



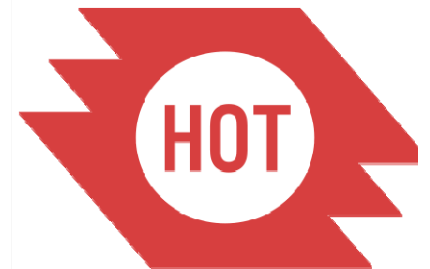
Understanding the Mapping Sequence of Online Volunteers in Disaster Response

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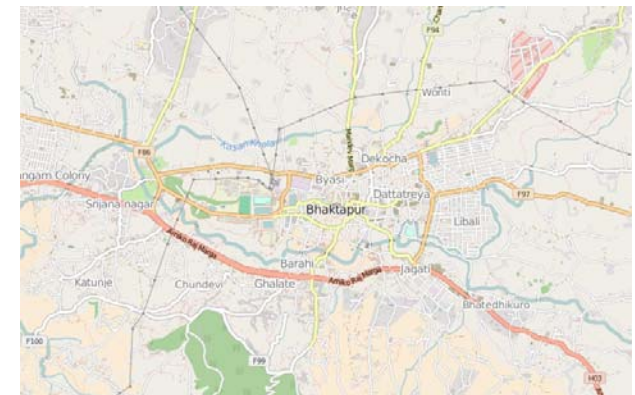
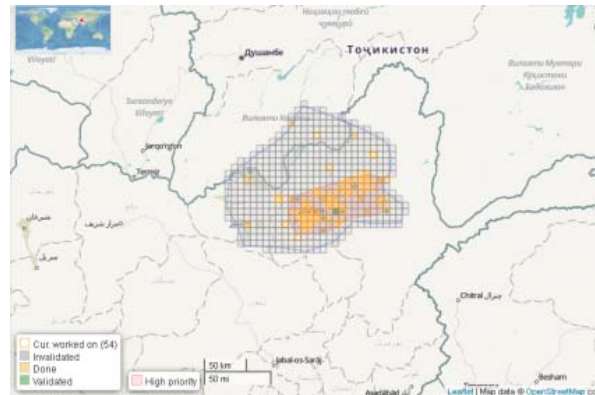
Introduction

