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Digital methods II: Digital-visual methods

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Abstract
Digital-visual methods enrol digital-visual artefacts as evidence or objects of study in research, and/or they rely on digital media and computational techniques to collect, explore, and analyse visual data. The use of digital-visual methods has increasingly figured in human geographic research over the last decade, coalescing around: i) work that interrogates digital-visual scopic regimes and politics; ii) scholarship that engages digital-visual artefacts, namely screens and interfaces, as immediate objects of research; and iii) research that employs natively-digital mediums and techniques to generate research data, analyse digital-visual artefacts, and produce visualizations.

Keywords
digital video, drones, interface, scopic regime, visualization

I Introduction

Geography has been identified as a visual discipline, or, at least, one characterized by a 'visual culture' (Crang, 2003; Rogoff, 2000; Rose, 2003; Ryan, 2003; Sui, 2000; Zimmerman, 2007). Previous state-of-the field *Progress in Human Geography* reports have foregrounded the importance of the visual across geography's subdisciplines, from cultural geography (Tolia-Kelly, 2012) to geographic information science (Elwood, 2010). Visual artefacts, practices, and regimes have figured as central to axes of inquiry and knowledge production in human geography for over half a century (Oldrup and Carstensen, 2012; Rose, 1993, 2015; Tuan, 1979). Importantly, as this report demonstrates, human geographers have contributed to the development of visual research methods, most notably Gillian Rose, whose *Visual Methodologies* (2016) is now in its fourth edition.

It is now difficult to think of visual things without conjuring thoughts of simultaneously digital things: mobile screens, streaming video, Snapchat. These digital-visual phenomena saturate and mediate the spaces and practices of our everyday lives. They accompany and surround us as we make our ways through the urban spatial fabric. We contribute visual content to any number of digital platforms. These relatively recent proliferations have unique implications for geographic methodologies that attend to the visual. Digital visual media have destabilized the ontological security of 'the image' as the privileged visual object of human geographic research while simultaneously ushering in new materialities and practices that demand our attention (Aitken and Craine, 2009; Rose, 2015).

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They have further precipitated new subjectivities (Schwartz and Halegoua, 2015; Wilson, 2011), spatialities (Ash, 2009; Kitchin and Dodge, 2011), and scopic regimes (Parks, 2006).

Against this backdrop of human geography's 'visual' (Rose, 2003) and subsequent 'digital' turns (Ash et al., 2017), this report highlights the increasing significance of digital-visual methods to geographic research praxes over the last decade. Building on Rose's (2014: 25; 2016) definition of visual research methods, *digital-visual methods* are those which enrol digital visual artefacts as 'part of the process of generating evidence to explore research questions', and/or those which use digital technologies and computational techniques to collect, explore, and analyse visual media or to visualize data. Digital-visual human geographic research has coalesced around three broadly identifiable axes of scholarship around which this report is organized: i) research that interrogates digital visual scopic regimes and digital visual politics; ii) work that engages digital-visual artefacts, namely screens and interfaces, as immediate objects of research; and iii) research that employs natively digital techniques to explore, collect, analyse, and visualize research data. Across scholarship that emphasizes digital-visual artefacts and visual regimes/politics, methods are predominantly qualitative and largely extend established social science research methodologies to digital-visual phenomena. These include content- and discourse-analytic, ethnographic, performative, and hermeneutic approaches. Natively-digital techniques for exploring and analysing visual media draw on more recent advances in digital visualization and big data analytics, though they are not exclusive to these methods.

II Scopic regimes and visual politics

To date, the bulk of geographical scholarship on digital-visual phenomena addresses the scopic regimes engendered by digital-visual technologies and visualizations (or representations), or related questions of the 'visual politics' of digital-visual artefacts, their production, and circulation. The methods used to identify, interrogate, and analyse both scopic regimes and visual politics are qualitative, but vary between studies in their specificities.

A 'scopic regime' refers to the ways in which vision – the act of seeing – is constructed under 'a set of conditions considered valid at a certain time' and place (Verhoeff, 2012: 15). Scopic regimes frame the legitimacy of what is (or is not) seen, the ways in which it is seen, and from whose perspective. A proportion of geographic scholarship looks to identify how particular scopic regimes are assembled. In one particular study, Degen et al. (2017) uniquely adopt a comprehensive mixed-methods approach drawing on data gathered through workplace ethnography, interviews with key stakeholders, content analysis of relevant documents, and an archive of computer-generated images. They use these data to identify how digital visualizations of a proposed urban redevelopment project in Doah, Qatar, actively construct affective scopic regimes through the design of digital 'place atmospheres' that invest viewers in embodied sensory experiences which elicit positive reactions to these initiatives. Other studies adopt a more monomodal methodological approach to tackle questions of the construction of scopic regimes. For example, Amoore and Hall's (2009) analysis of contemporary scopic regimes of bodily visualization that 'take bodies apart' via scanning technologies at national security checkpoints such as airports is historiographic. Verhoeff's (2012) media archaeology of mobile screens develops a historical-comparative analysis across a range of case studies to capture the ways in which contemporary touchscreen-enabled performative mobilities are rooted in antecedent technologies, from windshields as interfaces to road panoramas to Nintendo game consoles.

