Commentary on Next Generation Digital Earth

More than Names - Digital Earth and/or Virtual Globes?

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Abstract

This commentary suggests that the variety of terms used to refer to Digital Earth, the most widely used formulation, expresses a range of associations and meanings that appeal to different overarching concepts of the relationship between this phenomena and societies’ ongoing engagement with our place in the world. Gelernter’s Mirror Worlds concept is an apt starting point for considering Digital Earth, one, however, we should also consider and critique. Reflection on the usages of various terms should play a role in our considerations of what we wish to accomplish through our work and what we aspire to in next generation Digital Earth environments. Different terms, for example, Digital Earths are perhaps more suitable for some communities.

Keywords: semantics, language, digital earth

1 INTRODUCTION

How is Digital Earth different from Virtual Globes? Distinctions in these metaphors, beginning with differences arising from the use of the singular "Earth" or plural "Globes" suggest that ambiguity in the usage of these words obscures underlying scientific, administrative, cultural and political questions germane to proposed and existing Digital Earth activities. More importantly, thinking about these terms when we use them is part of reflecting on what our work involves and what aspects we wish to emphasize. Metaphors are more than names. As research in cognitive science has demonstrated (Lakoff 1997), metaphors help us to conceptualize complex situations and experiences and name what is
intangible by placing them in a familiar context. For example, a GIS is often described as a machine, an organism, a network, or an arrangement for different audiences. Metaphors are necessary and useful for communication; however, when they become entrenched, people can begin to mindlessly think and act without consideration of the dissonances. This commentary looks at the different meanings used to discuss digital earth and charts out the various user communities spoken to by the various constellations.

A 3 X 3 matrix presents the map of meanings as a simplified Wittgensteinian language game (Stroud 1996). In the conclusion I consider two significant dimensions (real and place) from this matrix in relationship to the mirror worlds produced with information technologies by scientists, bureaucrats and artists. I close by pointing to the potential of the 3X3 matrix to serve as a framework for considering the significance of next generation digital earth for society as well as in engaging progressive and critical studies of the growing availability of geo-referenced digital information about this planet and us.

2. GEOGRAPHIC INFORMATION MEETS THE MIRROR WORLD

A number of words are in circulation to describe what is perhaps most widely know as Digital Earth, the term then Vice-President Al Gore used in 1998. We identified the following nouns earth and globe and adjectives digital and virtual. Since Gelernter’s seminal work (Gelernter 1991) refers to a relationship to "reality", I find it important to also consider the substantive place and the adjective real in the 3 X 3 matrix as well.

The dictionary definitions of the lexemes, or the underlying units of meaning behind each word, offer important insights regarding the complex semantic fields of meanings we engage with when we use these words in writing or speaking. Turning to the headwords in the Oxford English Dictionary, I summarize from the taxonomy of each word the following significant lexemes.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
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<tbody>
<tr>
<td>earth</td>
<td>the planet on which we live; the world; the surface of the world as distinct from the sky or the sea; the present abode of humankind, as distinct from heaven or hell</td>
</tr>
<tr>
<td>globe</td>
<td>the earth; a spherical representation of the earth or of the constellations with a map on the surface; a spherical or rounded object</td>
</tr>
<tr>
<td>place</td>
<td>a particular position or point in space; a portion of space occupied by someone; a position in a sequence, in particular</td>
</tr>
<tr>
<td>digital</td>
<td>relating to or using signals or information represented by discrete values (digits) of a physical quantity, such as voltage or magnetic polarization, to represent arithmetic numbers or</td>
</tr>
</tbody>
</table>
approximations to numbers from a continuum or logical expressions and variables

virtual almost or nearly as described, but not completely or according to strict definition; Computing not physically existing as such but made by software to appear to do so

real actually existing as a thing or occurring in fact; not imagined or supposed; (of a substance or thing) not imitation or artificial; genuine

The definition of each lexeme, taken alone, points to different semantic fields. For example, globe, without a clear context might refer to a three dimensional model of spherical coordinates or it might refer to a three dimensional sphere covered with a map printed on a gore and glued to the sphere. The two are indeed different. A globe, in other words, is never just the earth; it is the representation of the earth referred to through a three dimensional spherical model. The term digital has two simpler lexemes, but the distinction between representations through discrete values and the expression of numbers "from a continuum of logical expressions and variables" suggests that digital indeed refers to something far more complex than a selected representation from a continuum. Questions surface when we probe this lexeme's use in ongoing discussion: What is the representation? What is the continuum? Without answers to these questions, the semantical relationship to the referent has some ambiguity. Is that desirable? Earth, as the lexemes point to, denotes several meanings tinged with metatheoretical, teleological and practical distinctions that different individuals make in connoting the meaning they associate with the word. Which lexeme is the referent in current discussions? Just as in the iconic image "Earthrise" (see Figure 1), earth inescapably refers to both the planet we live on and the surface of the world distinct from the sky or sea but also the present abode of humankind.

