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Mapping DigiPlace: geocoded Internet data and the representation of place

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Abstract. The recent development of web-based services that combine spatial coordinates and indexes of online material allows any web user to conduct geographically referenced Internet searches. In this paper we characterize the resulting hybrid space as DigiPlace—that is, the use of information ranked and mapped in cyberspace to navigate and understand physical places. We review relevant theories of hybrid combinations of physical and virtual space, how software (code) automatically produces space, and how the politics of code (particularly map generating code) shape the representation of places. The paper concludes with a case study of the DigiPlace created by GoogleMaps that utilizes the same code which powers Google's index of cyberspace. A central argument advanced by the case study concerns how the interactions between culture, code, information, and place construct DigiPlace and shade perceptions of the places that are mapped.

Introduction

The recent development of web-based services that combine spatial coordinates and indexes of online material allows any web user to conduct geographically referenced Internet searches. While commentators have long argued that cyberspace can only be understood in reference to material places (Castells, 1996; Graham, 1998; Zook, 2000), these online mapping services are particularly striking examples of the blending of virtuality and physicality. In this paper we characterize the resulting hybrid space as DigiPlace—that is, the use of information ranked and mapped in cyberspace to navigate and understand physical places.

As in any mapping exercise, the creation of DigiPlace is not simply a technical issue but a socially constructed process that embodies a range of political, economic, and cultural considerations. These, however, are rarely in the forefront, despite their central role in structuring the representations of places embodied in DigiPlace. The increasingly widespread use of geocoded Internet information may be novel, but the utilization of these visualizations to understand places is subject to the same simplifications and distortions that have been part and parcel of traditional maps.

We first review earlier formulations of the melding of the digital and the physical. We then critically consider how the software underlying the formation of DigiPlace is created and regulated. A growing literature within geography explores the intersection of code (or software) and space, and DigiPlace is a continuation of this tradition. Code is almost infinitely malleable but is ultimately structured by the desires and constraints imposed by its programmers and managers. Thus, the code of DigiPlace constructs representations of places that highlight or obscure on the basis of algorithms designed with particularly political and economic agendas. These choices (made consciously or otherwise) are then propagated in the maps of DigiPlace.

The paper concludes with a case study of the DigiPlace created by GoogleMaps,[1] a spatial interface to one of the most important indexes of the Internet and an early provider of online geocoded searching (AlexaResearch, 2006; Google, 2005; Nielsen, NetRatings, 2005). While business directories have long existed on the web, GoogleMaps is novel for several reasons. First, as a leading web information portal, Google has become the destination of choice for a large portion of the Internet population. Second, Google's introduction of innovative technologies and business models has in the past created entirely new ways for people to interact with the web (Stross, 2005). Finally, and most importantly, Google is applying the same code that underlies its index of cyberspace to the mapping of physical places: resulting in a blending of the digital and the material. A central focus of this study is to identify how GoogleMaps shades the perceptions of the places that it maps.

Cyberspace, place, and DigiPlace

Cyberspace was originally conceived as an alternative to the physical world; a "consensual hallucination" in the "nonspace of the mind" (Gibson, 1984, page 69), and, as such, seemed to have little relevance to place. One legacy of this conception is the continued tendency (at least within the public mind) to erroneously assume that virtuality is fundamentally divorced from physicality. Urban studies and geography researchers, however, view cyberspace as an additional layer of function and access that maps onto physical place (Graham and Marvin, 1996). For example, Mitchell (1995) envisions an urban space in which code is just as important as bricks or mortar, and in which electronic logical linkages are as crucial for connections as are physical roads (Mitchell, 1995, page 107). This is an argument for augmentation or evolution, not substitution. Streets remain relevant but digital networks and ubiquitous computing create opportunities for new uses of old urban areas.

Likewise Batty's (1997, page 340) early typology of virtual geography includes the concept of cyberplace, which he defines as "the ways in which this space inside computers is changing material place outside computers." Although primarily concerned with the physical infrastructure underlying cyberspace (ie wires and routers), Batty also highlights changes in functionality that the embedding of this infrastructure could have on the built environment. These ideas were later expanded by a number of researchers who provided theoretical formulations and empirical evidence of how code and digital networks affect the nature of the material world (Aoyama, 2001; Dodge and Kitchin, 2004; 2005; Thrift and French, 2002). This notion of digital networks intertwined with place clearly moves away from the notion of place as a mosaic (Hartshorne, 1939) that possesses some authentic and irrefutable nature (Relph, 1976) and views it as more than just a spatial parameter or setting for human existence and interaction (Giddens, 1979; 1984).