- The role of **online volunteers** in disaster response

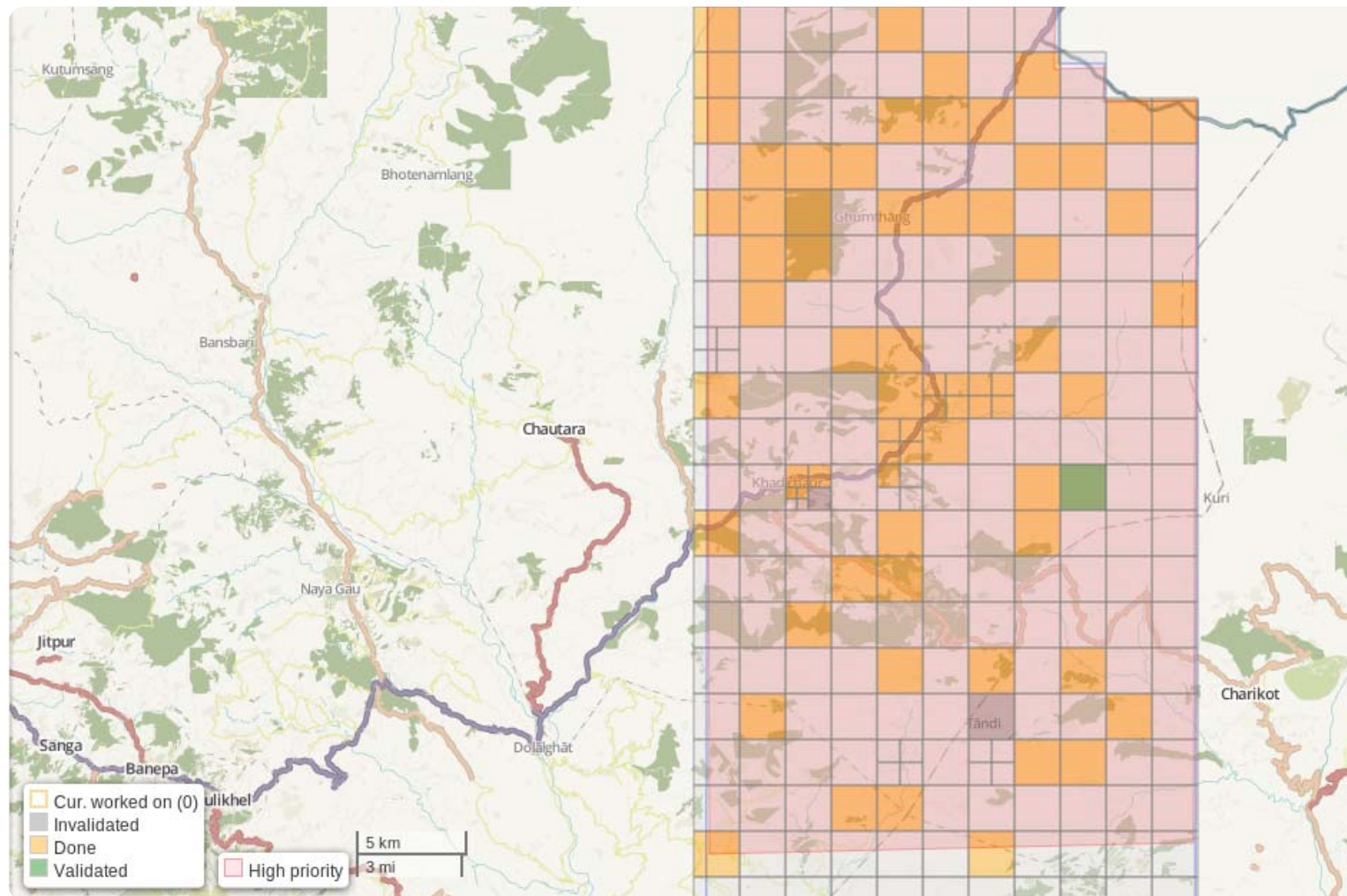


Introduction

“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.”

