in order to generate cross-tabulations that could be reported as general statistics and trends or calculated to discover contingency coefficients. These results, in turn, serve as evidence for making higher-order hypothesis related to broader meanings and more general relationships with findings elsewhere. For this phase of the X-Posed Brand Mark project, the process also involved working in dialogue with a research team to establish perceptual dimensions of contrast in the data and to begin to test cross-coder reliability.

In practice, this meant that each logo in the database needed to be analyzed relative to a set of select variables in a process that can be classified as visual content analysis (VCA: see earlier discussion in Section 2). For purposes of this case study VCA variables could be textual, thematic, conceptual, morphological, and/or anatomically symmetrical. Fifteen dimensions of contrast emerged through processes of team discussion and open-coding, including many of the variables introduced above along with seven coding variables related to the anatomical planes and symmetrical or asymmetrical dimensions of contrast drawn from human physiology and theories of plane pattern analysis (Washburn; Crowe, 1988, 2004; Marsden; Thomas, 2013). Although much more analysis waits to be carried out using this database, preliminary results (pending further data collection and coding) suggest a number of remarkable findings that lend themselves well to interpretation against a broader backdrop of connections in a larger study, as reported in Pelkey (2017b, p. 63–83). Morphologically speaking, a clear typology of patterns emerged, emphasizing the organizing influence of the anatomical planes (as illustrated in Figure 1).

Thematically speaking, at-risk demographics (e.g., children, youth, refugees, the poor, the elderly) and risky behaviours (e.g., gambling addiction, extreme sports, electrical services, insurance providers) both

emerged as salient themes motivating the use of spread-eagle logos. Extreme experiences of both pain and pleasure were also found to be well-represented, with health-and-wellness-oriented companies being the most frequently represented and with chiropracty emerging as the best represented occupation in the database. A full 30% (n=60) of logos represent chiropractic clinics, where people with extreme pain go for extreme procedures for pain relief. Clues such as these all provide further evidence of the posture's associations with extremes and reversals. Such findings also provide supporting evidence for better understanding the meanings and origins of this full body posture, along with the ways its memory traces and conceptual mappings serve to inform human cognition.

Case Study 2: comparative Yama Bhavachakra Mandalas

Primary Phase: Abduction. The second case study under consideration here grows out of the same network of research questions surrounding the semiotics of embodied patterns as the first. I refer to this ongoing line of inquiry as "embodied pattern grammar"; but, instead of looking to contemporary brand marks found primarily in western corporate culture for clues, however, this case study shifts the focus to a more historically oriented visual symbol system or model that emerges in a decidedly non-western context: Tibetan Buddhism. The model in question is a sacred didactic mandala or Bhavachakra featuring the Wheel of Rebirth or *Samsara* being supported by the monster of impermanence, also known as Yama the god of death. I will forego an in-depth description of the model here for the sake of methodological focus; but suffice it to say that these depictions each consist of several indispensable component parts that are organized recursively according to diagram-internal and cultural-internal logical relations. The two most prominent features of the diagram are the monster Yama and the wheel of life itself. My interest in this diagram type, beyond its captivating visual appeal, is the possibility that its internal organizational logic might map onto the logic of the semiotic square of A. J. Greimas (1987). The weight of this possibility in turn would be augmented by the embodied relations of the four-limbed Yama who supports it; and this orientation might provide evidence for testing my hypothesis that the semiotic square is itself an embodied diagram (Pelkey, 2017a).

Figure 2. Yama Bhavachakra exemplars. Left: painted thanka, c.1900, Tibet, via Royal Ontario Museum;[5] Middle: embroidered thanka, c.1800, Eastern Tibet, via Wikimedia Commons;[6] (right) painted thanka (c.1800, Mongolia), via Rubin Museum of Art.[7]

With this hypothesis in mind, I began to wonder whether or not different tokens of this model were robustly consistent in terms of their internal organization between part-whole relations or, alternatively, whether they might be marked by substantial variation. Did organizational schemes differ from region to region or through time? Was variation between diagrams patterned and regular with logical progressions or were differences relatively random? Were there dominant patterns and recessive patterns? The only systematic, historical study of the model (Teiser, 2006) helped orient myself to these questions in some ways but provided few systematic answers. And looming largest of all was the question of the wheel analogy itself. Since a wheel can rotate 360 degrees, one might expect based on the analogy alone that the wheel's internal relationships would be more randomly ordered than consistently ordered. My guess, though, was that this hypothesis would be proven wrong due to the embodied constraints of the monster Yama who provides an organizing frame of reference for the diagram and its observers. In short, the hypothesis was complex, and I had more questions than answers. Indeed, finding answers and testing these hypotheses is still an ongoing process at the time of writing, but I have already taken the next steps.

