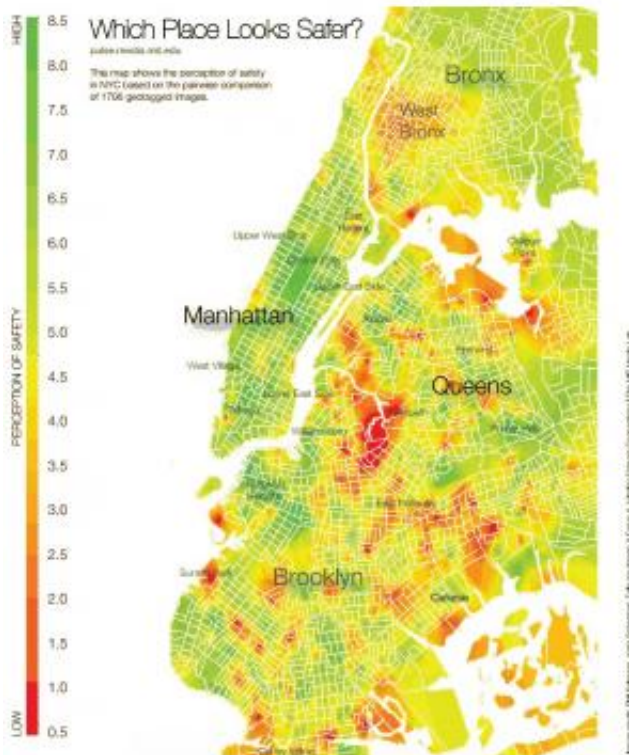# What does a city's appearance say about itself?

July 25 2013, by Lisa Zyga



Data on perceptions of safety in New York City. Credit: P. Salesses, et al.

Just as we are quick to judge people by their appearances, we can also get a good feel for a city from its appearance. With a quick glance, we subconsciously notice the cleanliness of the neighborhoods, the beauty of the architecture, and the liveliness of the streets to form our impressions. But how deep is the information that a city's appearance can reveal?

In a new study, researchers at the MIT Media Lab have asked Internet users to compare thousands of geo-tagged images from four cities in terms of their perceived safety, class, and uniqueness. The results not only allow a comparison of different parts of a city, but can even explain homicide rates beyond what is explained by income alone. As cities continue to grow, the researchers hope that understanding the correlation between urban perception and various social dimensions can help guide urban growth.

The research was conducted by Phil Salesses at the MIT Media Lab's Macro Connections group, under the supervision of Professor Cesar A. Hidalgo, and in collaboration with Katja Schetchner from the Austrian Institute of Technology. The results are published in *PLOS ONE*.

## Data on urban perception

Overall, the study is an attempt to quantify people's perceptions of cities and neighborhoods using big, robust data. The researchers collected 4,000 geo-tagged images of places in New York City and Boston in the US, as well as Salzburg and Linz in Austria. The images from the American cities were sourced from Google Street View, while the images of the Austrian cities were collected manually onsite.

Then the researchers created a website and extended an open invitation to anyone interested in participating. Users were shown two randomly selected images, and asked to click on one in response to one of three questions: "Which place looks safer?", "Which place looks more upper-class?", or "Which place looks more unique?" The survey attracted 7,872 participants from 91 countries, who contributed more than 200,000 votes.

The researchers assigned each image a score of 1-10 based on its win ratio, or the fraction of times it got selected over another image. The researchers also incorporated a correction factor to account for the win

ratios of the images it was compared with, as well as calculated the robustness of the data, or agreement among users.

**Implications are more than skin-deep**

The researchers then used the data to create high-resolution maps of cities showing different evaluative criteria. By analyzing the data, the researchers made several interesting observations. Not too surprisingly, they found that places with higher safety scores also had higher class and uniqueness scores.

However, sometimes the different score types were inversely related, which could reveal particular insight. For instance, locations with low safety scores and high class scores correlated with higher violent crime rates. In such situations, the researchers explain that the "orthogonal component" between class and safety carries important information.

The researchers also found a correlation between safety and class scores and homicide rates in New York City. It's well-known that average income, population, area, and average age in a zip code can partially explain the variation of homicide across zip codes—specifically, these statistics explain 69.9% of homicide variation. Here, the researchers found that adding the average perceptions of safety and class, along with their standard deviations, to the traditional statistics can explain 79.4% of homicide variation, a statistically significant increase. The discovery indicates that the measures of urban perception contain information that is not contained in the traditional statistics alone.

Another interesting result the researchers found is that the images from New York City and Boston elicited a wider range of perceptions than the images from Salzburg and Linz. This finding suggests that the American cities are perceived as more unequal than the Austrian cities. Further, the images of both American cities are geographically clustered closer together based on their scores compared with the Austrian cities. In

other words, the American cities appear more segregated, with larger gaps between their "good" and "bad" neighborhoods than their Austrian counterparts.

**Designing tomorrow's cities**

The idea that urban perception can influence various social dimensions such as crime and health is not new, and may be best exhibited by the Broken Windows Theory. According to this theory, relatively minor disorder such as broken windows, graffiti and litter can induce more serious kinds of disorder such as violent crime. Although the theory is controversial, it has influenced policies that focus on repairing minor problems in order to help fight off more serious criminal activity.

The researchers also note in their paper that urban perception is at the root of many urban planning theories. However, planning movements of the past century have varied widely, from the monumental buildings of the "City Beautiful" movement, to the mixture of low-density housing and parks of "The Garden City" movement, to high-density buildings and parks of Le Corbusier's "Radiant City." Later, in the 1960s, the influential urban planning writer Jane Jacobs perceptively reflected on the connections she observed between the physical environment and the social interactions of its citizens.

Perhaps one of the problems with defining which urban features promote the well-being of its inhabitants is the lack of big data of urban perception, and this is the gap that the current study is attempting to fill.

In the future, the researchers hope to develop techniques to identify the specific features that contribute to high scores. They are now launching a new study in which 56 cities are being scored with respect to 5 new dimensions. The goal of the new study is to compare cities and identify the architectural and planning features that help give rise to different evaluative responses. To participate in the study, visit

http://pulse.media.mit.edu.

Eventually, the researchers hope to involve not only participants on the web but also incorporate machine learning tools and crowdsourcing. They also hope to explore some of the limiting factors, such as image quality, time of day, and weather conditions, that may cause bias.

**More information:** P. Salesses, K. Schechtner, and C.A. Hidalgo. "The Collaborative Image of The City: Mapping the Inequality of Urban Perception." *PLOS ONE.* DOI: 10.1371/journal.pone.0068400