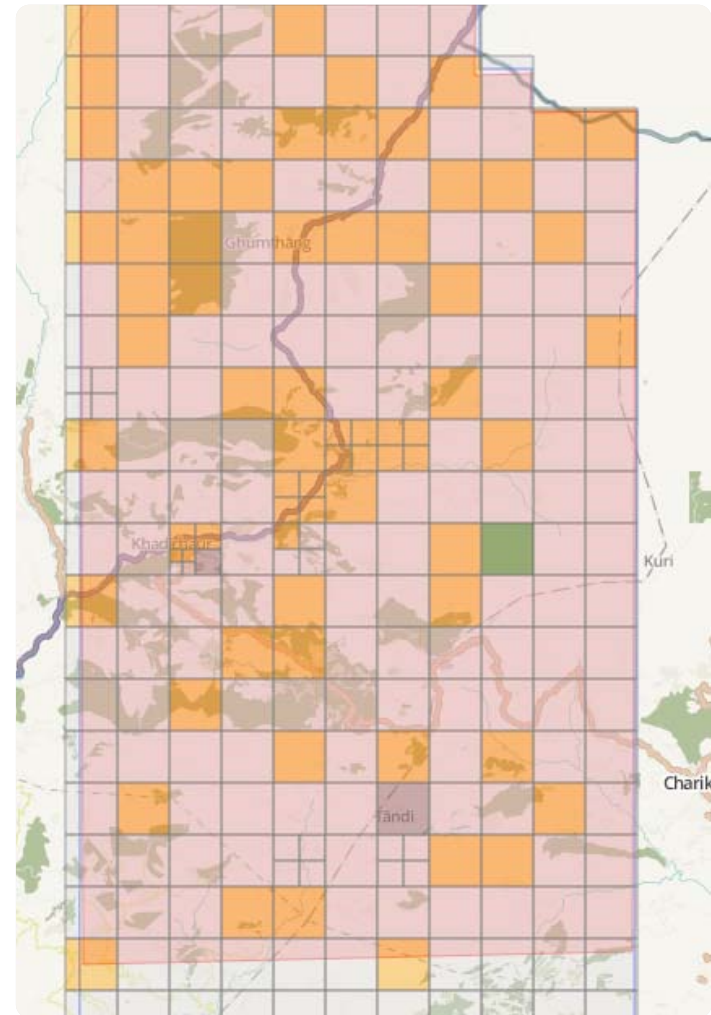


Coordination by grid-based tessellation



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**

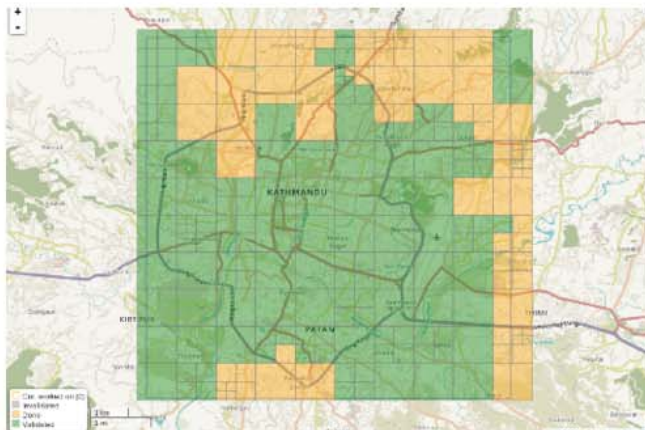


Dataset

- Online mapping projects in three different cities

Information about the three studied projects.

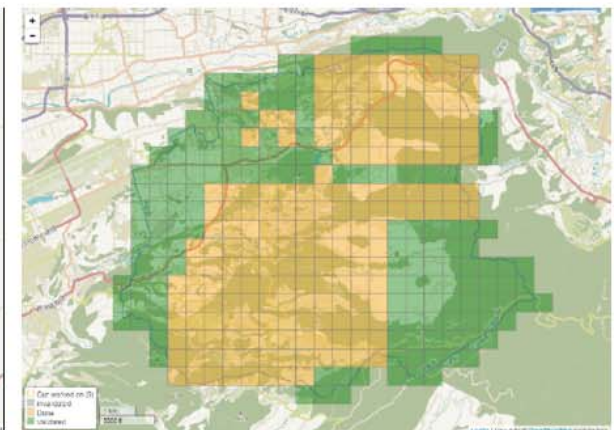
	Kathmandu, Nepal	Pedernales, Ecuador	Kumamoto, Japan
Number of Cells	208	186	340
Varied Cell Sizes	Yes	Yes	No
Number of Volunteers	321	85	52
Earliest Finish Time	2015-04-27 15:20:43	2016-04-23 13:40:13	2016-04-16 21:41:46
Latest Finish Time	2015-04-30 10:57:21	2016-04-25 21:29:25	2016-04-20 01:54:14