Secondary Phase: Deduction. In order to begin testing these hypotheses and interpreting my findings, I needed to define parameters. I would also need to collect a preliminary dataset with sample size and scope sufficient to make valid general claims. For the initial phase of the study, my

5 himalayanart.org/items/77565.

6 commons.wikimedia.org/wiki/File:Wheel_of_Existence.jpg.

7 himalayanart.org/items/78.

goal was to collect 100 unique cases using Google Images search in order to reach a reasonable threshold suitable for statistical inference. To get started, I once again began with keyword searches and with the handful of images that I had collected in an ad hoc manner (while focused on other questions) across the span of several years. It soon became necessary to define my operational parameters for what would and would not constitute a valid case.

As mentioned above, my first two criteria were the monster and the wheel. Some version of Yama the god of death needed to be present, with two hands visibly protruding from the top half of a wheel diagram, and two feet visible protruding from the bottom half. The wheel, in turn, needed to be segmented in some visible way to, at least, indicate the various realms into which one might be reborn. While there is much more to most Tibetan wheel of life diagrams than these elements, and while many of these other elements are also important for answering the questions and testing the hypotheses introduced above, these three emerged as the minimal qualifying components needed for operationalizing a valid case and screening for invalid cases.

Once I had amassed a core starter set of 25 cases from both earlier ad hoc collection and new keyword searches (i.e., Bhavachakra, Tibetan Wheel of Life, Wheel of Life), I began to rely solely on reverse image searches for discovering more cases. In this way, I quickly found that my most fruitful results stemmed from collecting further cases on webpages linked from the Google Images search page. In order to document this process of data collection off-site, I found it necessary to a Google Images hit tracking column to my metadata spreadsheet. In this way, I was able to record, for example, that reverse image searches involving image case 3/25 resulted in the collection of 32 new images: 9 from the main Google Images page (3.1–3.9), 20 from a website[8] linked via image case 3.7 (3.7.1–3.7.20), and three from a website[9] linked via image case 3.8 (3.8.1–3.8.3). These records help provide an important layer of transparency useful for validating or scrutinizing the data collection process. I included six other layers of metadata as well for documenting and contextualizing images—many of which may themselves prove to be useful as coding variables in future analyses:

8 himalayanart.org.

9 traditionalartofnepal.com.

1. ID#: Data case identifier
2. Webpage layer tracking: layer tracking coding system to identify embedded page searches.
3. Source: Organization hosting the image online
4. Web link: The source url for locating the image online
5. Country: The nation state of origin (i.e., where the image was created vs. curated).
6. Era: The year or approximate era in which the image was originally produced (if known)
7. Medium: The material and medium used for producing the original artwork
8. Notes: Miscellaneous clarifications including curatorial location of image (if applicable)

Tertiary Phase: Induction. Once I had managed to collect at least 100 unique image cases (the current database stands at 103), it was possible to begin analysing and coding the patterned relationships within and between these images. This was done in preparation for, and co-requisite with, analysis. In other words, as I started to analyze the data, I slowly found that I needed to find answers to a number of new questions, prominently including the following:

1. Realms: how many identifiable realms of *Samsara* are featured in each wheel?
2. Spokes: how many delineated spokes separate the realms of *Samsara*?
3. Samsara Pattern: what are the patterned relations of actor types in each realm?
4. Unmarked Position: which actor type is depicted in the upper-left section of the wheel?
5. Correlative Position: which actor type is depicted in the lower-left section of the wheel?
6. Karma Pattern: if the hub of the wheel depicts a karma distinction, is the subdivision vertical or horizontal?

In each case, the answers to these questions are capable of enumeration (being turned into a numerical value in a coding spreadsheet) that can then be cross-tabulated with other variables in order to report basic statistics, or to calculate contingency coefficients useful for making strong claims about general tendencies and relationships in the data. Once again, methods of VCA and grounded theory coincide substantially with this level of analysis. The semiotician is simply able to draw on a more varied array of relationships, asking and answering questions more consequential in scope by situating the methodology in a more general, pragmatist approach to semiotic.