Correspondingly, there is a long-standing awareness that no matter how 'virtual' cyberspace may appear, geography continues to impact and to shape the individual and collective use of cyberspace (Adams and Ghose, 2003; Castells, 2002; Zook, 2000; 2003). While it is increasingly easy to interact via telecommunications and cyberspace (Cairncross, 1997; Gillespie and Williams, 1988; Wellman, 2001), other frictions based in place (eg transport costs, cultural differences, and accessibility) continue to influence and to shape access to these networks and the way in which they are used.

[1] The online mapping service called GoogleMaps was originally named GoogleLocal and was released to the general web public in February 2005. As a result, many of the figures in this paper show web pages that are labeled GoogleLocal. The structure and function of the service are identical regardless of the name.

Aoyama's (2001) analysis of e-commerce in Japan (particularly how it contrasts to the US version) provides an excellent example of how place-based factors shape the use of cyberspace. Geography and place remain relevant in the information age, but the way in which they are used and the manner in which they are relevant has changed, as must our analysis (Couclelis, 1996; Graham, 1998; Massey, 1993).

The goal of this paper is to refine the understanding of the complex and hybrid spaces made up of multifarious entangled elements of the virtual and physical environments. Echoing Massey (2005), it takes issue with the ways in which the many lived dimensions of the spatial are converted into essentialist representations of meaning; a canvas upon which human life can unfold. To imagine that perceptions of place remain unchanged, or, alternatively, that distance is dead, is to simplify the issue and to deny the 'hypercomplexity' of space (Lefebvre, 1991). Rather, the space we inhabit is at an 'intersection of two worlds' (Batty and Miller, 2000), where cyberspace and place are intricately connected in a dynamic and mutually constitutive process. An exemplar of this blending is the combination of mapping and of cyberspace indexes—that is, DigiPlace—which is available via GoogleMaps and similar web-based services.[2] Although GoogleMaps invites users to view its DigiPlace as an unproblematic mapping of economic and social activity, it is a socially constructed representation that rests upon a host of economically and politically driven decisions.

DigiPlace represents the fusion of digital and physical space as networked individuals navigate through increasingly dense (although not necessarily accessible) clouds of information (Norman, 1998; Thrift and French, 2002) about a local environment. The way in which the use, organization, and makeup of this information shape representation lies at the heart of DigiPlace. The concept of DigiPlace recognizes that place is both constituted by material and virtual social processes (eg the interlinkages and ranking of web-based information) and in turn constitutes those practices (Gregory, 1982; Pred, 1984; 1986). In doing so it "destabilizes the notion that we can point to some permanent and overarching groundwork within which all exists" (Curry, 2005, page 681). DigiPlace encompasses the situatedness of individuals balanced between the visible and the invisible, the fixed and the fluid, the space of places and the space of flows (Castells, 1996).

Moreover, it provides a focus on the ways in which the physical, tangible world combines with virtually accessible information and creates not a fixed setting for interaction, but a lived, fluid, and subjective space, shaped by space, time, and information. In other words, DigiPlace represents the simultaneous interaction with software (information) and 'hard-where' (place) by a individual. It is a way to conceptualize the scales of everyday life, and simultaneously to imagine the differences and interdependencies of places (see, for example, Castree, 2003; Johnston, 1984; Massey, 1985; 1993) as they interact with a spatialized dimension of information. Thus, DigiPlace is the understanding of a location based on and filtered through information about a place that is available in cyberspace.

For example, the GoogleMaps search engine allows a user to conduct keyword searches for businesses or other organizations and activities. One can conduct a search for 'restaurants' with a street address or postal code, and receive a listing of businesses

[2] Google is not the only company to see an opportunity in geodata, as a competing local search engine is offered by Yahoo, while both MSN (which has also recently introduced a local search engine) and Local.com are still in early stages of development. While the discussion which follows focuses solely on the Google search engine, similar arguments could be derived from studies of alternate websites. Google simply provides a convenient case study for this analysis of DigiPlace.

