Psychological Maps Fifty Years Later: Crowdsourcing to the Rescue
A city consists of streets, squares, and buildings that exist in objective, geographic space. But there is also a psychological representation of the city that each inhabitant carries around in his head. When a man comes to a strange city, at first he does not know his way around. He sticks close to a few known reference points, such as his hotel or the main shopping street, and quickly feels disoriented if he strays from these few familiar paths. With increasing experience, he begins to build up a picture in his mind of how the streets connect with one another, the relationships among paths, and specific turns he must take to move from one point to another. He acquires a representation of the city which we may call a psychological map. A psychological map is the city as mirrored in the mind of an individual. The acquisition of an adequate representation of the city may be a slow process, filled with confusion, and inevitably only partial in its achievement. Very few individuals, if any, have a total grasp of all of the streets and intersections of a major metropolis, but each of us holds at least the fragment of such a map.

In this paper, we shall describe a psychological map of New York City constructed by our research team. But before going further, I would like to raise some general questions about psychological maps and review some of the work that has been carried out in this field. We start with the notion that the person has a psychological representation of some features of the environment. The first question, then, in constructing a mental map, concerns the units of the environment that are to be mapped. In previous research, the scale of maps has varied from those of small campuses to the maps people have in their head of the entire world (Saarinen, 1971; Hooper, 1970; Stea, 1969; Gould, 1967). There is an important difference, of course, in acquiring a mental map of one's campus and that of the world. The campus map is mediated by direct experience, moving about the university buildings and piecing scenes together into some cognitive structure. The image of the world is learned not from direct exposure, but through formal schemas of it as represented in maps and atlases.

Once we have decided what units of geography are to be mapped, we need to decide which psychological features are of greatest interest. The most basic question

This paper was written in collaboration with Judith Greenwald, Suzanne Kessler, Wendy McKenna, and Judith Waters. It was first published in American Scientist, Vol 60, No. 2 (March–April 1972), pp. 194–200. Copyright © renewed 2000 by Alexandra Milgram. Reprinted by permission.
Crunch commuter data to track changing communities

16 April 2012 by Jacob Aron
Magazine issue 2860. Subscribe and save

Editorial: "Train tracks of our tears put to good use"

LONDON commuters are generally a surly bunch, grumbling as they battle through the city's underground train network each morning. Nevertheless, records of their journeys could be a key to improving urban well-being.

Every day, millions of Londoners touch their Oyster card to the underground's wireless ticket readers each time they enter and exit the system, building up a detailed database of travel through the city. Computer scientist Daniele Quercia and colleagues at the University of Cambridge have now compared this data with official measures of social deprivation and found that a community's prosperity is reflected in the comings and goings of its residents.
well-off  →  deprived
well-off $\rightarrow$ deprived

Visibility
visibility & well-being
Psychological Maps
A Psychological Map of New York City

Stanley Milgram (1972)
Recognizability

The ease with each [a city's] parts can be recognized and organized in a coherent pattern.
Recognizability

The ease with each [a city's] parts can be recognized and organized in a coherent pattern
FIGURE 7.4 This stylized map of New York City shows the correct placement of scenes at 152 viewing points in the city, placed according to neighborhood.
WWW Game!
Where is this?

Choose Your Answer's Precision: Tube Station Borough Don't know

Guess the tube stations close to this picture. The closer, the more points (max 100).

The closest London tube station is

View larger image
Gamifying Recognizability

1. Keeping score
2. Social Media integration
3. Different places every game
4. Not too hard
5. Feedback to the player
6. Sense of purpose
7. Allow multiple answer precisions
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launched few months ago > 2K players
# Demographics

<table>
<thead>
<tr>
<th></th>
<th>London</th>
<th>UK</th>
<th>World</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Answers</strong></td>
<td>7,238</td>
<td>8,705</td>
<td>3,972</td>
<td>19,915</td>
</tr>
<tr>
<td><strong>Users</strong></td>
<td>739</td>
<td>973</td>
<td>543</td>
<td>2,255</td>
</tr>
<tr>
<td><strong>Gender (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>59.13</td>
<td>64.34</td>
<td>46.51</td>
<td>59.58</td>
</tr>
<tr>
<td>Female</td>
<td>40.87</td>
<td>35.66</td>
<td>53.49</td>
<td>40.42</td>
</tr>
<tr>
<td><strong>Age (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18</td>
<td>0.87</td>
<td>0.78</td>
<td>0.00</td>
<td>0.70</td>
</tr>
<tr>
<td>18-24</td>
<td>16.52</td>
<td>24.81</td>
<td>9.30</td>
<td>19.16</td>
</tr>
<tr>
<td>25-34</td>
<td>41.74</td>
<td>38.76</td>
<td>51.16</td>
<td>41.81</td>
</tr>
<tr>
<td>35-44</td>
<td>16.52</td>
<td>13.95</td>
<td>20.93</td>
<td>16.03</td>
</tr>
<tr>
<td>45-54</td>
<td>13.91</td>
<td>13.95</td>
<td>6.98</td>
<td>12.89</td>
</tr>
<tr>
<td>55-64</td>
<td>5.22</td>
<td>6.20</td>
<td>9.30</td>
<td>6.27</td>
</tr>
<tr>
<td>65+</td>
<td>5.22</td>
<td>1.55</td>
<td>2.33</td>
<td>3.14</td>
</tr>
<tr>
<td><strong>Mean (years)</strong></td>
<td>36.39</td>
<td>33.88</td>
<td>34.52</td>
<td>34.98</td>
</tr>
</tbody>
</table>
Recognizability
Recognizability by Region
Greater visibility is based on people being better able to associate images of these places with the place itself. In a sense, visibility relates to how recognizable different parts of London are.
Londoners vs. UK vs. World