In the process of doing so for this particular case study, I made a number of remarkable, if tentative, discoveries and interpretations in need of further testing. Since these findings are currently unpublished, since their description would require much more contextualization than space allows here, and since the purpose of this paper is methods-oriented, let me simply say that the induction phase of this research has resulted in interpretive layers that suggest these diagrams are a valid source of evidence for affirming the embodied grounding hypothesis for the semiotic square due to their patterned organization.

Generalizations for Visual Semiotics Research Online

These two methodological sketches of visual semiotic research online using Google Images are somewhat artificially subdivided into three discrete phases each. This segmentation is helpful for heuristic purposes, but it is equally helpful to consider how, in actuality, there is a constant movement between abduction, induction, and deduction in processes of inquiry, as Peirce describes (1903, EP2, p. 208-225). Even though this movement is difficult to codify and outline, it is a familiar part of our everyday experience. Peirce notes, for example, that "the whole fabric of our knowledge is one matted felt of pure hypothesis confirmed and refined by induction. Not the smallest advance can be made in knowledge beyond the stage of vacant staring, without making an abduction at every step" (1901, HP 2, p.900). This is equally true in carrying out formal research.

When moving into the analysis of the Bhavachakra diagrams, for instance, I immediately needed to generate new hypotheses upon discovering differences in the number of Samsara realms between images and variant ways of marking these differences. This, in turn, required new deductive strategies for operationalizing these distinctions. But in order

to settle on such definitions, I needed to resort to further abduction and induction as well. In deciding, for example, that the presence of bows and arrows could differentiate the titan realm from the human realm, I had to first guess that this might be the case (abduction), then assume it to be the case (deduction), and then test to see whether or not it was actually the case (induction). Exceptions to the rule could then help refine the original hypothesis. These dynamics help explain the addition of "Revisions" in the "three stage, nine-step iterative process" outlined in Section 3 above.

Returning to questions of digital methodology using Google Images search, it is also important to note that both case studies moved beyond front page "top slice" searches relying solely on linguistic search strings. Instead of assuming that the first x number of images in a search return would provide a valid sample set (something that many other studies reviewed above recommend), these two research projects called for the collection of a much larger sample. Because of this, multiple keyword searches were complemented by reverse image searches and off-site data collection following successively embedded links. While a top slice approach may be adequate for projects with basic, pre-defined research questions, I recommend the more complex strategies introduced above when research questions are more multifaceted and exploratory, requiring a larger comparative database. Both of these methodological case studies are also open-ended in the sense that they are both ongoing projects. Projects that require a more bounded time-frame, with more manageable research questions, may benefit more from a top-slice approach that hews closer to Pritchard's thematic/perceptual analyses of human resource management depictions through a Google Images top-slice approach (Pritchard, 2020).

This is not to suggest that rigid parameters do not apply to more open-ended studies. It is important to note, in this regard, that in each of the two studies introduced above, new constraints were often necessary in addition to those assumed at the outset. In spite of being formulated prior to commencing with formal data collection, for instance, operational screening criteria for data case inclusion (or exclusion) needed to be refined during the process of data collection. This refinement resulted in the disqualification of some items and in the creation of alternative databases for future projects. In the X-posed brand mark study, for example, cases featuring two or more X-posed figures were ruled out early in the data collection process as a way of limiting the scope of the database and enhancing the validity of comparisons between cases.

Data Archiving and Semiotic Stewardship

Semiotic research is a fundamentally comparative enterprise (Sonesson, 2016). Any discussion of semiotic research methods is then an attempt to enhance our comparative abilities in identifying and interpreting the meanings of semiotic systems. The enhancement of comparative *capacity*, comparative *validity*, and comparative *practice* are, among others, all worth considering.

Enhancements to our comparative capacity are made possible by online search tools such as Google Images. Enhancements to the validity of our comparisons are made possible by critical evaluation sharpened in dialogue with specific theories, methods, and communities of inquiry. Enhancements to our comparative practices are enabled by the careful curation of collected visual data and the creation and input of metadata fields for tracking and managing this information. Each of these enhancements are vital for the empirical research processes described above. But what about comparative *availability*? How do we ensure that others are able to test our results and participate in our comparative research? Due to the constantly shifting nature of hyperlinks and webpages, it is frequently impossible to reproduce even the most basic and carefully documented dataset.

Fortunately, then, it is now possible to make one's datasets (visual or otherwise) widely available using public upload repositories and registered hyperlinks or digital object identifiers (DOI) thanks to free online hosting services such as Zenodo.[10] Zenodo is an Open Science initiative founded by the European Organization for Nuclear Research (CERN) that is open to dataset contributions and the creation of data research communities from all disciplines. Emerging guidelines, such as the open access "FAIR Principles", help ensure that data and metadata submitted to such open repositories is "Findable, Accessible, Interoperable, and Reusable" (Wilkinson *et al.*, 2016). Once the two research projects discussed above conclude, the visual data, metadata, database, and coding sheets will be added to their own linked archive on Zenodo or a comparable site.

