A citizen-powered tool for rapid post-disaster damage assessment or how everyone can help

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Ecosystems  Services and Management
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My Background

- Background – Applied Mathematics (Lviv Polytechnic National University, Ukraine)

- PhD thesis “Spatial inventory of greenhouse gas emissions in the residential sector”

Ecosystems Services and Management, IIASA:
- YSSP 2012
- Ernst Mach Scholarship in 2014
- Research Scholar in Earth Observation Systems Group - since 2015

Research topics:
- Land cover mapping
- Crowdsourcing and citizen science
- Post-disaster damage assessment
Disasters globally

- Disasters can be a country’s worst nightmare — death and destruction devastate economies and citizens alike. Between 2005 and 2014 disasters were recorded around the world, causing damages of more than US$1.4 trillion and killing more than 0.7 million people, 1.7 billion people were effected.
Once disaster happened...

Quick assessment of damage
  ‣ ... to map all those who need help!

But how fast the evaluation can be done?
  It depends on:
  ‣ how big the **area** of damage is
  ‣ what **type** of damage happened
  ‣ what **tools** are used for assessments

And it can be **very slow**...

Other options?
  ‣ **Satellite images and crowdsourcing**
Satellite images and crowdsourcing

- Disaster can be seen from space
  - Satellite images: high resolution imagery for before and after event time

- Post-disaster assessment:
  - Crowdsourcing - with each volunteer spending even just a few minutes on it makes a significant contribution to the overall effort
**Picture Pile app**

(“indoors”)

Answer simple yes-no question to help science tackle big problems!

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- **Unsorted Piles**
  - Deforestation
  - Wild Landscapes
  - Hurricane Matthew

- **Achievements**
  - Play 5 days in a row
  - Play 7 days in a row
  - Play 14 days in a row
  - Make 500 classifications in one day
  - Make 500 classifications in three days
  - Make 5000 classifications in one week
  - Make 5000 classifications in three days
  - Make 50000 classifications in a week

- **Results**
  - Total Score: 133
  - Weekly Score: 133
  - Sorted: 0.11025%

- **Leaderboard**
  - Players: 1255+
  - Unique images: 300,000+
  - Classifications: 5+ million
  - Time: < 5 seconds
Key features of Picture Pile

- Who can contribute via Picture Pile?
  - Anyone with the phone or computer
  - Everywhere where the internet is available

- How?
  - **Microtasking** through **fast pattern recognition** doing only **tap or swipe**:
    - quick assessment of the area by many people
    - answering simple yes-no question

- Furthermore, since the microtask is quick to do, with each volunteer spending even just a few minutes on it makes a significant contribution to the overall effort.
What are the results?

- Map of damaged areas
  (with different levels of confidence)
- Table with damage assessment results
- Several validations per locations

More than that...

The proposed approach will not only help to increase **citizen awareness** of natural disasters, but also provide them with a **unique opportunity to contribute** directly to relief, recovery and rebuilding efforts.
Hurricane Matthew: Post-disaster damage mapping

- **225492** tasks
- **182** volunteers
- **120 hours** of volunteers’ time

- Most volunteers showed a high agreement rate with our experts (>85%)
- Average time per validation – 2 sec

182 volunteer can check area of Vienna (400 km²) in approx. 7 minutes (one pass through)
Conclusions

Such a crowd-driven approach for rapid post-disaster damage assessment:

- **Creates up-to-date maps** for timely response to disaster events
- **Increases citizen awareness** of natural disasters and provides everyone with a unique opportunity to contribute directly to relief efforts
- **Supplements existing approaches** for post-disaster damage assessment and can be used by different networks of volunteers (e.g. the Humanitarian OpenStreetMap Team) to assess damage rapidly
FotoQuest Go ("outdoors")

Picture Pile ("indoors")

Geo-wiki ("indoors")

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