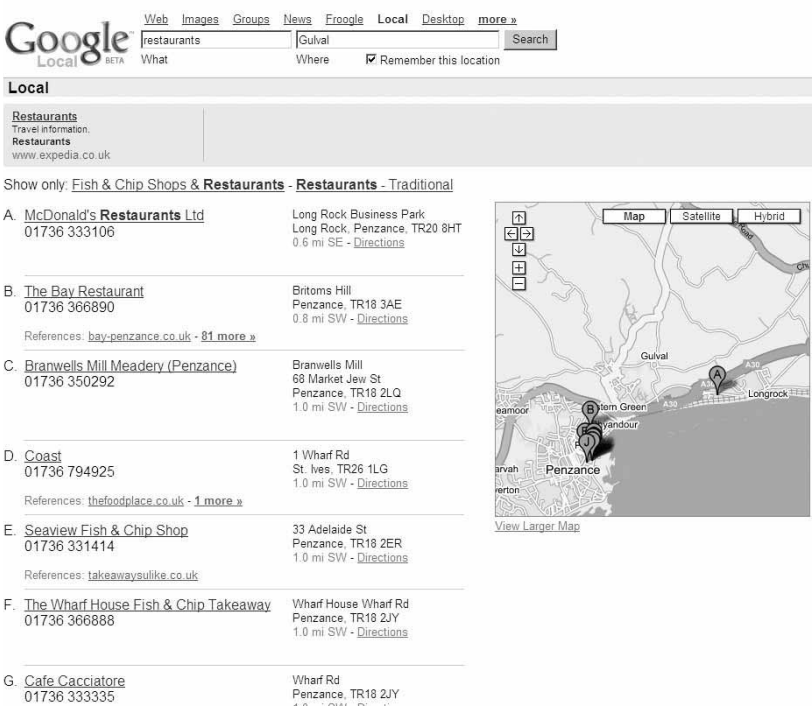

Figure 1. Search for keyword 'restaurants' in Gulval, UK (image generated on 10 August 2005).

that meet this criterion.[3] Figure 1 illustrates an example of such a search. As discussed later, the ranking and categorization of these listings are all but invisible to the user, but are absolutely fundamental to how places are presented. Particularly compelling is how code automatically determines the availability and visibility of electronic information that shapes the representation and consequently the perception of places.

Information, code, and the automatic production of place

GoogleMaps represents a recent and novel intersection of information and place that builds upon earlier efforts to categorize places. As Amin and Thrift (2002, pages 43–45) note, "the city is being fixed, positioned, guided as never before. The map, the census, postcodes, area codes, license plates and other means of producing location have been joined to technologies like GIS, global positioning ... to produce spatial categorizations, so that the portion of human subjects dwelling in databases becomes increasingly determinate." As more data are digitized and made available it becomes increasingly easy to assemble powerful databases about places and to use them for classification purposes. One of the best examples of this effect on places is the growing amount of information and code specifically about places represented by geodemographics—that is, the combination of demographic data from a variety of sources to construct a profile of a particular location, such as a zip code or neighborhood.

Geodemographics, code, and DigiPlace

Curry (1997) critiques the propensity of users of geodemographics to apply spatial data to individuals living in an area. The ecological fallacy of this assignment is particularly

[3] As of August 2006 GoogleMaps is available for thirty-one different countries, predominantly located in North America and Europe. The only Asian country included is Japan. For further information see http://www.google.com/apis/maps/faq.html#faq14.

troubling when it is mapped because, as Curry (1997, page 691) argues, "people tend to see maps as direct representations of reality in ways that tables and charts are not." Goss (1995, page 171) shares Curry's concern and suggests the use of geodemographics as a spatial reality means that "the model may become real—in other words... the assumptions will be validated as the strategies take effect." Goss is particularly concerned that this may mark a return to positivism in presenting and managing the spatial dimension of social life.

In a more recent review Burrows et al (2005) use the example of Internet-based neighborhood information systems (IBNIS) to understand how the use of localized knowledge is impacting the fortunes of neighborhoods. Although they identify potentially positive uses such as increased civic engagement or 'online local tourism' that promotes local venues, Burrows et al (2005) worry about potentially negative effects, such as the avoidance of certain areas as a spatial means of risk reduction. They note (page 37) that IBNIS could "contribute to ongoing processes of inter-neighbourhood segregation and intra-neighbourhood homogenisation" that lead to "the virtual segregation of deprived areas." In other words, IBNIS is potentially the means to construct a new regime of redlining in the 21st century.

This is likely to become increasingly a concern as geodemographics are incorporated into software used by people to navigate the spaces of their daily routines. Software, or code, is increasingly embedded in everyday life regardless of the function or action in question (Dodge and Kitchin, 2004; 2005; Thrift and French, 2002). Thrift and French (2002, page 309) note that "more and more of the spaces of everyday life come loaded up with software, lines of code that are installing a new kind of automatically reproduced background." In large part this is driven by the intense information processing demands of an information society in which it is neither possible nor desirable to have humans responding to queries or making routine decisions. Instead code is designed to react to stimuli and to produce automatically certain outcomes—for example, restaurants ranked based on the type of neighborhood (as defined by geodemographics) in which they are located. The structure and design of code therefore become central actors in the creation of computer-mediated space.