(a) Kathmandu, Nepal

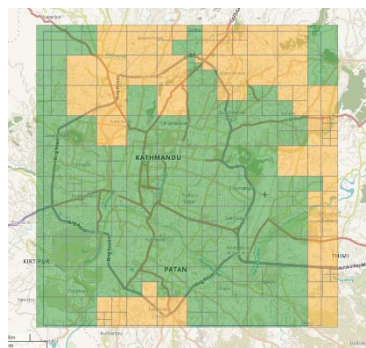


(b) Pedernales, Ecuador

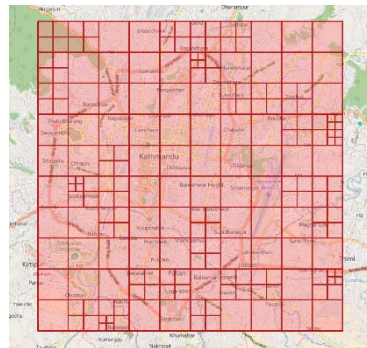


(c) Kumamoto, Japan

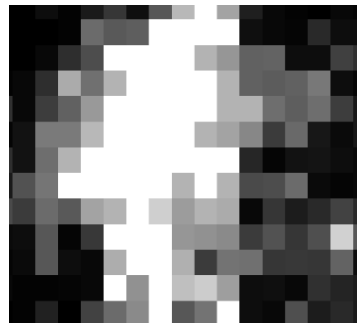
Method



Real mapping case



Reproduced grid



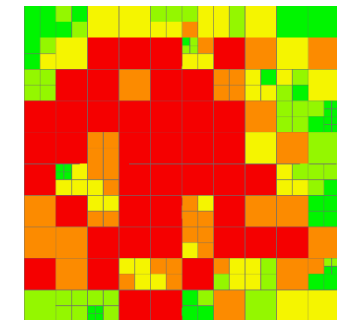
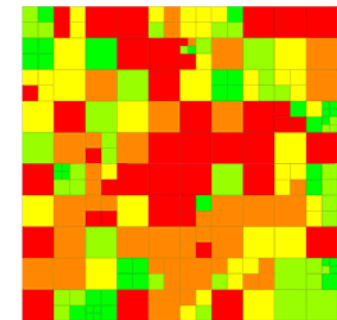
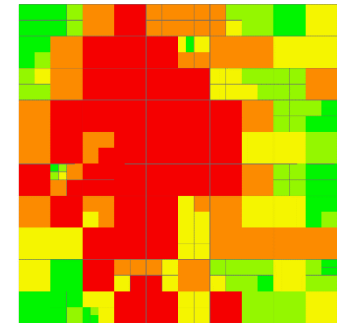
Population