Given the vagaries and mutability of copyright laws from region to region and year to year, the ways in which, or the extent to which, visual data should itself be added to open repositories are themselves open questions. As various other researchers have described, it is currently impossible to suggest universal guidelines for publicly archiving visual data

10 zenodo.org.

collected from the internet (Boje; Smith, 2010; Pritchard, 2020). Instead, after consulting one's local guidelines, it is more useful to appeal to fair dealing or fair use guidelines for non-profit, educational purposes, in addition to practicing careful, accurate, and detailed attribution of image sources in the archived metadata. As more and more visual research data is curated in these ways, digital humanists, visual anthropologists, and other visual semioticians will be able to establish more detailed guidelines and practices that eventually coalesce into well established precedent. Until then, thoughtful experimentation seems warranted for the sake of semiotic stewardship.

Conclusion

Digital humanities scholarship has much to gain from enriched integration with general semiotic theory and methodologies such as those discussed in this paper. Conversely, approaches to general semiotic research have much to gain from closer dialogue with digital humanities scholarship and practice. Both approaches need to develop more flexible, robust methodological guidelines for carrying out visual research online. That has been my goal in this paper, with a special focus on the use of Google Images as a research tool. I have also attempted to describe ways in which such research could move beyond applied semiotics to contribute reflexively to the development of semiotic theory and methodology.

The sheer scope, variety, and availability of visual data that online image search platforms offer is unprecedented. One affordance these tools introduce is increased access to variations in part-whole relationships between validly classified image types. In the words of Atsumi e Koizumi (2017, p. 567), "Web image analyses are still preliminarily with many limitations, but could be promising for investigating variations in visible traits". Paying attention to such variations, on the other hand, requires focused training, filtered through theoretical paradigms, and applied through suitable methodologies. Such layers of attention are known in Peircean semiotics as "interpretants", that which one is prepared to interpret when noticing some representamen-object relation. With robust interpretants, one can not only identify and classify variation patterns, one can also use those findings to contribute to semiotic theory.

In this paper, I presented two case studies that demonstrate this potential. In both cases, paying close attention to variations between individual images relative to specialized interpretants enabled the discovery of new insights useful for answering questions in cognitive semiotics. The first study illustrated the comparative analysis of variations in X-posed

brand mark logos, the second study illustrated the comparative analysis of variations between Tibetan wheel of life diagrams. Both studies are ongoing, and both have already resulted in findings that help test and refine theories of embodied semiotics involving logical relations of opposition and correlation.

The approach involves a sustained, multi-layered analysis of systematic relations or "diagrammatic iconicity" (Nöth, 2008) developing standard practices in VCA. As such, it serves as a complementary approach to the systematic methodology recommended by Pritchard (2020) for Google Images research geared toward perceptual/thematic studies involving shorter time constraints and top-slice approaches to data collection. Another way in which my approach differs from Pritchard's is in my assumption that the methodology should be mapped onto semiotic theory and praxis from start to finish (instead of relegating semiotics to a third, interpretive step). This was accomplished by situating the methodology within Peirce's three modes of inquiry: abduction, deduction, and induction. I then went on to highlight the many ways in which these phases overlap, since processes of guesswork, hypothesis refinement, and interpretation are apparent in every phase. In other words, each phase of the research constitutes a kind of microcosm of the whole, in spite of being distinct, both chronologically, conceptually, and methodologically from each of the other two phases. Ultimately, then, the approach is thoroughly semiotic in at least three senses, including experiential, formal, and practical means:

1. Experiential: by blending of sensory modes and communication channels

2. Formal: by attending to hypoiconic manifestations with a focus on diagrammatic relations, mapping social semiotic questions onto analyses of icon-index-symbol as manifestations of connotative meaning vs. denotative meaning

3. Practical: by undertaking iterative detective-style guesswork in which hypotheses are adopted, tested and refined toward interpretive ends.

The fact that this approach can also be used to contribute to the development of semiotic theory and methodology makes it semiotic in a fourth way as well, but this need not be the aim of every researcher who sets out to discover answers to visually oriented questions by critically sifting through the abundance of patterned variation made available by online image search engines. Semiotics has much to offer and expects nothing in return.

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