

3D Geo-Design Mapping Using DataAppeal

Concept for a workshop at the Digital Landscape Architecture DLA Conference 2013

Invited contribution by
Nadia AMOROSO and Haim SECHTER

Abstract

Maps provide layers of geographical data that direct one through the city. They guide the user in space and reveal specific parameters of the city. The “Geo-Design Mapping Workshop” offers an engaging opportunity for participants to transform environmental data derived from site and design it into visually engaging 3D and animated maps using a new simplified GIS web-based application called DataAppeal. Using DataAppeal as the digital platform, participants will take CSV or excel data-files with geo-coordinates and numerical values, and create spatial maps designed with different “presentational looks”. This offers a playful opportunity to design the visual display of your data while revealing further insights into your information.

Introduction: Research Behind the Application

Manifesting the Invisibles of the City into New Form

The concept behind the DataAppeal application is grounded on research pertaining to new depictions of the city blended by art, design and data. Imagine a city invisible to the human eye and only manifested by its non-visual urban phenomena. What shape will it take? With the new urban forms represented as images, would they become guides into the city? Revealing forces not visible to the naked eye, the research abstracts textual urban data and transforms them into landscape architectural visions. Examples of these forces in the urban context would include criminal activities, zoning by-laws, population densities, transportation patterns, public surveillance, cell phone usage, air quality readings, and other spatial statistics. The application draws from aspects taken in Nadia Amoroso’s book, “The Exposed City: Mapping the Urban Invisibles”.

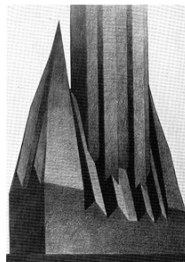
How can the abstract forces shaping urban life be rendered artistically and informatively in the form of alternative 'maps' which represent urban dynamics, not usually accessible to routine professional expertise (such as the urban designer) or the ordinary urban dweller; and in what ways do the new visualizations provide deeper insights into the city than conventional maps are capable of revealing? The research described in “The Exposed City” proposes to test the visual and spatial qualities of new urban forms through the creation of multi-dimensional maps. The research defines and redefines the term map throughout the twentieth century, experimenting with a hybrid of map and image to create alternative visual representations of urban conditions. Using new and alternative modes of graphic display, these maps express otherwise unseen urban data.

Also considered in this research is the capacity of an artistically rendered image (or map) to influence and capture the audience. An image of the city that has artistic merits attracts its viewers with its seductive qualities and is likely to inspire immediate reactions – which can be said to bridge the gap between data, visual art and urban design.

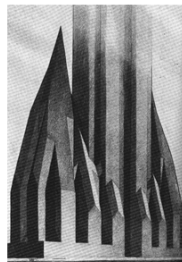
Key Figures of Inspiration: Hugh Ferriss, Edward Tufte, Richard Saul Wurman, MVRDV, James Corner ...

In the research, key individuals from the early to late twentieth century whose works are analysed as precedents for the study of maps as both informative and artistic productions are examined. This included the graphical interpretations of the 1916 zoning Ordinance of New York City drawings of Hugh Ferriss, interpreting his sketches a theoretical framework for analyzing the representation of the city through powerful visual documents. Ferriss's drawings are examined to show the ways in which this artist revealed the unknown constraints of the 1916 Ordinance of New York. These drawings also referred to as the 'Evolution of the Set-Back Building', can be considered three-dimensional maps, offering guidance in which the permissible building form as be constructed. The drawings of Ferriss contributed to an all-encompassing awareness of the effects of zoning and its architectural and urban design implications. Presenting Ferriss's maps as catalysts for the innovations which characterize the architectural movements of the early 1920s may seem an exaggerated proposition. However, the fact that his drawings consolidated and provided a clear definition of the major legal and economic shifts within the milieu of early twentieth century American culture cannot be denied. His images spoke to all sets of audiences simply by their familiar architectural form and style.

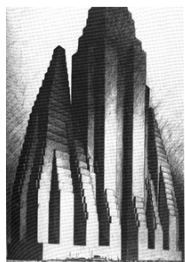
NYC Building Ordinance Visualizations by Hugh Ferriss (1920)



Stage One-
The first drawing of the series represents the maximum permissible building mass under the zoning laws. As a simple expression of mass, the image describes a composition of bulky, pyramidal forms arranged in an elegant manner. Ferriss captures the poetics of the data through his chiaroscuro techniques.



