Mapping city-wide perceptions of neighbourhood quality using street view images: a methodological toolkit

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Background

How individuals interact with city neighbourhoods is, in part, determined by the perceived quality of the urban environment1. Beyond the beauty aesthetic, neighbourhood quality is a core component of urban vitality, influencing the development of social cohesion, sense of community, physical activity and mental health of residents2. Large-scale assessment of perceptions of neighbourhood quality was pioneered in 2016 by the MIT’s Place Pulse 2.0 project3. Researchers demonstrated the efficacy of crowd-sourcing perception ratings, training a model on user ratings of image pairs. However, variation across cities may limit the usefulness of this tool for assessing nuanced within-city perceptions.

Objective

We set forth a protocol for city-specific urban perception collection using the exemplar question ‘On which street would you prefer to walk?’. We test our method in London and examine group differences.

Methods

• Pairwise images were hosted on our website www.pulselondon.co.uk (Fig 1) and shown to over 200 users to rate their preference (Table 1).

We collected ratings from personal networks and supplemented data using Amazon Mechanical Turk. We examine user differences in rating.

• Images were scored using Microsoft TrueSkill algorithm.

• Scores were used to finetune a CNN (Fig 2) to predict scores on unseen dataset and mapped across the city (Fig 3).

Results

1. Successfully built and deployed app with code available on Github4 (Fig 1).

2. Low test accuracy compared to Place Pulse perceptions (Table 2) which appears to be related to games multiplier.

3. Multi-level models with random effects for games and fixed coefficients to test group differences: London/non-London, gender, low-activity/high-activity shows no significant difference between gender and games with significant differences for London and high-activity (Fig 4).

Conclusions

i) Web-based survey design can be used to map findings at the city scale to propose regions of regeneration for urban public health.

ii) Games multiplier threshold must be satisfied to reduce error.

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References