Discourse analytic approaches figure strongly in scholarship of this vein. In work on

the visual representation of men's bodies via the interfaces of 'hook-up' applications used by men who have sex with other men, Bonner-Thompson (2017) draws on discourse analysis to identify how the hypersexualized visual regimes of masculinity characteristic of these interfaces work to create haptic desires amongst their users. Parks similarly uses discourse analysis to analyse the 'Crisis in Darfur' layer in Google Earth, determining that the organization of information on the platform – structured as layers of information that become progressively more detailed the closer one zooms in – encourages visual practices of bypassing smaller-scale (larger area) contextual satellite imagery in favour of individualized photojournalistic images of suffering which scopically reproduce 'Western tropes of African tragedy' (p. 536).

In a slightly different take on questions of scopic regimes, rather than focusing on how particular regimes are assembled, researchers have also employed a range of diverse qualitative methods to identify the specificities of the kinds of scopic regimes that are supported or precipitated by particular digital technologies. Kinsley (2010), for instance, conducts a discursive analysis of promotional videos for computing technologies which he engages as texts, determining these videos to be invested in visual regimes that build embodied anticipation for futures saturated by these technologies. Similarly focusing on futures, Amoore's (2009) hermeneutic critique of the cultural attention economy identifies how an entire complex of visualization technologies – from data-driven visualizations of individual security risk scores accessible to state security personnel, to screens which project the relevant fashion runway scenes of items clothing being tried on by individuals at high-end fashion designer retail outlets – underwrite scopic regimes predicated on images of future personhood and/or subjectivity.

Elsewhere, Boersma and Schinkel's (2015: 1043) content and compositional analysis[1] of computer-generated statistical data visualizations identifies the ways in which spatial distance between 'immigrant' and 'native-born' population categories on demographic bars, charts, and graphs stabilizes scopic 'imagining[s] of otherness' that reproduce status quo images of society from which migrant populations are systematically excluded. Yet others engage with geospatial immersive environments as digital-visual artefacts. For instance, based on their immersive, inductive exploratory analysis of the kinds of visual phenomena encountered in ludic interactions with the virtual immersive environment of Google Earth, Kingsbury and Jones (2009: 502) foreground the 'Dionysian' scopic regimes afforded by playful engagements with Google Earth, revealing Google Earth to be as much of a ludic 'digital peepbox' as it is a surveillant technology. Geospatial technologies are also centred as objects of inquiry in critical-theoretic engagements with drone visualities. On the one hand, drone regimes are seem to 'claim to remove human actors from their practices' (Rose, 2017: n.p.), yet on the other, they are also seen as technologies of vision which subsume human bodies within regimes of hypervisibility wherein they are rendered not only visible but also targetable and trackable (Parks, 2014: 2518; 2016).

A closely related strand of research focuses less on scopic regimes per se, emphasizing instead the politics and power relations that attend and/or are enabled by particular visual regimes, digital-visual practices, and visual artefacts. Elwood and Leszczynski (2013), for instance, draw on an exploratory analysis of a selective sample of geovisual interfaces to show how interactive maps are being used to support a 'politics of transparency' vested in the ability of charitable donors to trace the flows of their monetary contributions to any number of organizations. Employing visual content analysis of marketing and advertising content across two case studies (tourism, real estate), coupled with an ethnography of a scenic visitor bus tour,

Hercbergs and Noy (2015: 943) determine that visual representations of Jerusalem underwrite ideologically-laden practices of visual consumption which promote cultural, religious, and ethnic hegemonies and exclusions.

Turning to urban dashboards, Kitchin et al. (2015) draw on their own personal experiences of working on city dashboard projects within a semi-autoethnographic analytical frame to elicit the ways in which these interactive, real-time visual interfaces enable new modes of governing cities through indicators that may be visualized on a screen. In more of the work generated from their ethnography of the digital visualization of a proposed urban real estate development in Doha (see Degen et al., 2017), Melhuish et al. (2016) identify the ways in which computer-generated images of Doha's futures reveal a postcolonial, cosmopolitan Qatari urban imaginary which subverts Orientalist aesthetics of the city's historical depictions. Elsewhere, Bissell and Fuller (2017) adopt a hermeneutic approach to interpret the ways in which myriad forms of urban visualization, including computer-generated images and stills from virtual flyovers, have agency as material-political devices deployed to 'sell' road infrastructure developments as solutions to Sydney's urban transport infrastructure crisis.