Stage Two-
Hugh Ferriss depicts the second evolutionary stage of the set-back building. The drawing shows a volumetric expression, similar to the definition of mass in the first stage, is further articulated with a series of vertical cuts arranged rhythmically along the base and the shaft of the tower.



Stage Three-
Hugh Ferriss depicts the third evolutionary stage of the set-back building. The building envelope attains an appearance that is both architecturally and economically practicable with its steps.



Stage Four-
The fourth and final drawing that Ferriss creates to demonstrate the formal consequences of the zoning laws is a close representation of a building with no exterior articulation.

Fig. 1: Ferriss's drawings from the 'Evolution of the Set-back Building'.

Source: Hugh Ferriss, The Metropolis of Tomorrow, 1926.

Other key figures that provided inspiration to the concept behind DataAppeal included the works of the geographer and theorist Kevin Lynch. Active in the 1960s and 70s, Lynch is best known for investigating how people conceived the city. The people made maps. His process is labelled as “cognitive mapping”. In a more recent investigation of the potentials of representational media, contemporary landscape architect James Corner portrays mapping as a creative and inventive process and shows the potentials of maps to unfold “hidden” facts of the city. His seminal book with famed photographer Alex MacLean “*Taking Measures Across the American Landscape*” (1996), Corner showcases landscapes, agricultural lands, railway sites, mountainous terrains, wind farms and burning fields (among other subjects) from above while offering further “measures” on the site with his created supplementary *map-drawings* (a combination of map and drawing styles such as collage crafted by Corner as means to interpret the aerial photos, and thus, creating a *map-drawing* of the site).

Other key figures included the works of MVRDV and their celebration of the *datascape*. Similar to Ferriss’s visual investigations of the 1916 Ordinance, *datascapes* serve as an architectural language, which turns statistical description into representations of the theoretical envelopes within which built forms can be placed:

“*Datascapes* are visual representations of all quantifiable forces, which can have an influence on the work of the architect or are even able to determine and to steer them.”¹

Another description of the concept of *datascape* include:

“*Datascapes* are visual representations of all the visual and non-visual influences that have an impact on or regulate the work of an architect.”²

James Corner, former partner with Stan Allen, landscape architectural theorist, and Chair of the Department of Landscape Architecture at the University of Pennsylvania, describes *datascapes* as:

“... imagings constructive and suggestive of new spatial formations,...so ‘objectively’ constituted (from numbers, quantities, facts, and pure data) that they have great persuasive force in the bureaucratic and management aspects of contemporary city design. They differ from the quantitative maps of conventional planning in that they image data in knowingly selective ways. They are designed not only to reveal the spatial effects of various shaping (e.g., regulatory, zoning, legal, economic, and logistical rules and conditions), but also to construct a particular eidetic argument.”³

Also, *datascapes* have been described as “...revisions of conventional analytical and quantitative maps and charts that reveal and construct the various shape-forms of forces and processes operating across a given site.”⁴

¹ STEELE (1998, p. 10).

² Bart Lootmsa expresses his thoughts on the concept of *datascapes* in *Berlage Cahiers* 7, July 1997, p. 39.

³ James Corner, *Operational Eidetics: Forging New Landscapes*. In: Harvard Design Magazine, Fall, 1998, p. 25.

⁴ Ibid.



Fig. 2:
Rendering by MVRDV. *Image source:*
Winy Maas, *Metacity/Datatown*, 1999.

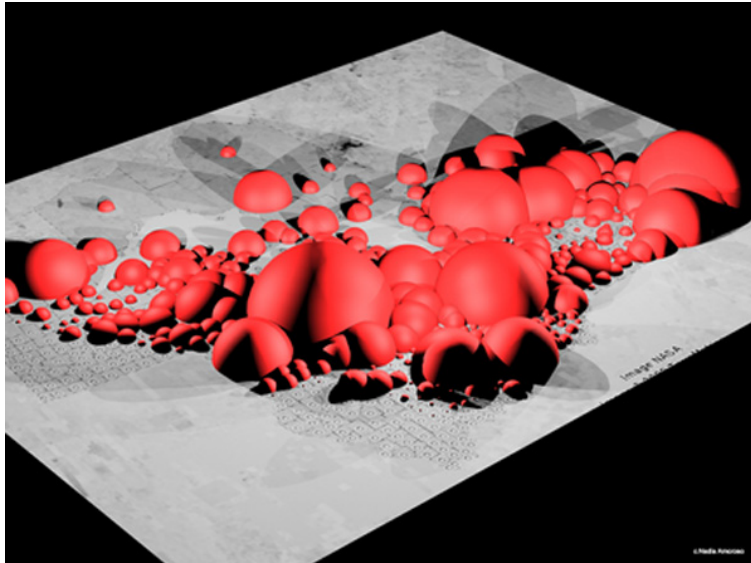


Fig. 3: Landscape of Great Lakes Regions Toxicity Levels, Nadia Amoroso 2010, using 3D Studio MAX, Photoshop

