CreativeCities: Does Infrastructure Influence Creative Hotspots in Cities?

Mohammad Hadhrawi* Massachusetts Institute of Technology
Yu-Ann Wang† Harvard University
Alexander Lex‡ Harvard University
Kent Larson§ Massachusetts Institute of Technology

Abstract

The study of creativity and innovation in different cities has traditionally been challenging for several reasons: (1) the data available varies widely and is not standardized, (2) there are many existing and debated proxies for creativity and innovation, and (3) analyses have commonly focused on calculating correlations for selected factors rather than integrating multiple data sources and interactively visualizing them.

To remedy this, we developed CreativeCities, a visualization technique that enables analysts to study factors influencing creativity, such as geospatial relationships between the number of companies incorporated with infrastructure and commercial factors such as public transportation, public schools, and restaurants.

We demonstrate CreativeCities on the example of creative centers in and around three cities (San Francisco, New York and Boston). Not only did our data draw our attention to key clusters (e.g., SOMA/Mission, Upper West Side), but we've also examined how each city has changed in innovation and creativity through time by studying the number of creative professions and the number of patents.

Index Terms: H.5 [Information Interfaces and Presentation]: visualization—maps

1 Introduction

Mainstream media has traditionally been interested in ranking cities based on different factors to compare which city is the most innovative. From patent registrations to VC dollars to R&D investments, there have been unlimited analyses and interpretation of the data.

In the last century, there has been an exodus of people moving from rural environments to the city. It is estimated by 2050, 70% of the world's population will live in cities (UN World Settlement Program). Currently, 51% of the world's population lives in urban areas. The increase in urban population also leads to a burden on current city infrastructure. To address these problems, it is necessary to prioritize measures.

This visualization focuses on the relationship of innovation with three contributing factors: cafes and restaurants, public transportation, and public schools. Drawing inspiration from a variety of literature, we use new companies incorporated as a proxy for city innovation in our geospatial visualization.

According to Florida [4], cultural diversity and tolerance is an important driver for innovation in cities. Florida has argued for increasing the number of cafes, music festivals, and art shows to facilitate the collision of ideas and collaboration in groups [1]. Based on this reasoning, we have mapped each city's caf with its innovation clusters to see if there are common locations.

Another mechanism that city officials use to bring disparate populations together is public transportation. Not only does public transportation increase the overall quality of life for inhabitants through improved walkability and reduced congestion, but it positively impacts businesses. According to the American Public Transportation Association, every $10 million invested in capital equipment results in an increase of $30 million in business sales [2]. In an urban audit a number of European cities are analyzed to show that the availability of public transportation is associated with higher levels of wealth and idea creation [3].

Finally, a city's level of innovation relies on the quality of human capital [5]. Studies on human capital often use education parameters as an estimate: school enrollment rates, average years of schooling, competence of test scores, etc. [5]. Public schools allow universal access of education. While there was no consistent measure of the quality of public education across cities/states, we study if the quantity and geographic concentration of schools held a relationship with the citys innovation clusters. In addition, cities such as New York have been piloting different models of learning (iZone) to increase the innovative thinking of its citizens.

To analyze and evaluate how these different infrastructures of different cities could impact innovation and creativity, we developed CreativeCities, a web-based geo-spatial and analytical data visualization tool to assist city planners and analysts to investigate the relationship between creativity and the distribution of different infrastructures elements within a city.

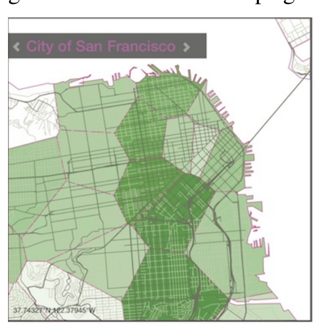
2 The CreativeCities Visualization Technique

The core components of CreativeCities are maps where data is overlaid and that is integrated with additional views, such as bar and line charts. These components enable users to discover and compare different datasets with multiple levels of granularity between cities.

2.1 Maps

The maps component assists users to discover and analyze districts or areas of high/low density within a city, as well as how and where different businesses are clustered. We implemented two methods to overlay existing data on the map with different levels of granularity. These are polygons and points overlays.

The **polygon overlay** is a low granularity level method, which aggregates data into regions. The regions were generated using voronoi tesselation. The points used to generate the diagram are the centroids of city. The main objective for using a voronoi diagram is to standardize shape generation for districts/neighborhoods



(a)

(b)

Figure 1: Visualization of restaurants data in the city of San Francisco using (a) Polygons Overlay, and (b) Points Overlay methods.

*e-mail: mkh@mit.edu
†e-mail:ywang@mba2014.hbs.edu
‡e-mail:alex@seas.harvard.edu
§e-mail:kll@mit.edu

especially when we start comparing different cities side by side. Such approach assists users to quickly navigate and select highly dense areas while observing two maps.

The **points overlay** method provides more details compared to the polygons overlay, emphasizing specific locations instead of an overview. It plots spatial locations of the datasets, such as cafes and schools locations, on the map. The points overlay works better when analyzing clusters and patterns on a smaller scale, to see, for example, the details on how business distributed between two neighborhoods, complementing the aggregated data presented in the polygon overlay.