Insofar as geographical research that attends to scopic regimes and visual politics identifies the 'work' that digital-visual artefacts *do* (Kennedy et al., 2016), it makes few methodological propositions for studying digital-visual phenomena as objects of research in and of themselves. This is the subject of the next section.

III Images, interfaces, and drones

A growing strand of geographical scholarship engages digital-visual artefacts as immediate objects of study in their own right. Many of these studies privilege digital screens, interfaces, and computer-generated images. Rose (2015) identifies that the kinds of deep engagements and readings of images as 'texts' characteristic of cultural-geographic approaches to scopic regimes and the politics of images are methodologically incommensurate with and not scalable to digital-visual artefacts characterized by modifiability, platform independence, and massiveness of production and circulation. In lieu, she suggests the espousal of 'performative' approaches which engage digital-visual phenomena as interfaces constituted by an ecology or intersection of the agencies of digital screen surfaces, their underlying software and algorithms, and their haptic and visual engagements by users. This performative approach is evidenced perhaps most strongly in Ash's (2009) work on interfaces, wherein he draws on a selective sample of video game interfaces as case studies in which digital screens are methodologically emphasized as the objects of study. Methodologically privileging interfaces serves two purposes, allowing Ash to identify new kinds of 'screen spatialities' constituted by feedback loops between users, their environments, and the two-dimensional frame of the video game interface itself. Elsewhere, Ash (2015) advances a similar comparative approach to theorize interface 'envelopes' (2015) as atmospheres which modulate space-times for gamers and which are simultaneously themselves modulated by user behaviours vis-à-vis these interfaces. Adopting an ethnographic approach to the performativity of digital visual interfaces, Longhurst (2013) conducts semi-structured interviews, focus groups, and ethnographic observation to identify that the ways in which the real-time nature of the Skype interface and its moving-image visualities enable new modes of mothering through, for example, emotionally connecting with children across distances, and of assessing children's material well-being.

Moving beyond performativity-centric approaches to interfaces, Rose et al. (2014: 386) suggest using an actor-network approach to engage computer-generated images as interfaces 'circulating through a software-supported

network space' rather than static surfaces or representations fixed in space. Methodologically, an actor-network approach allows for the relational identification of the myriad encounters between humans, code, and digital devices in which digital visualizations have their genesis and through which the conditions for the circulation, appropriation, and modification are created. More recently, Ash et al. (2018) have developed a new, 'more-than-visual' post-phenomenological methodological vocabulary which prefigures 'units,' 'vibrations,' and 'tones' as analytic categories for studying digital interfaces as multi-modal entities. This method entails engaging interfaces as objects to be broken down into discrete 'units' – including visual components such as buttons and icons as well as sonic and haptic elements. Through 'vibrations' (or perturbations between these discrete units), these units may be understood to modulate human behaviours and interactions with interfaces by encouraging idealized end-user responses to/interactions with digital app interfaces and their feedback systems ('tones').

Moving beyond digital images and interfaces, geographers are beginning to methodologically engage digital technologies as visual phenomena. Most notably, Garrett and McCosker (2017: 13) and Garrett and Anderson (2018) position drones as sensory material assemblages that operationalize forms of 'non-human, multi- and extrasensory' vision which reconfigure bodies, subject positionalities, place and landscape, and scales of geographical inquiry. Drones 'offer a break with' the default to 'grounded positionality' in research, allow sensing beyond the (human) visual spectrum, and make available forms of algorithmically-mediated aerial proprioceptive movement across a range of vertical strata (Garrett and McCosker, 2017: 20). Engaging with drones as visual digital technologies through 'drone methodologies' involves embracing the highly experimental and experiential methodological possibilities opened up by researching with drones, through for instance actively piloting drones (Garrett and Anderson, 2018). Garrett and Anderson (2018) argue that such active engagements with the technology are central to geographers' efforts to continue to interrogate the socio-political implications of, amongst other things, their scopic regimes.

While heightened attention to digital-visual artefacts as objects of study in and of themselves is an important shift in the direction of contemporary human geographic research, the methods for engaging these digital-visual artefacts as described in this section remain largely non-digital in nature. The uptake of natively digital visual methods is nevertheless a burgeoning trend in human geographical scholarship.

