CROWD-SENSING, CITIZEN ENGAGEMENT AND THE SMART CITY:

ASSESSING THE ABILITY OF CYCLING APPS TO INFORM SMART INFRASTRUCTURE PLANNING

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Outline

1. Introduction - Crowd sensing and smart city transitions
2. How to evaluate representativeness - Methodology & engagement
3. Findings - Demographics, quantification & journey characteristics
4. Discussion - Usefulness and application areas of cycling app data
Introduction

Crowd-Sensing and Smart City Transitions

- “truly smart cities will emerge as inhabitants and their many electronic devices are recruited as real-time sensors of daily life”. Carlo and Townsend (2011)
- User-generated data: Potential to offer a smart planning tool to prioritise and choose locations for cycling infrastructure investments.
- This paper is a proof of concept as to whether Strava is useful.

Smartphone app Strava - Is it possible to …

- …use Strava data to understand how cyclists use the city?
- …make inferences where infrastructure investment would be most beneficial?
- …encourage people to use the app?
Methodology

Strava Data

Field Counts

User Engagement
Findings – Number of users

Strava users in numbers
- Approx. Cyclists in Greater Manchester: 200,000
- Approx. Strava users in Greater Manchester: 25,000
→ Strava users represent approx. 12% of all cyclists in GM.
Findings - Overview map of monitored segments

Side roads

Main roads

Segment 9 (06/2014)

Segment 2 (05/2014)

Segment 1 (06/2014)

Segment 2 (06/2014)
Findings – Journey purpose & average speed

Journey purpose

![Bar chart showing the proportion of commuting and leisure cycling.]

Average speed

<table>
<thead>
<tr>
<th></th>
<th>All users</th>
<th>New users</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg speed</td>
<td>24.3 km/h</td>
<td>23.2 km/h</td>
</tr>
<tr>
<td>Main roads</td>
<td>26.1 km/h</td>
<td>24.5 km/h</td>
</tr>
<tr>
<td>Side roads</td>
<td>21.8 km/h</td>
<td>20.9 km/h</td>
</tr>
</tbody>
</table>

Overview speed

![Box plots showing speed distribution by segment.]

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User demographics & engagement

**User demographics**

When did you start using Strava?
- 60% started a while ago (record nearly 100% of all bike rides)
- 30% started to support the Manchester Cycling Lab

Which types of rides do you record?
- 40% commutes, 33% leisure, 15% short trips, 7% racing

What is your motivation to use Strava?
- 45% personal statistics
- 11% compare myself with others
- 20% support research project
Findings from other cities

Flows in Bristol (Distribution)

Flows in Oregon (Seasonality)

<table>
<thead>
<tr>
<th>Month</th>
<th>Bike Counts</th>
<th>Strava Trips</th>
<th>Strava Trips % of Bike Counts</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>10,244</td>
<td>85</td>
<td>0.9%</td>
</tr>
<tr>
<td>February</td>
<td>13,033</td>
<td>125</td>
<td>1.0%</td>
</tr>
<tr>
<td>March</td>
<td>17,569</td>
<td>202</td>
<td>1.1%</td>
</tr>
<tr>
<td>April</td>
<td>20,476</td>
<td>205</td>
<td>1.0%</td>
</tr>
<tr>
<td>May</td>
<td>23,935</td>
<td>230</td>
<td>1.0%</td>
</tr>
<tr>
<td>June</td>
<td>24,422</td>
<td>239</td>
<td>1.0%</td>
</tr>
<tr>
<td>July</td>
<td>28,835</td>
<td>308</td>
<td>1.1%</td>
</tr>
<tr>
<td>August</td>
<td>16,911</td>
<td>166</td>
<td>1.0%</td>
</tr>
<tr>
<td>September</td>
<td>146</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>October</td>
<td>15,196</td>
<td>160</td>
<td>1.1%</td>
</tr>
<tr>
<td>November</td>
<td>12,672</td>
<td>125</td>
<td>1.0%</td>
</tr>
<tr>
<td>December</td>
<td>7,965</td>
<td>60</td>
<td>0.8%</td>
</tr>
<tr>
<td>Average</td>
<td>17,433</td>
<td>174.3</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

mean = 4%
max = 18% | min = 0%

Bristol Count Data Comparison

Adjusted R Square of 0.9691

Bicycle Counts vs. Strava Trips at Halehouse Bridge Bicycle Counter

Adjusted R Square of 0.94

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Conclusions

- **Key findings representativeness**
  - It’s not all MAMILs
  - Strava users represented 9% of cyclists that were counted (MCR)
  - Strava data well represents commute and leisure rides on main roads
  - Strava use appears consistent throughout the year
  - New Strava users are increasingly female at lower speed
  - However, Strava users still more likely to be younger men
  - Strava users may travel faster than general cyclists
  - Can provide a reasonable indication of actual levels of cycle use

- **Key findings user engagement**
  - Possible to encourage citizens to use a cycling apps for research
  - Barriers are battery drainage & behavioural change (switch on/off)
Discussion

Goal: Improve the cycling experience of current and future cyclists (and other road users) to facilitate a modal shift towards active transport.

- Understand how cyclists use the city?
  - Strava provides useful complementary data on current cycling levels
  - StravaMetro provides historical data to analyse cycling levels, direction, stop times etc.

- Prioritisation of infrastructure investments?
  - What is the target group?
  - Experienced vs. beginner, fast vs. moderate, leisure vs. commute?
    → Infrastructure to accommodate different needs of all cyclists
  - Not only planning but monitoring, evaluation and learning needed

- User engagement?
  - Yes, possible to increase Strava user levels → What is (long-term) user motivation?
  - Example: TfGM “Better by cycle challenge” increased PleaseCycle app users from 0 to 1,200 within a week → One month data (September challenge) vs. long-term app use?
    → What are effective (doing the right things) and efficient (doing things right) alternatives to sense cyclist behaviour and identify needs at city level?
Any questions?

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