Upon examining these key individuals and their works, the attempt is to create a hybrid “map-landscapes” that visualize “hidden” forces (numerical data) into new 3d mapping styles. Map-landscapes fuses art, spatial form, site-based data to form a new kind of data-landscape. In an attempt to inspire better built forms, new modes of representation are proposed.

DataAppeal Application

Grounded in this research-based design principles, we developed a web-based application the transforms data files into beautifully design 3D and animated maps situated on the Google Earth platform. DataAppeal is a simplified mapping and Geographic Information System platform, intended to visualize location-based information, transforming it into business insight, instantly.

Numerical data from simple data file (csv, xls) is proportional rendered into models referenced to a geo-coordinates. The larger the numerical value, the bigger the model is creation. This follows principles of graphical integrity as professed by acclaimed infographic guru, Edward Tufte. According to Tufte, graphical integrity is maintained when the visual representation of the data is consistent with the numerical representation.⁵ The first principle is that: “The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities represented.”⁶ The relative size of the symbol is critical. Size applies to all dimensions involved.

Collectively, all these models create a unified 3d data-map. If the user applies the colour gradient feature, low values are rendered with a light hue, while larger values are rendered with a darker hue. The same dataset category is rendered in the same colour, following design principles suggested by Information Architect, Richard Saul Wurman.

As part of his mapping principles, Wurman suggests, “When and why to use colour” are critical aspects in mapping information visually. He claims that many cartographers are incorrect in their use of colour. “Cartographers have had it wrong. They use different colours to represent the same category such as temperature change. In a weather map, for example, high temperature readings are usually coloured in red (which is fine). Higher temperatures should still use red but in richer intensities. Lower temperature readings should be rendered using the same colour but with a moderate to lighter intensity such as lighter shade of red. Often a blue is used, which is incorrect. Different colours should only express different categories.”⁷ In the image below, Wurman uses colour – intensification to highlight denser areas in New York City.

⁵ TUFTE (2001, p. 55).

⁶ Ibid. (p. 56).

⁷ Discussion with Wurman on mapping strategies, principles and techniques on July 8, 2006.



Fig. 4: Wurman's map on Residential Population Density for New York from Passonneau and Wurman's Urban Atlas (1966) depicting various urban data sets for twenty American cities. *Source: Joseph R. Passonneau and Richard Saul Wurman. Urban Atlas: 20 American Cities; a Communication Study Noting Selected Urban Data at a Scale of 1: 48,000, 1966, section on New York City.*

Some of the main goals that underline the development of the DataAppeal application include:

- **FAST**-Visualize many rows of data in seconds for instant decision making
- **SIMPLE**-Provides an intuitive self-service application to analyze data. No previous training required No GIS training is required to use our tool. The user can simply upload a spreadsheet (csv, excel, and shapefiles) and design their data through a palette of visual options. It's quite intuitive to use.
- **EMPOWERING**-Places information at the fingertips of all departments.
- **CREATIVE**-Makes the use of information more palatable, ensuring high quality, evidence-based decision making.
- **COMPATIBLE**-Leverages Google Earth base map to ensure familiarity with tool. Accepts file formats from existing enterprise applications.