Clearly the distinctions are more than terminological. Our use of the terms "digital earth" or "virtual globe" takes up particular meanings from previous usage and connects a body of work to a vast implicit array of meanings, what Wittgenstein's seminal language game concept points out. Significantly, the different fields of meaning individuals construct in the language game are of importance for rationally thinking about the world we both know and don't know--we can fill in gaps in knowledge through the associations we construct and share. The formal purity of an abstraction when unveiled turns into a deeply rooted miasma of meanings and allusions. This linguistic flexibility underpins the vitality of these terms in our communications. It is also what actor-network theories dealt with early on in the development of this theoretical work as they sought to develop a theoretical framework that merged the pragmatic semiotics of Pierce with the non-essentialist philosophies of post-structuralism. Anglo-americans in a number of fields have readily adopted the boundary objects concept (Star and Griesemer 1989; Harvey and Chrisman 1998), going one further by deploying a well-known
and often concrete metaphor to verbally signify how single terms can easily refer to multiple lexemes.

Figure 1: The “earthrise” image taken from Apollo 8 in 1968. (Source: NASA)

3. THE 3X3 MATRIX

The different meanings in the semantic fields for the terms I consider is potentially n-dimensional. My interest is however to focus more narrowly on the nine possible permutations of words that appear most widely in circulation among GI scientists and related researchers and academics based on an unofficial assessment.

To plot this field of meanings I suggest considering a 3X3 Matrix that graphically lays out the possibly permutations of widely used terms.

<table>
<thead>
<tr>
<th>Digital</th>
<th>Virtual</th>
<th>Real</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth</td>
<td>Digital Earth</td>
<td>Virtual Earth</td>
</tr>
<tr>
<td>Globe</td>
<td>Digital Globe</td>
<td>Virtual Globe</td>
</tr>
<tr>
<td>Place</td>
<td>Digital Place</td>
<td>Virtual Place</td>
</tr>
</tbody>
</table>
Out of the nine, only real globe seems to have not found broad currency in discussions. This permutation is in fact oxymoronic: a globe that is real is not the representation, but the referent itself. From the other eight, both digital earth and virtual globe have found widespread circulation and I focus on them. Virtual earth and digital globe appear to have been used far less, making them less significant for the issues I consider here, but still relevant. Digital place has taken on a variety of meanings in human geographical engagements with the influence of information technologies on spatial experience to virtual economies; the same appears to be true for virtual place. The real column of the matrix has not yet found much use in GIScience discussions compared to geographical discourse—both contemporary and historical.

The four word pairings from the matrix I focus on are therefore: digital earth, virtual globe, digital globe, and virtual earth. Drawing on the earlier discussion I posit that digital earth is in fact most widely in circulation because it refers both to the research activities of the GIScience community and also to key understandings of our planet that embrace not only the GIScience but speak clearly to other groups in societies, even if they might dispute the importance of associated metatheoretical and teleological meanings. Virtual globe appears in distinction, based on the lexemes involved, to possess a narrower semantic field and hence be more specific in referring to the software-based representation of the world without the metatheoretical and teleological connotations of digital earth. Digital globe fails to capture the broader resonances of digital earth. Virtual earth, while offering a broad cumulative semantic field, also is more diffuse. Virtual connotes an uneasy ambiguity between representation and referent.

4. SUMMARY AND POSSIBLE ISSUES

To conclude I turn back to David Gelernter's Mirror World concept. In the seminal work *Mirror Worlds* he lays out a utopian (but for some dystopian) vision of what these soft- and hardware enabled infrastructures could look like. "A Mirror World is some huge institution's moving, true-to-life mirror image trapped inside a computer--where you can see and grasp it whole." (Gelernter, 1991, 3). We are far from such a mirror world, but the vision articulates an age-old desire to represent, engage, and control the world through its visual mediator (Pickles, 2004). Before getting anywhere near Gelernter's vision, we should get our terms straight and disentangle the important differences between the *Mirror Worlds* in Gelernter's usage and a single *mirror world*. Digital earth appears to be the right term for most of jobs because it clearly signals the potential of Gelernter's vision while connecting multiple communities. For some jobs it may less well suited, particularly, when the diversity of understanding the world and hermeneutics of knowing stand foremost in the scientific engagement with the world, the plural seems better suited to the "job". Virtual Globe, again, appears to be the more viable terms for discussions of the applications' software environments. As the
two terms are hardly synonyms, the distinctions are usefully engaged to remind us that there is real earth with real places and we should remain attentive to the differences between referent and referrer in our models and discussions. "Digital Earths" points most clearly to the unequivocally multiple experiences and knowledges we have -- and continue to make -- of the world. Finally, I would like to make a clear note about the limitations of this commentary. Relying on Google to demonstrate significance is questionable (Goodchild 2007) and this commentary is limited by its preliminary engagement with the linguistic dimensions of Wittgensteinian language games in SDI practices. I have not performed a linguistic study to empirically support either the reasoning or conclusions. The aim of the commentary is merely to contribute to discussions about how we refer to this important area and promote reflection in the development of next generation Digital Earth, or whatever it may be called in the future.

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REFERENCES