IV Natively-digital visual mediums and methods

Whereas the two previous sections profiled qualitative methods for engaging with digital-visual artefacts, practices, and their effects, the methods identified were largely non-digital in nature. This section inverts this relationship by instead emphasizing digital methods for researching – or researching with – visual artefacts and media. Natively-digital visual methods are practices and/or instruments of data collection, production, exploration, analysis, and reporting that are reliant upon or enabled by computational technologies and processing techniques. These may involve the application of digital techniques *to* digital-visual artefacts, or alternatively they may involve the use of visual-centric techniques as part of digital research. Three broad categories of natively-digital methods may be identified here: methods that use digital-visual media to capture or generate research data, methods for analysing digital-visual artefacts, and digital visualization methods.

Digital visual media are increasingly figuring as mediums through which to generate and capture research data. The most developed

methodologies for such practices in geography involve the use of digital video (Bauch, 2010; Garrett, 2010). Most obviously, digital video footage may be used to produce a data record much like field notes (Garrett, 2010; Simpson, 2011). Yet digital video further supports auto-ethnographic approaches by allowing researchers to turn the cameras on themselves in practices that Garrett (2010) terms 'reflexive' filmmaking. It may also figure as a central methodology within participatory research praxes in the form of collaborative filmmaking projects which dissipate hierarchies between academics and research participants in an approach that may be characterized as 'filming *with* people' rather than 'making a film *about* people' (Bauch, 2010; Garrett, 2010: 529; Kindon, 2016). As an ethnographic medium, digital video is particularly useful for generating 'thick' data, capturing not only the researchers' perceptions and reflections, but also 'participants' direct thoughts and experiences' as well as other nuances such as body language, body-environment interactions, and embodied practices that 'can escape text- and talk-based approaches' (Garrett, 2010: 242; Lorimer, 2010; Simpson, 2011; Jacobs, 2016b). Lorimer (2010: 242) refers to the use of digital video to bear witness to such tacit practices, exchanges, gestures, and knowledges as 'moving image methodologies', which are developed through a case study of elephant-human interactions. Moving image methodologies involve both practices of generating videographic evidence (moving images), and of subsequently analysing these images for the affects that they evoke through heuristically mapping practical filmmaking techniques to individual affective registers.

Bauch (2010: 476) further highlights the uniqueness of digital video methods in combining voiceover with moving imagery in a single narrative, which allows for research practitioners to both '[elucidate] the image' and also support oral narration with visual evidence. This multi-narrative, multi-sensory, more-than-textual nature of digital video makes it a particularly effective tool to disseminate and communicate research findings (Bauch, 2010; Jacobs, 2016a). Advances in digital video moreover afford multimodal opportunities for immersing audiences in research outputs, for example through the proprioception afforded by 3D or the ways in which the resolution of high-definition video surpasses that of the human eye (Garrett, 2010).

More recent research is operationalizing digital methods to analyse digital visual content. A particularly innovative method is that of spectral analysis, which consists of using image analysis and plotting software to detect the hue and saturation of large volumes of images, and to arrange them according to these properties. Rose and Willis (2018) employ this method to identify the dominant colour characteristics of images contributed as part of smart city-tagged posts on Twitter. They use the results of this analysis as primary data to support a hermeneutic interpretation of how dominantly blue- and orange-hued smart city imagery on Twitter affects three impulses of 'becoming smart: *participating* in smart, *learning* about smart, and *anticipating* smart' (Rose and Willis, 2018: 1, emphasis in original). In their work on the 'Instagram city,' Hochman and Manovich (2013) similarly use image plot software to identify the undulating 'visual signatures' of 13 global metropolises from a select sample of Instagram activity geotagged to those cities (sourced from mining public Instagram accounts via the Instagram API). Through their more detailed temporal-spectral analysis of Instagram activity in Tel Aviv, Hochman and Manovich (2013) found that the spectral signatures of visual social media practices both reflect and are constitutive of the ways in which different parts of cities differentially fade from or assume importance across a range of temporal scales, from the year to the day. Their natively digital visual analysis further sheds

light on the ways in which social media such as Instagram have become essential components of how cities are brought into being through everyday digital-visual practices.

Boy and Uitermark (2017) likewise focus on urban Instagram activity, this time in Amsterdam. Their mixed quantitative-qualitative study combines social network analysis[2] of the social graphs of Amsterdam Instagram users, qualitative interviews with Instagram influencers, and heat mapping of natively geotagged Instagram images to identify patterns of socio-spatial segmentation (overlapping social clusters Instagramming from particular areas within Amsterdam) and stratification (certain 'power' users who have more followers and more influence on the platform) which materially 'assemble' the city and shape everyday urban life. They found that particular areas of the city – historic and tourist districts, as well as recently gentrified and quickly gentrifying areas – are the most likely to be 'Instagrammed'. The preference of Instagram influencers for boutique rather than corporate chain cultural, dining, and retail venues in areas prone to gentrification may actually accelerate and intensify those practices by attracting followers to those locations.