(a) Londoners
(b) UK
(c) Outside UK
(d) All
# Misclassifications

<table>
<thead>
<tr>
<th>Region actually is</th>
<th>But identified as</th>
<th>Combined Errors</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>E</td>
<td>W</td>
</tr>
<tr>
<td>Central</td>
<td>40.79</td>
<td>4.52</td>
<td>4.33</td>
</tr>
<tr>
<td>East</td>
<td>6.97</td>
<td>16.58</td>
<td>6.80</td>
</tr>
<tr>
<td>West</td>
<td>10.10</td>
<td>6.42</td>
<td>12.70</td>
</tr>
<tr>
<td>North</td>
<td>6.85</td>
<td>4.79</td>
<td>12.67</td>
</tr>
<tr>
<td>South</td>
<td>6.04</td>
<td>5.37</td>
<td>11.41</td>
</tr>
</tbody>
</table>

Response Bias (popular among wrong guesses)
- 29.96
- 21.1
- 35.21
- 16.46
- 23.04
Recognizability

\[ R = f(C \cdot D) \]

- centrality (exposure)
- distinctiveness

[ MILGRAM 72 ]
Recognizability vs Distinctiveness
## Distinctiveness

<table>
<thead>
<tr>
<th>name</th>
<th>$R$</th>
<th>$C$</th>
<th>$r_R$</th>
<th>$r_C$</th>
<th>$D$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackfriars</td>
<td>9.09</td>
<td>4583</td>
<td>30</td>
<td>2</td>
<td>15.00</td>
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<tr>
<td>Park Royal</td>
<td>20.00</td>
<td>13119</td>
<td>61</td>
<td>5</td>
<td>12.20</td>
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<tr>
<td>Pinner</td>
<td>10.00</td>
<td>13823</td>
<td>37</td>
<td>6</td>
<td>6.17</td>
</tr>
<tr>
<td>Royal Oak</td>
<td>10.00</td>
<td>16681</td>
<td>37</td>
<td>8</td>
<td>4.63</td>
</tr>
<tr>
<td>Westbourne Park</td>
<td>16.66</td>
<td>24593</td>
<td>54</td>
<td>13</td>
<td>4.15</td>
</tr>
<tr>
<td>Hornchurch</td>
<td>7.14</td>
<td>11988</td>
<td>16</td>
<td>4</td>
<td>4.00</td>
</tr>
<tr>
<td>Essex Road</td>
<td>5.55</td>
<td>2027</td>
<td>4</td>
<td>1</td>
<td>4.00</td>
</tr>
<tr>
<td>Oakwood</td>
<td>11.11</td>
<td>22321</td>
<td>41</td>
<td>11</td>
<td>3.73</td>
</tr>
<tr>
<td>Hillingdon</td>
<td>6.67</td>
<td>9482</td>
<td>11</td>
<td>3</td>
<td>3.67</td>
</tr>
<tr>
<td>Acton Town</td>
<td>40.00</td>
<td>33022</td>
<td>73</td>
<td>22</td>
<td>3.32</td>
</tr>
</tbody>
</table>
Recognizability vs Exposure
Recognizability vs Exposure
Datasets

- flickr
- foursquare
- twitter
- tube passengers
Datasets

- 38k users (flickr)
- 9k users (foursquare)
- 58k users (twitter)
- 5.2M users (tube passengers)
Recognizability vs Exposure

- Flickr: $r = 0.36$
- foursquare: $r = 0.33$
- Twitter: $r = 0.21$
- Tube: $r = 0.40$
Recognizability vs Well-Being
1. Income
2. Employment
3. Health
4. Education
5. Housing
6. Crime
7. Living Environment
Recognizability vs Well-being

**borough-level**

- Housing: 0.64
- Living Environment: 0.61
- Income: 0.35
- Employment: 0.34
- Health: 0.3
- Crime: 0.16
- Education: 0.08

**census area-level**

- Housing: 0.29
- Living Environment: 0.23
- Crime: 0.22
- Health: 0.07
- Income: 0.05
- Education: 0.04
- Employment: 0.01
Psychological Maps 2.0
urbanopticon

Choose a city

BARCELONA  Daejeon? Seoul?

or maybe you fancy the  GLOBAL VERSION
THANK YOU!

@danielequercia
Questions