Volunteer mapping



Road network



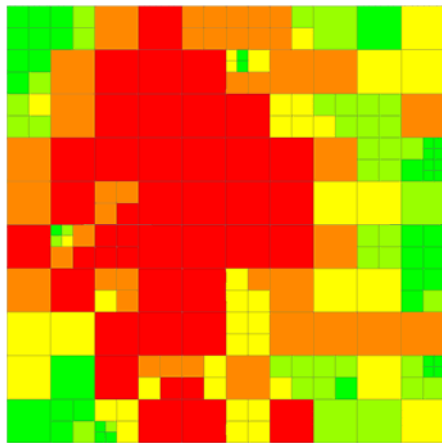
Method

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

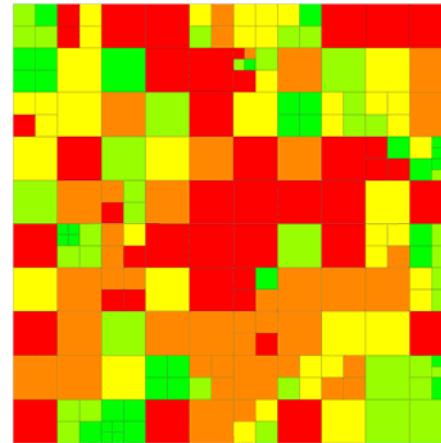
Correlation



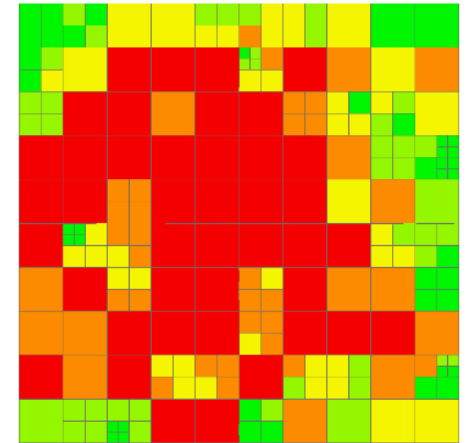
Correlation



Population-based
Ranking

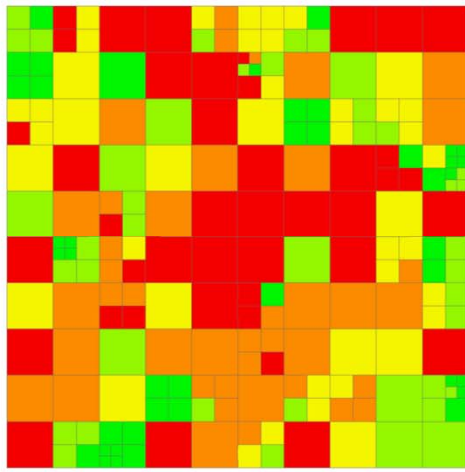


Mapping-time-based
Ranking

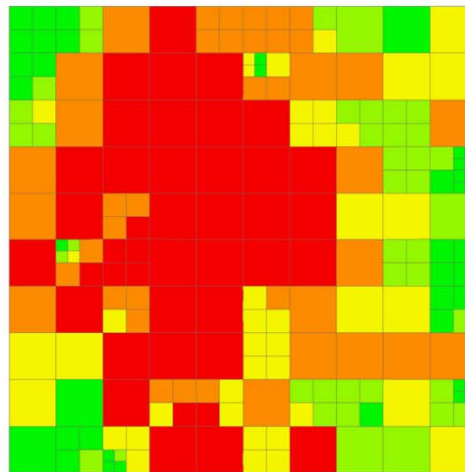


Road-network-based
Ranking

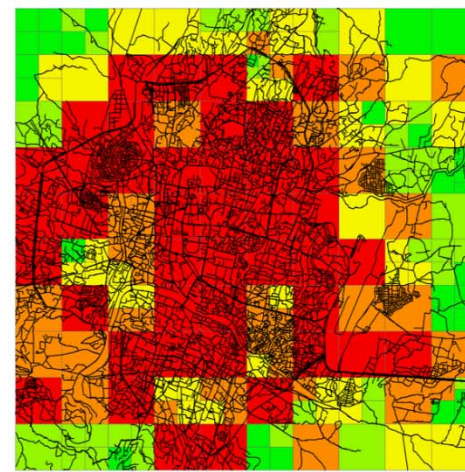
Result



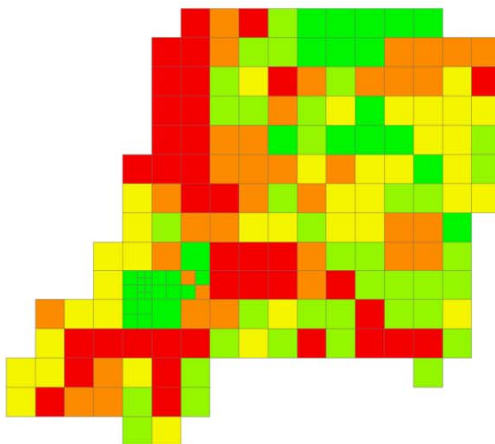
(a) Ranking based on mapping time



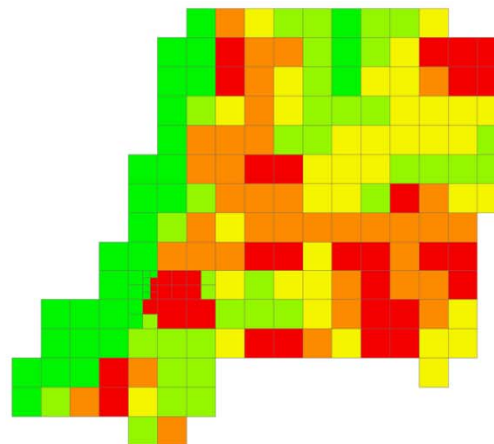
(b) Ranking based on population



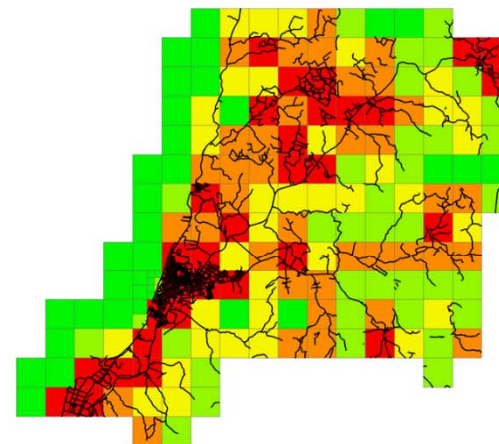
(c) Ranking based on roads



