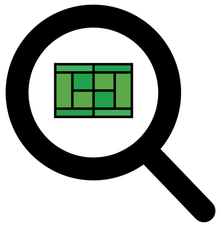
Identifying and Assessing Points of Interest through Crowdsourced Image Analysis

Sofia Eleni Spatharioti, Sara Wylie, Seth Cooper
Northeastern University

Introduction

How can crowd workers efficiently identify, label and visualize **geo-located Points of Interest (POIs)** in aerial photos for disaster response applications?
We designed an **interactive crowdsourcing application** and compared a disaster and a non disaster application through Amazon Mechanical Turk.

Inputs: A set of points of interest, a set of geotagged images
Outputs: Assessments for each POI



Non Disaster Scenario:
Boston MA Tennis Courts Condition

Needs Repair

Good

Unselected

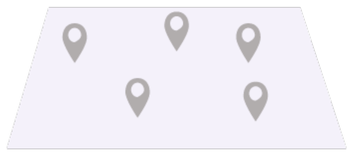
Disaster Scenario:
Post 2013 Colorado Floods Bridges Condition

Damage

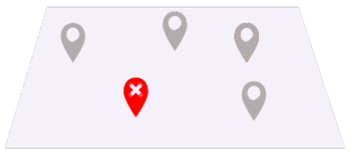
No Damage

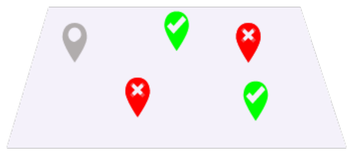
Unselected

How it works

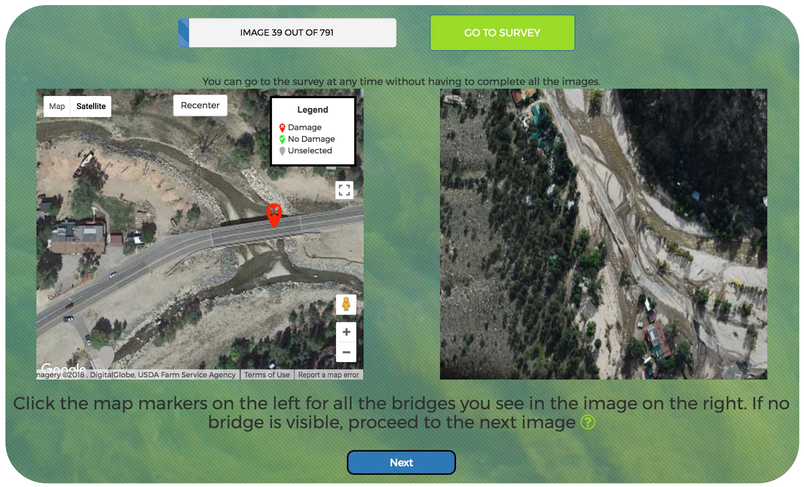


Participants were given a series of microtasks consisting of a map with markers and an image.

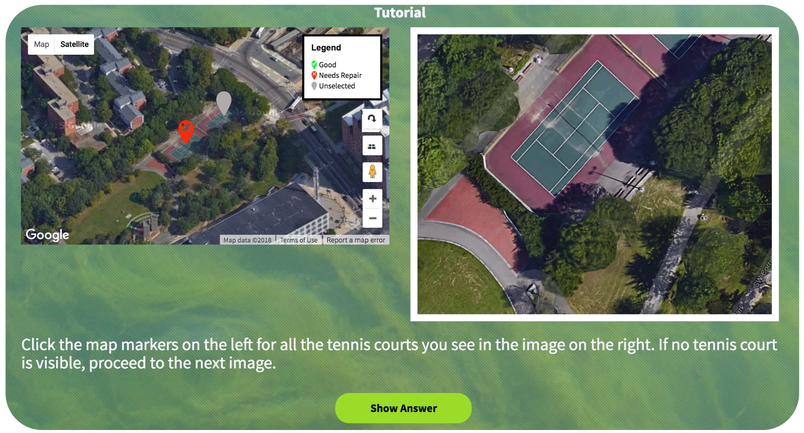




If a POI was found in the image, they would label it based on its condition in the photo, resulting in a map of all POIs assessed.



. **Disaster response scenario:** Locate and assess damage in bridge structures by clicking and coloring the appropriate marker.



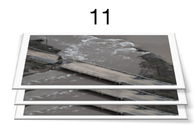
. **Non Disaster response scenario:** Locate and assess condition of tennis courts. The above screenshot is from the interface tutorial.

Supported by:

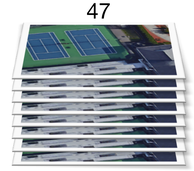
Google
New World Foundation

Results

Labels (Median)



11
Disaster Scenario

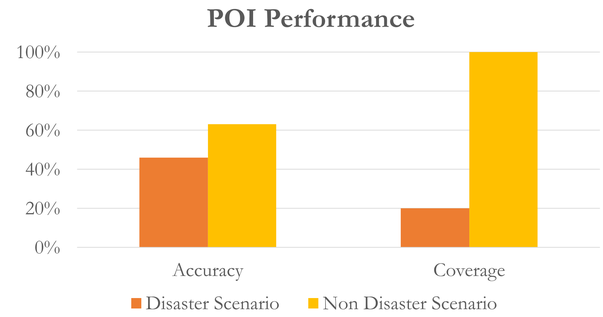


47
Non Disaster Scenario

Total Time (Median)

102s
Disaster Scenario

225s
Non Disaster Scenario



POI Performance: Results for accuracy in identifying the structure condition compared to ground truth (Accuracy), and percentage of POIs in the dataset identified (Coverage). Ground truth for the disaster scenario was cross-referenced with post-disaster data from the Colorado Department of Transportation (CDOT).

- Identifying bridges much **more challenging** task as they were **less visible** from aerial photos than tennis courts, resulting **in poor accuracy** (< 50%).
- Dataset for non disaster response scenario generated **specifically** for tennis courts, but disaster response scenario images **not targeted** towards bridges.
- Future survey flights should be designed **with key structures** in mind, for more detailed and focused aerial images.
- Part of a project on developing a crowdsourcing platform for disaster response, using elements of task design, training and workflow optimization.

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References & Credits

- Barrington, L., Ghosh, S., Greene, M., Har-Noy, S., Berger, J., Gill, S., Lin, A. Y.-M., and Huyck, C. (2012). "Crowdsourcing earthquake damage assessment using remote sensing imagery". In: Annals of Geophysics 54.6.
- Goodchild, M. F. and Glennon, J. A. (2010). "Crowdsourcing geographic information for disaster response: a research frontier". In: International Journal of Digital Earth 3.3, pp. 231–241.
- Munro, R.; Schnoebelen, T.; and Erle, S. 2013. Quality analysis after action report for the crowdsourced aerial imagery assessment following hurricane sandy. In *Proceedings of the 10th International Conference on Information Systems for Crisis Response and Management*.
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