Understanding the Mapping Sequence of Online Volunteers in Disaster Response

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Introduction

• The role of online volunteers in disaster response
Introduction

“When a major disaster strikes anywhere in the world, HOT rallies a huge network of online volunteers to create the maps that enable responders to reach those in need.”
<table>
<thead>
<tr>
<th>Introduction</th>
<th>Method</th>
<th>Result</th>
<th>Possible Solutions</th>
<th>Conclusions</th>
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</table>

Coordination by grid-based tessellation
### Understanding the mapping sequence of online volunteers

- Online volunteers can help generate **up-to-date** geographic information.
- The time that a grid cell was mapped can be as different as 3 to 4 days from another.
- Emergency responders who need information within one cell may have to wait for **a long time**.
Dataset

- Online mapping projects in three different cities

<table>
<thead>
<tr>
<th>Dataset Information</th>
<th>Kathmandu, Nepal</th>
<th>Pedernales, Ecuador</th>
<th>Kumamoto, Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Cells</td>
<td>208</td>
<td>186</td>
<td>340</td>
</tr>
<tr>
<td>Varied Cell Sizes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Number of Volunteers</td>
<td>321</td>
<td>85</td>
<td>52</td>
</tr>
</tbody>
</table>
Method

- Real mapping case
- Reproduced grid
- Volunteer mapping
- Road network

Introduction | Method | Result | Possible Solutions | Conclusions
Method

\[ \rho = 1 - \frac{6 \sum_i d_i^2}{n(n^2 - 1)} \]

- Population-based Ranking
- Mapping-time-based Ranking
- Road-network-based Ranking
Result

- **(a) Ranking based on mapping time**
- **(b) Ranking based on population**
- **(c) Ranking based on roads**
Result

Result of the correlation analysis.

<table>
<thead>
<tr>
<th></th>
<th>Kathmandu, Nepal</th>
<th>Pedernales, Ecuador</th>
<th>Kumamoto, Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation with Population</td>
<td>0.45 ($p &lt; 0.001$)</td>
<td>-0.05 ($p = 0.521$)</td>
<td>0.48 ($p &lt; 0.001$)</td>
</tr>
<tr>
<td>Correlation with roads</td>
<td>0.46 ($p &lt; 0.001$)</td>
<td>0.07 ($p = 0.369$)</td>
<td>0.26 ($p &lt; 0.001$)</td>
</tr>
</tbody>
</table>
Discussion

- It’s possible that the mapping sequence of volunteers may correlate well with other datasets.

- 3 mapping projects are examined, and more projects can also be studied.

- It’s also likely that online volunteers have been mapping cells in a more or less random order.
Possible solutions

• Maybe we can guide the online volunteers by highlighting the priorities of these grid cells

• Prioritizing the grid cells by population density, by road network, by …

• Prioritizing the grid cells by the value of information within each grid
Possible solutions

- Prioritizing by the **value of information** within each grid
Possible solutions

• Identifying the possible routes to disaster-affected areas
Possible Solutions

• Integrating population and disaster severity
Conclusions

• Examined the mapping sequence performed by online volunteers

• 3 mapping projects, 3 different cities and countries, 458 online volunteers, 734 mapping cells

• Guiding online volunteers on the priorities of the grid cells can be beneficial

• One possible approach on measuring the value of information within each grid cell
Questions and comments?

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