(a) Ranking based on mapping time

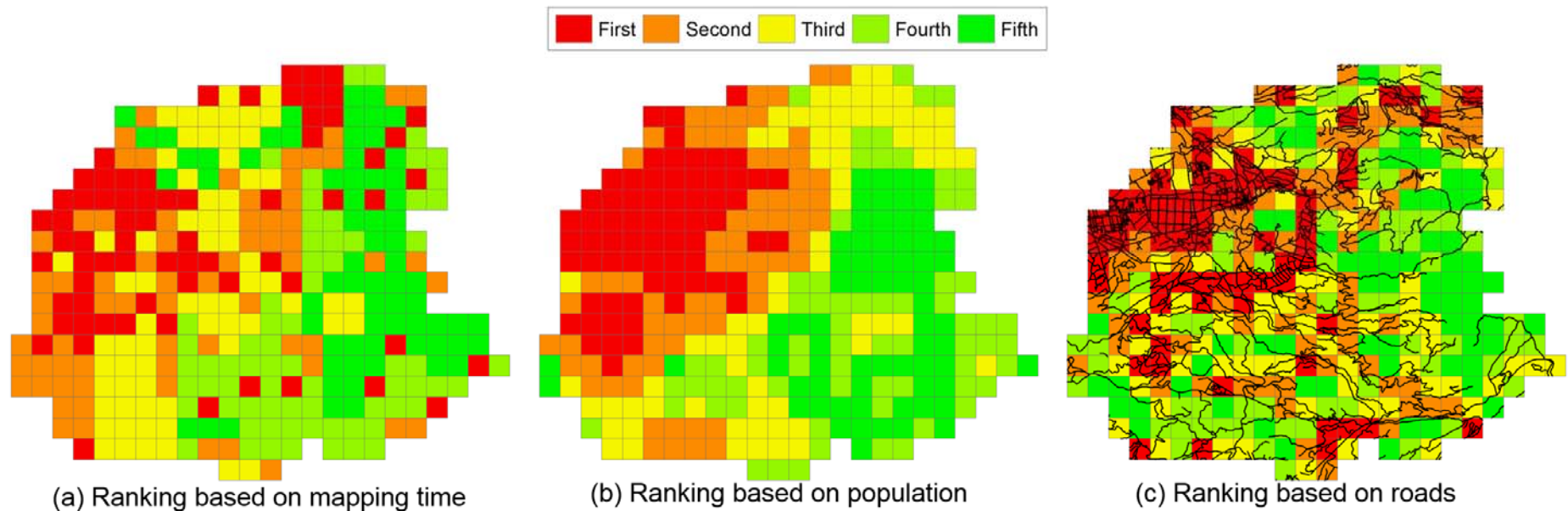


(b) Ranking based on population



(c) Ranking based on roads

Result



Result of the correlation analysis.

	Kathmandu, Nepal	Pedernales, Ecuador	Kumamoto, Japan
Correlation with Population	0.45 (p < 0.001)	-0.05 (p = 0.521)	0.48 (p < 0.001)
Correlation with roads	0.46 (p < 0.001)	0.07 (p = 0.369)	0.26 (p < 0.001)

Discussion

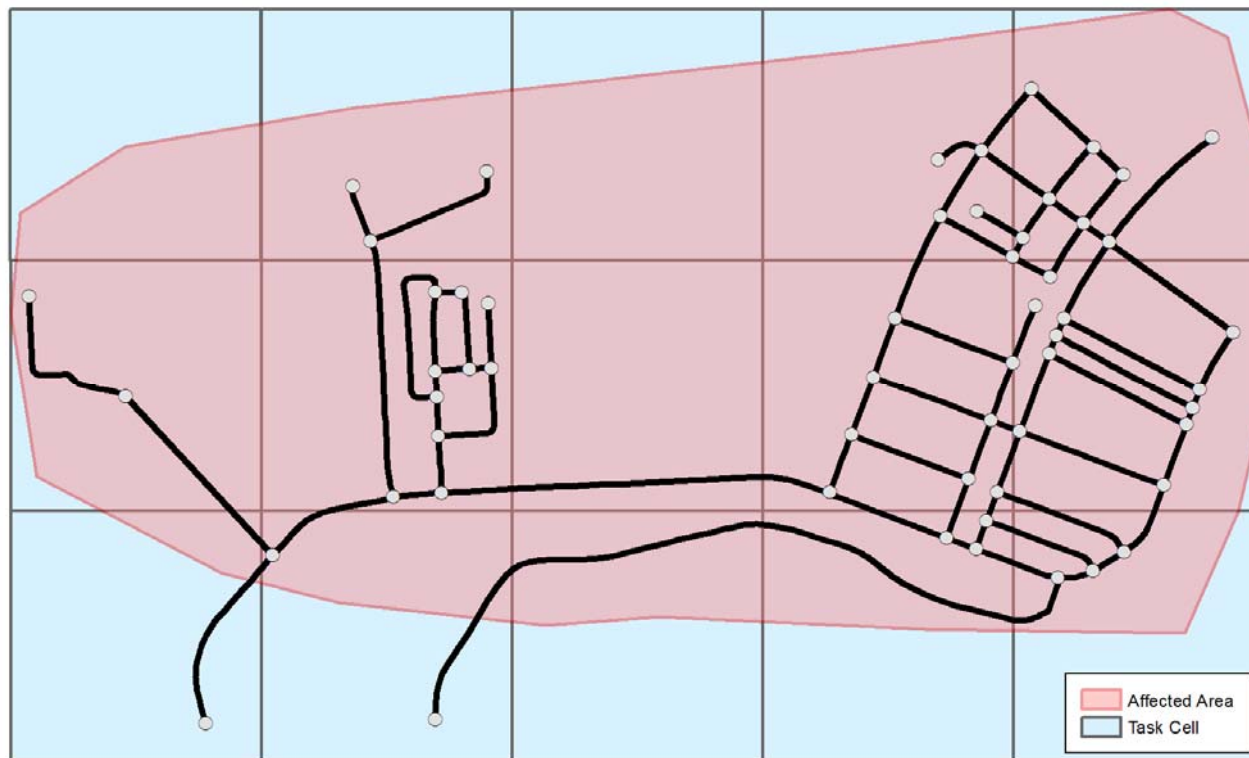
- It's possible that the mapping sequence of volunteers may **correlate** well with **other datasets**
- **3** mapping projects are examined, and more projects can also be studied
- It's also likely that online volunteers have been mapping cells in a more or less **random order**