This process is exemplified by a key actor in the creation of the GoogleMaps DigiPlace—that is, Google's system of PageRank. PageRank is a trademarked software algorithm developed by Google for ranking web pages, and is central to its ability to return relevant search results. A web page's rank is determined by the rank of all other web pages that link to it. The system "interprets a link from page A to page B as a vote, by page A, for page B. But Google looks at more than the sheer volume of votes, or links a page receives; it also analyzes the page that casts the vote. Votes cast by pages that are themselves 'important' weigh more heavily and help to make other pages important" (Google, 2005). While Google's PageRank system is undeniably central to the creation of DigiPlace, it is an extremely opaque actor.[4] Furthermore, although it is understandable why Google considers the algorithm a business secret, PageRank is problematic since it invites one to consider it a 'natural' outcome rather than the result of specific human-designed algorithms embedded in software. These algorithms, however, are far from natural and are constructed with specific intents and outcomes in mind, such as the desire to circumvent would-be manipulators and the pressure to generate corporate profit.

[4] While it is possible to e-mail Google to ask for clarification about how their systems work, the replies are generally uninformative. For example, the following text was received in response to a question about GoogleLocal categories. "Thank you for your interest in GoogleLocal (beta). At this time, we don't provide this information. However, we appreciate your feedback on the usefulness of this information. Thank you for your support as we work to improve GoogleLocal. Regards, The Google Team" (received 25 August 2005).

Politics of code and the production of DigiPlace

At issue is the power of code to set rules for behavior. As Lessig (1999, page 60) argues, "code writers are increasingly lawmakers. They determine what the defaults of the Internet will be ... . They are the ones who set its nature. Their decisions, now made in the interstices of how the Net is code, define what the Net is." Galloway (2004, page 214) echoes this sentiment with his assertion that the central characteristic of the Internet is control (manifested in technical protocols), not freedom. He further argues that the creation of these protocols is a deeply political event—that is, "the technical is always political ... *network architecture is politics*." In the context of global capitalism this often translates into strategies for profit maximization being a central (albeit not technically required) element of code.

Although Google (and other search engines) takes pains to emphasize the quality of its results, the coding for the search is as much of a value judgment as a technical process. Software is designed to rank websites according to some criteria and even search engines that strive to be 'objective' are subject to the nature of the web pages they index. As numerous studies have shown, the makeup of cyberspace exhibits clear biases of topic, language, and authorship (Castells, 2002), and is far from representative of the nondigital world. Knowledge companies and workers (eg technology or business/financial services) are more likely to have elaborate web presences than small manufacturing or locally owned retail businesses, making the latter much less visible and accessible in GoogleMaps. Moreover, Google's system of weighing links between web pages means that languages and cultures that have a large Internet presence—for example, English and the US—are likely to have higher ranked pages.

Of even more concern is the issue raised by Introna and Nissenbaum (2000, page 181) regarding "the evident tendency of many of the leading search engines to give prominence to popular, wealthy, and powerful sites at the expense of others. This they do through the technical mechanisms of crawling, indexing, and ranking algorithms as well as through human-mediated trading of prominence for a fee. As long as this tendency continues, we expect these political effects will become more acute ... ." In short, the views and opinions of the powerful and the networked have a much better representation in indexes and search than the marginalized. Rogers (2004) explores the extent to which the results returned from search engines reflect a reality that represents the version desired by governmental or corporate interests.

Moreover, there is reason for concern over the ability of code and search engines to filter out the 'undesirable' as they construct representations of place. As Lessig (2000, page 180) notes, "In real space ... filtering is usually imperfect. However much I'd like to ignore homelessness, I cannot go to my bank without confronting homeless people on the streets ... . All sorts of issues I'd rather not think about force themselves on me. They demand my attention in real space, regardless of my filtering choices." In contrast, the rankings behind DigiPlace can easily exclude 'undesirable' listings, even though any filtering is based on a value judgment—for example, are chain restaurants or local family-owned restaurants more 'desirable'?

Finally, while many believe (and Google attempts to ensure) that a high PageRank equals a high-quality and popular website, a whole industry has emerged (ie search engine optimization) in order to attempt to increase websites' rankings (Perkins, 2003; Van Couvering, 2004). Utilizing methods ranging from search-specific advertising (via Google's sponsored links) to the creation of so-called 'link farms', these efforts seek to rank highly one's cyber presence in an effort to gain a footing in the top ten results for a search—that is, some of the most 'centrally' located points in cyberspace. In short, new code has emerged to challenge the code of search. Thus, the rankings underlying GoogleMaps are influenced and shaded by a large number of actors,

beginning with the unequal participation of people and places in the construction of cyberspace, continuing with the code and algorithms of indexing and ranking and concluding with unabashed efforts to manipulate the results of a search.