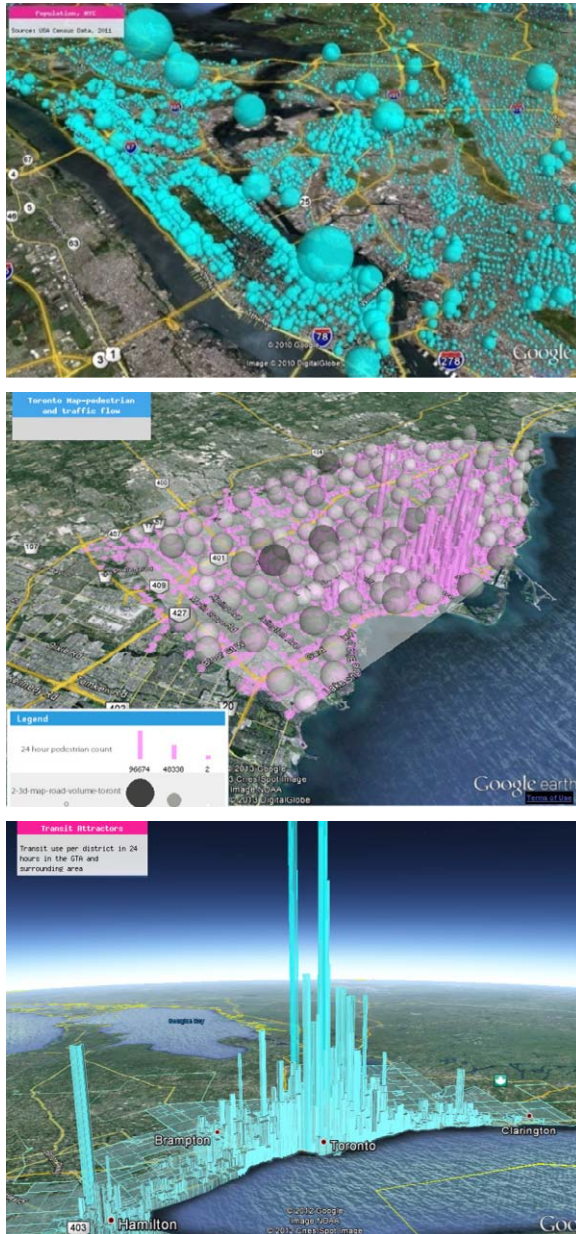


Fig. 5-7: Various data-maps generated and designed using DataAppeal (NYC population, Transit attractor in Toronto and surrounding area, 24 pedestrian count and road volume, Toronto)

How can landscape architects and urban planners use DataAppeal?

DataAppeal provides a simplified GIS platform, therefore landscape architects without any GIS training can use the application to get visually engaging site analysis, that can be used to retrieve further insights on the site and can also be used for visual communication purposes. Also, landscape architects can take the raw data about the site typically found on government and natural resource websites, and then upload this data in our tool. Thousands

of rows of information will be rendered into a landscape revealing hidden trends in the city. Landscapes architects and urban planners can use the created data-map, as an alternative presentational and research device. These design maps can be used as an instrumental device to help make better design decisions. For example, a group of landscape architecture graduates used DataAppeal to pin point and visualize contaminated site along the Miami River corridor in Miami Florida. They also used tool to highlight abandoned areas along this space. Other elements visualized and analysed including market value and demographics. Using the data map layering features, the landscape architects combined various datasets to “see” and examine brownfield space, parks and urban efforts on natural sites to determine appropriate future development sites. The data-maps helped the designers discover new findings of their location and to draw linkages between various datasets, when maps were overlaid.

Along Washington Ave, in Miami, one group of landscape architects visualized the number of homeless occupying various spots along this corridor. The design maps revealed a high homeless presence near 20th to Dade Blvd and presence of homeless along 13th to Lincoln. Another group, for example, created maps reflecting property and housing values along the strip, while others examined data relating to foot-traffic at various times of the day. Higher volumes were present near popular restaurants, cafes and cultural venues; while at night, key bar and clubs had larger spikes in the model representation. Other 3D mapping representations included façade beautification values and transparency levels in the buildings along Washington Ave. Also, façade beautification efforts seemed to have a direct relationship with housing prices, but not with pedestrian traffic. Others included noise levels with night time activities.

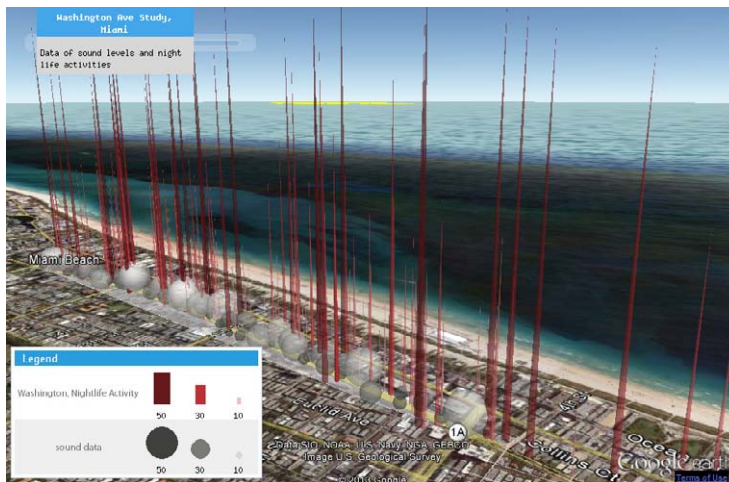


Fig. 8: Washington Ave, Miami Visual Study – Night time activity and sound levels, data-map designed using DataAppeal Application

Landscape architects have also used the tool to visualize municipality’s Well-being data. For example, a group of planners and landscape architects obtain typical textual city data on the diabetes rate and green space. Normally, this type of data would be presented in spread sheets, offering no visual impact to the audience.