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

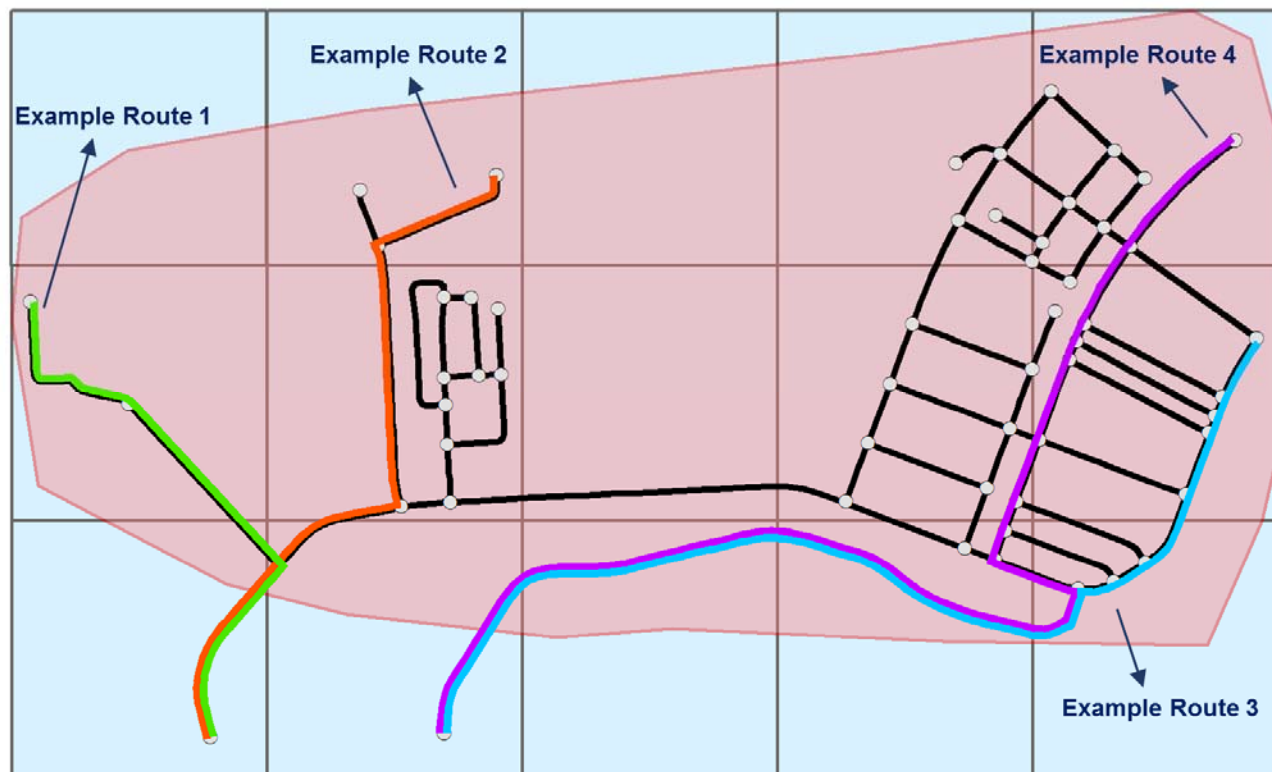
Possible solutions

- 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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