Visibility in DigiPlace

The implications of ranked results of localized search terms presented in DigiPlace are fairly significant. Prior to widespread use of the Internet, people were able to locate things in four main ways: the visual presence in the field of view of a person's daily lived geography, visual or audio-based announcements or advertising, word-of-mouth from personal acquaintances, and paper directories such as phonebooks. Each of these methods of locating services affects where people spend time and money, and so also, either directly or indirectly, affects where these activities are located. The DigiPlaces engendered by GoogleMaps (and other similar online systems) is reworking the importance of various factors in determining visibility in places. A prominent street sign or high-street location is simply irrelevant to the DigiPlace created by a GoogleMaps search. Likewise, businesses without a web presence (beyond a simple listing in an electronic phonebook) could run the risk of marginalization as the use of DigiPlace expands.

In addition, there are long-standing issues of how visualizations of activities or resources simplify and distort reality in order to represent it (Monmonier, 1996). Harley's (1988) analysis of maps from the European age of exploration provides an astute look at how cartography serves political ends and maintains existing power structures. Moreover, maps represent the perspective of the mapmaker (or his/her patron) and thus can provide insight (via what is shown and what is obscured) on how a place, be it the globe or a city, is viewed. Harley (1988, page 71) argues that "There is no such thing as empty space on a map. Revealed by a careful study of the cartographic unconscious and its social formations, these hidden agenda have much to offer historians of cartography... ." In a similar vein, Ackerman's (2002, page 187) analysis of road maps distributed by gas companies in the 1920s and 1930 also reveal a specific agenda (albeit economic rather than political) of promoting "specific brands by associating them with the positive social aspects of automobile travel and good customer service."

Extending the insights of critical cartography to the DigiPlace created by GoogleMaps is relatively straightforward. Google (and similar providers) has the means to highlight and obscure activities in its maps of places. Similar to the way in which geodemographics create profiles for neighborhoods, GoogleMaps provides a specific and automatically produced representation of a place based on code. Google rose to prominence based on its ability to provide high-quality search results but it has also shown that it is willing to filter its indexes (Watts, 2006). Although the use of GoogleMaps is currently free of charge, replicating the practice of giving away free road maps in the early 20th century, the representation provided remains under the exclusive control of Google and as such is subject to a wide array of social, economic, and political imperatives embedded in its coding.

Critical assessment of the GoogleMaps DigiPlace

The remainder of this paper presents a critical assessment of the ways in which DigiPlaces are constructed through GoogleMaps. In August 2005 we searched for fifteen categories of amenities and services in ten cities, selected on the basis of our intimate familiarity with each location. Rather than an attempt to generalize from a representative sample, the review shows how the theoretical issues raised earlier manifest in the GoogleMaps DigiPlace. Though we selected the examples that best highlight a particular aspect of the GoogleMaps DigiPlace, the same issue was identified in a number of

the study locations. Furthermore, it should be noted that Google's indexing of web pages, and consequent calculation of PageRank, is a dynamic process. This means that the discussion below is based on results that change on a daily basis.

What's in a search term?

An important issue in the GoogleMaps DigiPlace is the categorizing system utilized by its code. Although classifications are an inherent part of everyday life, they easily fade into the background. This is not in itself problematic but can become so when the categories are simply accepted at face value. Bowker and Star (1999, page 5) argue that there is a moral obligation to explore these systems because "each standard and each category valorizes some point of view and silences another ... and as such it is dangerous ... classifications and standards give advantage or they give suffering." In the case of GoogleMaps, choice of phrasing and classification can affect visibility in DigiPlace and subsequently alter understandings of local geographies.

For example, when searching for gasoline, Google displays and omits different businesses depending on whether 'gas', 'gasoline', 'gas station', 'gas stations', 'petrol', 'petrol station', or 'petrol stations' is used as a search term. In New York City, a search for 'gas' returns the corporate offices and headquarters of oil production and exploration companies and a supplier of diesel engines in the first page of results. This is likely tied to the fact that generally corporations have much larger cyberpresences than local businesses and are thus more visible in DigiPlace. A search for 'gasoline' brings back a combination of corporate offices and gasoline/service stations. Searching for 'gas station' and 'gas stations' likewise highlights both gasoline stations and business offices, albeit with a larger quotient of service stations in the results than with a search for 'gasoline'.