The third cluster of natively digital visual methods involves the use of digital visualization. As identified by Elwood (2010: 406), '"visualization" may refer to practices of originating from scientific information visualization, qualitative methods, or the visual arts'. Here, I profile one example of each of these forms of visualization, to the exclusion of geovisualization and cartography (which are considered in their own dedicated *Progress in Human Geography* reports). The image plots generated by Rose and Willis (2018) and Hochman and Manovich (2013) constitute examples of the use of scientific data visualization techniques, where in both of these studies the data being visualized is natively digital-visual content (social media imagery). Turning to qualitative visualization, geographers are advancing the use of content clouds (also known as tag or word clouds). Content clouds arrange text elements (terms, tags) according to their prominence (assigned weight) or frequency in a dataset using proportional font size (larger-sized text for more frequent or more heavily-weighted terms) and differences in colour, producing a visualization that appears cloud-shaped in its vertical and horizontal extents. As advanced by Cidell (2010) and Jung (2015), generating content clouds is a form of qualitative exploratory data analysis that may be used to identify central themes or codes in research data to support inductive, hermeneutic, and discourse and content analyses (Cidell, 2010; Jung, 2015).

And lastly, regarding artistic digital visualization, while a number of studies profiled in earlier sections engage the processes and politics of the production of computer-generated images of envisioned geographical futures (see Degen et al., 2017; Melhuish et al., 2016; and Rose et al., 2014, on urban development imagery in Qatar), scholars such as Mahoney (2016) are advocating for the active utilization of digital graphic design techniques to produce visual montages that incorporate digital photographs with computer-generated elements. Mahoney (2016) for instance suggests producing montages to depict future anthropogenic climate change scenarios at localized scales (the street or neighbourhood) as a means of rendering the forecast effects of global warming real, relevant, and relatable rather than intangible, speculative, and something that is happening in distant places.

V Conclusion

While human geography has long been concerned with the visual, the proliferation of digital media in the spaces and practices of everyday life has made it difficult if not impossible to conceptually or methodologically separate visual from digital fields in scholarly inquiry. Over the last decade, digital-visual phenomena have gained traction as objects of human geographical research. The majority of

geographical research on the digital-visual has extended established qualitative social science methodologies to interrogate digital-visual artefacts and practices via their scopic regimes and politics. Yet, two significant methodological research trends are advancing digital-visual scholarship in human geography beyond studies that emphasize and critique the effects of digital-visual phenomena. The first involves the development of innovative new methods such as drone methodologies (Garrett and Anderson, 2018; Garrett and McCosker, 2017) and post-phenomenological approaches (Ash et al., 2018) which not only centre digital-visual artefacts and technologies as immediate objects of research, but which also provide practical prescriptions for studying and analysing these phenomena, including through experiential immersion via operating technologies such as drones, and through analytic imperatives for unpacking interface components and ecologies (unit, vibration, and tone; Ash et al., 2018). The second notable trend involves the use of natively-digital techniques to generate, capture, explore, analyse, and visualize research data. These consist of computational big data analytics of digital images (e.g., image plots, social network analysis), digital videographic methodologies, and various forms of visualization, including scientific information visualization, exploratory qualitative visualization (e.g., content clouds), and artistic visualization (e.g., graphic design).

As digital-visual human geographic research continues to burgeon in tandem with visual and digital turns that continue to inflect the social sciences, we may anticipate further engagements with digital-visual artefacts as objects of research in their own right, and continued developments of natively digital-visual methods across research studies and praxes. Going forward, human geographers should be encouraged by the opportunities opened up by digital visualization and big data methodologies for generating, exploring, and analysing digital-visual phenomena in the context of mixed-methods qualitative-quantitative studies. Closer affinities with computational and data-driven methods have the capacity to introduce new kinds of evidence and analytical insights which may inform discursive and hermeneutic engagements, as well as lead to more nuanced understandings of the social implications and effects of digital-visual media.

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1. Compositional analysis or interpretation looks at the arrangement or organization of components that constitute a visual artefact such as an image, paying attention to elements such as content, colour, the spatial organization of visual elements, and the logic of figuration (Rose, 2016).
2. Social network analysis is a method of tracing relationships (ties) between users of a social network.

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