2.2 Support Views

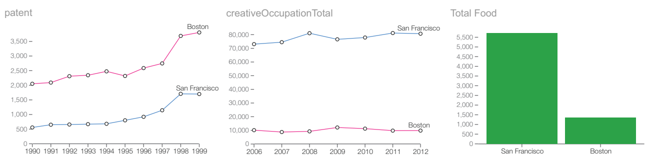


Figure 2: An example of the Support Views visualizing San Francisco vs Boston.

In our support views we visualizes city scale data. We show total counts of each selected parameter for the selected cities in a bar chart. In addition, we use line charts to visualize the development of these parameters over time. This includes number of patents registered in a city, as well as the total number of creative occupations per year.

3 Data Collection and Integrity

To acquire the data, we conducted a web search in addition to interviewing several people from Code for America, Code for Boston, an HBS Real Estate Professor, and two previous employees in the NYC government.

We looked at the US Patent Office to get the number of utility patents in major cities, and at the American Community Survey for the total number and relative percentage of creative professions in theses cities. We pulled other data, such as cafes/restaurants, public schools and transportation from the cities OpenData websites. Unfortunately, items in OpenData tended to be inconsistent and require standardization. For example, we used the Google Developer API geocoding service to convert street address into latitude/longitude values. Our current dataset misses some values. The list of restaurants/cafes in NYC, and Boston corporations data, for example, is incomplete. We will replace these datasets with a complete source aquired through google maps in the future.

4 Conclusion and Futureworks

CreativeCities was developed as a student project for Harvard's visualization class and is available at `http://www.creativecities.co`. To improve the analysis capabilities of the tool, we intend to improve and expand our data, visualization methods, interaction methods and validate a final tool.

Data. Currently, we are collecting data for Seattle, WA and Boulder, CO. We plan to enhance our dataset using additional sources, such as Google Maps to produce more reliable results.

Visualization Methods. In addition to the polygons and points overlays, we are testing three new overlays. First, we will use the zipcodes/districts shape files to generate the overlays. While this serves the same purpose as the polygons overlay, it preserves districts boundaries and might prove more familiar to users. Second, we are testing a grid overlay that divides the cities into smaller squares with equal areas. Finally, we plan to provide a magic lens to mix overlays, thus giving an overview while providing details for areas of interest. This option was favoured by various architects and other users after showing them a mock-up of the method.

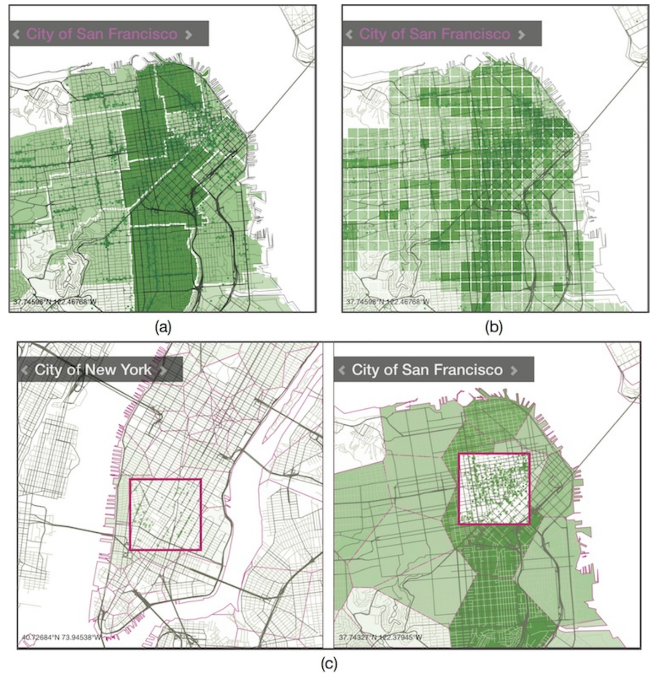


Figure 3: Illustration of visualizing restaurants/cafes data in the city of San Francisco using (a) Zipcodes/Districts Overlay, preserving familiar quaters (b) Grid Overlay, allowing variable scales, and (c) a magic lens approach combining the point overlay with the aggregation mehtods.

Interaction. As mentioned earlier, our tool assist users in identifying dense areas. To allow the comparison of abritrary regions, e.g., neighborhood between different cities in the support views, we plan to enable brushing of specific areas and visualizing the associated data values in the support views.

Evaluation. We plan to evaluate the different visualization methods developed and proposed in this poster, in a user study with city planners and other users, to collect, quantitative and qualitative feedback.

In this abstract we discussed how our visualization, CreativeCities, could assist city planners and analysts investigate the relationship between creativity and the distribution of different infrastructures elements within a city. We described the tool components, the different visualization methods used, and the data used in our visualization. Finally, we proposed other visualization methods to be implemented in future work, and outlined our next steps. We hope that CreativeCities will help city planners to identify creative hotspots in cities, and discover what makes cities creative.

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