The search for a sandwich shop could similarly take the searcher to different locations, depending on whether the search was for a 'sandwich', 'hero', 'sub', 'grinder', 'hoagie', 'po 'boy', or 'bomber'. A noteworthy example can be seen in Boston when searching for the aforementioned terms. In every search using one of the terms, none of the first ten businesses returned is listed as a search result for any other term. The disparate results returned by these searches highlight how language use and choice can affect the creation of DigiPlace. Likewise, the same keyword search paired with a variety of geographic locations can yield surprisingly different results, and highlights inconsistencies in Google's categorizing of search terms. For example, a search for 'Gay & Lesbian Service Organizations' in New York pulls up at least 200 results. The same search in San Francisco highlights only two results, while performing the search in the other study locations brings up no results at all. Only by removing the word 'service' from the search term does Google return more results for all the cities.

Dynamic data in place and time

The DigiPlace enabled by Google is an interactive, dynamic space. Not only are search results and listings constantly shifting due to changing cultural links and connections, but interested and outspoken users of the DigiPlace can directly change it by uploading relevant text. However, this interactivity is expressed in significantly different ways within the Google DigiPlace than in physical space. In physical space, a dissatisfied consumer's only means of visual protest against an establishment might be vandalism or graffiti. In DigiPlace, means of protest are simultaneously more controlled and anarchic, as they first must abide by rules set by censors, web designers, engineers, and programmers, but within these boundaries statements can be made by anyone within the same DigiPlace as the relevant business or organization (see figure 2).[5]

[5] More extreme forms of cyber opinion can also be expressed via cyber-vandalism/website defacements (see Dodge and Haklay, 2002).

Figure 2. Paul Smith clothes in New York City (image generated on 10 August 2005).

In addition, telecommunications companies are actively working on technologies that will enable digital graffiti with which people can tag messages to geographic x, y coordinates, making them visible (or audible) to passersby who have the appropriate technology (Daviss, 2001). Again, as with much of the Google DigiPlace, these interactive elements are highly opaque and are often manipulated and censored in a variety of ways (Graham and Zook, 2006).

Measuring distance in DigiPlace

GoogleMaps also creates new representations of distance and accessibility as it ranks and displays results. The geocoded search results returned by GoogleMaps are ordered using an algorithm that takes both the distance from the geographic identifier in the search term, and the PageRank of the query term in account. Distance is calculated from a central point in a city, or the centroid of a postal code polygon, if a specific street address is not provided by the user. Thus, the results of GoogleMaps represent a hybrid measure of distance that combines Euclidian distance with relational distance as defined by online popularity.

For example, Google's hybrid calculation of distance is evidenced through a search for a bar from 500 South Limestone, Lexington, KY (the entrance to the University of Kentucky campus) (see figure 3). The search engine displays only two bars within the immediate vicinity of the campus, while the remaining eight bars returned by Google are further away and require the map to be 'zoomed out'. Thus, initially the results appear to be a measure of pure geographic relevance: the closest bars are listed first, and more distant bars are listed last. Yet Google is in fact altering geographic relevance in two important ways. The bars displayed beyond the initial map-view are not purely ranked according to distance. For example, result 'C' is slightly further away from the search location than result 'F'. Google's representation of nearness or distance is, however, more strikingly illustrated by a number of absences. A number of bars which are even closer to the search location than result 'A' are simply omitted from the search results.

Figure 3. Search for keyword 'bar' in Lexington, KY (image generated on 21 August 2005).