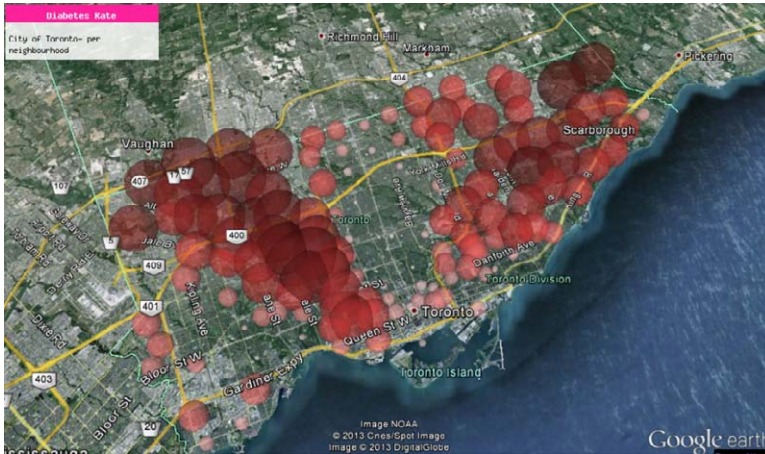


Fig. 9: Diabetes rates data-map, Toronto, designed using DataAppeal application

The landscape architect upload these datasets into the DataAppeal application and quickly design the look of this information. Higher diabetes rates can be quickly revealed throughout the city, the application of colour gradient quickly revealed areas of higher diabetes rates on the periphery of the city. The landscape architect then overlaid this data with cultural venues and green spaces in the city to see if there is any relationship between the datasets and the location. As a visual. It offers a strong case to design or improve various location of the city based on the data representation. Landscape architects can use the images as communication material and as analytical devices.

A recent post regarding data on DataAppeal's Data Gallery pertaining to Hurricane Sandy visualized a representation of the number of trees damaged in New York City and surrounding area. The data-map provided a powerful visual story of the storm's damage. Landscape architects could use this information to determine which areas deserve the most attention or replanting.

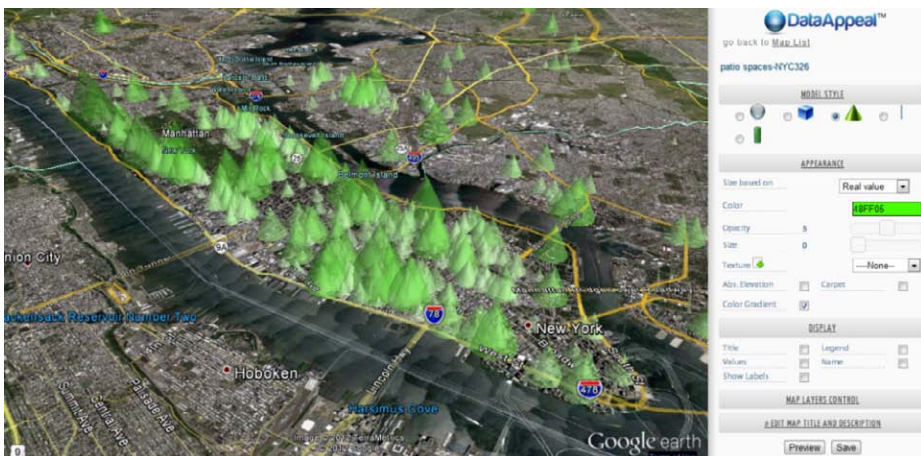


Fig. 10: Inside DataAppeal Application showing design control list panel on the right

The DataAppeal Data Gallery is an online store and data sharing platform, in which users can browse and access data and data-map and use them for their own work. As more data becomes available and accessible, people need a way to make sense of it. I think it's important to make the flow of data easier and more widely understood – to create an open-data culture with an ever-growing number of participants.

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