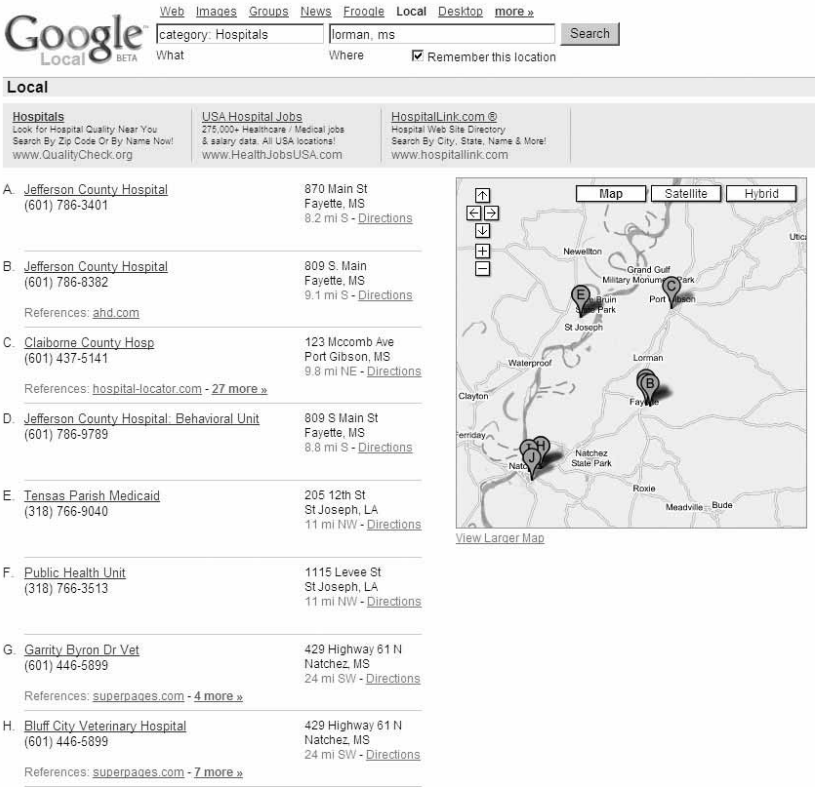

Figure 4. Search for keyword 'Hospitals' in Lorman, MS (image generated on 10 August 2005).

Another important issue in the GoogleMaps service is that it uses Euclidean instead of Manhattan distance in its calculations. In most cases the difference is negligible. However, in towns close to major natural barriers—such as the Mississippi river near Lorman, Mississippi—there are often few roads which exist to transect those barriers. In almost every search conducted using Lorman (see figure 4), Google returned results on the other side of the Mississippi river that are relatively close to Lorman in Euclidean distance, but are actually far away in Manhattan distance due to the fact that very few bridges span that portion of the river (see result E).

While this example illustrates an extreme case of the ways in which the differences between Euclidean and Manhattan distances come to fore in Google search results, it is nonetheless important in illustrating the differences between perceptions shaped by DigiPlace and perceptions based on place. Even more importantly, it highlights the problems associated with "automated production of space ... [the] new landscapes of code that are now beginning to make their own emergent ways" (Thrift and French, 2002, page 309). While it is trivially easy for a human to see that these results are spurious, code produces only the space that its algorithms dictate.

Moreover, by relying solely on absolute Euclidean distance as a measure of separation between points, relative and relational distance is not taken into consideration. The ease of movement along various arterials can differ significantly depending on whether points are connected by buses, trains, interstate highways, or rural connector roads. In the case of a search for restaurants in the small English village of Gulval (see figure 1), Google offers a McDonald's restaurant southeast of Gulval in the village of Long Rock as the first result listed. This restaurant is in fact closer to Gulval in absolute distance than all subsequent results, which are in the town of Penzance, southwest of Gulval. By not factoring in data related to transportation infrastructure and services, the code of GoogleMaps cannot recognize that all southbound bus services in Gulval are destined for central Penzance. To reach the Long Rock McDonald's without a car [a majority of people in Gulval, Long Rock, and Penzance do not use automobiles for nonwork trips (Graham, 2004)] would require a time-consuming change of buses, or a long hike. It is challenging to conceive of ways in which these issues could be satisfactorily resolved. But, these assumptions (or lack of assumptions) that Google makes about distance should nonetheless be highlighted as they determine which locations are, and are not, considered local.

Online visibility and representation in DigiPlace

In many cases Google will place large and well-established businesses close to the top of any returned results, even if they are further away than smaller and less well-known businesses. For example, if 'Alcoholism Information & Treatment Centers' are searched for in Lexington, Kentucky, a spatial outlier is immediately visible on the map (see figure 5). Result B is significantly further away from the central city than all other returned results, but is nonetheless returned as the second result out of twenty six. The alcohol treatment center represented by result B is part of a large healthcare establishment with a sizeable cyberpresence. GoogleMaps combines the relatively highly ranked cyberpresence of treatment center B with distance from the central city. This results in treatment center B being placed in the top five results, despite being a considerable distance from downtown. Using this method Google often returns spatially distant results which are arguably more relevant to the searcher than closer results. An inherent shortcoming of this technique, however, is that it equates rank in cyberspace with the quality of a place.

Figure 5. Search for keyword 'Alcoholism Information & Treatment Centers' in Lexington, KY (image generated on 10 August 2005).

The discussion above suggests that the size of a company can be correlated with the magnitude of its online presence and subsequently with its visibility in DigiPlace. The search for 'restaurants' in Gulval (see figure 1) illustrates this trend by displaying McDonald's at the top of the listings. The McDonald's restaurant that Google identifies is actually not even in Gulval itself, but is instead in the neighboring community of Long Rock. The searches for 'food' and 'restaurants' do not list the only restaurant in the village of Gulval: a family-owned restaurant – pub called the Coldstreamer. A search for 'pub' or 'pubs', likewise fails to list the Coldstreamer. Only when the term 'restaurant' is used, does the Coldstreamer finally appear in the GoogleMaps listings.

This restaurant – pub does in fact have an Internet presence, having two separate Internet domains and websites (figure 6). However, despite its Internet presence, the Coldstreamer's poor showing in the GoogleMaps rankings can likely be attributed to the fact that only one website (an online restaurant guide for Southwest England) links to http://www.coldstreamer.com, and no websites at all link to http://www.coldstreamer-penzance.co.uk. As Google's entire ranking system is based on links between sites, it is not surprising that the restaurant – pub is largely absent from its search results.

The example of the Coldstreamer in Gulval thus suggests that smaller, nonchain establishments, with correspondingly smaller online presences, will have lower Google rankings. This, however, is not always the case. A search for 'pizza' in Lexington, Kentucky reveals that the top three lists are local, nonchain establishments. Central to their high ranking is that they have between twenty-one and eighty-three other websites linking to them (which is significantly more than most other pizza restaurants in the city), which helps to explain why Google considered them to be worthy of

Figure 6. Screenshots from the Coldstreamer Inn web pages (http://www.coldstreamer.com and http://www.coldstreamer-penzance.com).

Figure 7. Search for keyword 'pizza' in Lexington, KY (image generated on 10 August 2005).

listing first (figure 7). These results are from a search conducted in August 2005; an identical search performed in August 2006 revealed that rankings had dramatically shifted. The 2006 results display only the listings of national chains (ie Pizza Hut, Dominos, and Papa John's), while the local pizza shops that came out on top in 2005 are relegated to the third page of listings.

These examples illustrate that, while it is tempting to correlate the size of an establishment's online presence with the physical size of its offline presence, the actual relationships between virtual and nonvirtual presence are more complex and nuanced. Establishments at the periphery of search results are not necessarily lacking an Internet presence (or even online popularity), but nevertheless are ranked lower on the basis of GoogleMaps code. Although the stated mission of GoogleMaps is to leverage local information to find businesses and services, the examples in this article raise concern that Google is simply magnifying the visibility of large firms, thereby further empowering those with already entrenched advantages. In the example of pizza in Lexington, it is unclear whether the altered rankings which favor Pizza Hut and other corporations are a result of an increased cyberpresence, altered ranking algorithms, or conscious attempts on the part of large companies to manipulate the results. However, such questions can only gain in importance because, with the increasing use of Internet searches to obtain local information, a lack of visibility in software can easily translate into a lack of visibility in hard-where (place).

Conclusion

> "Code is the lifeblood of the network society, just as steam was at the start of the industrial age. Code, like steam, has the power to shape the material world; it is able to produce space."
>
> Dodge and Kitchin (2005, page 209)

The GoogleMaps interface combines spatially referenced information located and ranked in cyberspace with characteristics of places to create one form of DigiPlace. While there are clear technical algorithms used to generate these maps, the underlying code represents a set of socially constructed values embodying a range of political, economic, and cultural imperatives. Despite their importance, however, these values are generally obscured behind DigiPlace's representation of places that can be easily accepted at face value, particularly by noncritical users. Thus, GoogleMaps is much more than just an online mapping service; it is the producer of a subjectively designed interactive space that influences how people interact with their local environment. This 'hypercomplex' DigiPlace relies upon the uneven terrain of cyberspace to rank and categorize via coded algorithms that are subject to manipulation by economic and political interests.

The case study of GoogleMaps illustrates that, while DigiPlaces are unstable and unfixed (ie minor changes in spatial and temporary positionality or altered formulations of search terms can fundamentally alter and reconfigure DigiPlaces), there remain distinct hard-coded influences on DigiPlaces and people's consequent perceptions of, and interactions with, place. DigiPlace is not determined and constrained by transcendental structures, but exists instead in a fluid and complex state of being, in which agents and structures are interminably enabling and shaping one another. In some cases it provides a means and space for outspoken users to voice their own opinions (user reviews and rankings) while simultaneously constraining and censoring those opinions. Moreover, since both the content of Google and individuals' day-to-day lives are constantly in motion, there is a perpetual reformulation of DigiPlace. DigiPlaces thus provide an important new research avenue through which to explore the interactions between culture, code, information, and place as they create new lived spaces which transcend the cyberspace versus physical place binary.

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