Understanding the activity of contributors to VGI projects. How, why, where, and when do they contribute geographic information?

Dr. Peter Mooney
Overview of presentation

What are the characteristics of ‘senior mappers’ (Neis and Zipf, 2012) in OpenStreetMap? Where do they map? When do they map? What do they map?

Outcomes: Further our understanding of contributors (‘the crowd’) to VGI. Dedicated, long-term, altruistic volunteers can provide stability for a VGI process/project and can greatly influence data quality. **Crossover WG1 and WG2 of the COST Action**
Professional or commercial spatial data production

**Known Quantities** - highly skilled people working in usually large organisations (Government: legally mandated or Commercial company)

**Using robust industry strength methodologies** for the entire spatial data production workflow. Information on these may not always be publicly accessible.

Follow rigid collect-update-release data cycles.

Spatial data quality, accuracy, timeliness, etc are crucial to the success of the business model of the specific organisation.
2013: The global picture of OSM ‘highways’

Matthijs Tissen (16 years old - Hilversum, NL)

Balloon, consumer grade GPS, Camera

Flight path - avoiding residential areas only at high altitudes

Amazing captures of high resolution, spatially referenced, aerial imagery!

http://www.fl1200.nl/faq/
We understand how VGI works in the European context

Very active OSM communities in almost all European countries

Excellent, high quality data (shown by several case-studies)

Focus is still a skewed towards urban and semi-urban locations

Active academic research etc
Jokar and Mooney (2013 - in review)

Global Monitoring for Environment and Security Urban Atlas (GMESUA)

305 urban regions within Europe

Figure 5: spatial distribution of agreement and disagreement between OpenStreetMap land-use features and GMESUA dataset for Frankfurt (top-left), Munich (top-right), Hamburg (down-left), and Berlin (down-right)
How are semantics negotiated in OpenStreetMap?

= Is the OSM Wiki used as forum for open and democratic discussion for the development of OSM’s: data model, data policy, vision, etc?

Fig. 1: Global temporal development of the OSM Wiki website
We understand how VGI works in a North American context

- Legacy issues with bulk import of openly available data such as TIGER
- Access to national mapping datasets (Canada + USA)
- Street networks and urban fabric in large and major cities *very well developed*
- Reasonably small community
- Still large areas with no OSM coverage (except roads)
The issue of data imports to OSM has proved controversial in the US.

Most densely mapped OSM tiles with > 10,000 nodes per sq KM - Note no UK, DE


Mfounded, Cameroon: http://www.openstreetmap.org/#map=18/3.85441/11.49164

Cook County, Chicago: http://www.openstreetmap.org/#map=17/41.95037/-87.68063
Neis, Zielstra, Zipf (2013)

Figure 3. (a) Number of contributors; and (b) Distribution of mapper groups per urban area (Sept. 2012).

Figure 7. (a) Number of senior mappers per urban area; and (b) Distribution of senior local or external mappers per urban area (Oct. 2012).

http://dx.doi.org/10.3390/fi5020282
Mooney and Corcoran (2013)

Figure 1: This figure shows the percentage of all contributions which were performed by the Top 10% and Top 5% most prolific contributors to OSM in a given city.
Schmidt (2013) - We already know much about motivation in OSM/VGI

- E.g. studies by Coleman 2009; Haklay & Budhathoki 2010; Budhathoki et al. 2010; Lin 2011; Stark 2011, Lechner 2011

- Typical OSM contributor:
  - male
  - well-educated
  - technology-savy

http://flrec.ifas.ufl.edu/geomatics/agile2013/presentations/ACTIVITY_WS_AGILE_2013_SESSION_1_Schmidt.pdf
### Stephens (2013)

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Stephens (2013)

Table 4  Gender dimension of GoogleMapMaker users and regional expert reviewers (RER) implies both are more frequently men (figures as of May 22, 2012)

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DOI 10.1007/s10708-013-9492-z
In general

- Local community eco-systems have evolved to ensure “managed” development of OSM in Europe, North America, Oceania.

- Access to ubiquitous Internet, smartphone technologies, higher levels of education, personal motivation, etc means that the contributor community in these regions (whilst still unknown in ways) are well equipped to provide good quality VGI

- VGI (such as OSM, GMM, Wikimapia, etc) is not really a ‘crowd’ - there is gender discrepancies and a Pareto 10-90 rule of contribution
OSM Mapping in Africa

Several approaches...

**Humanitarian: Sudan Aug 2013**
openstreetmap.org/wiki/2013_Sudan_floods

**Donation of data or open access**
http://blog.osmfoundation.org/?p=1874

**Map Kibera Project** (NGOs + Citizens)
http://www.mapkibera.org/

**Community-based GIS**
http://ugunja.wordpress.com/research/
Distribution of Active Users per Area (1 000 km²) in OpenStreetMap (Oct. 1st – Nov. 15th 2012)

http://neis-one.org/wp-content/uploads/2012/11/20121116_ActiveUserPerArea.png

Created by Pascal Neis & Dennis Zielstra
Map data © OpenStreetMap contributors
Ugunja Kenya - Work by ICT4D, RGS+UCL
Map Ugunja
(Parfitt and Parsons, 2012)
Six weeks were spent mapping, surveying and interviewing. These research methods combined to give insight that hopes to move the mapping project forward.

We conducted two surveys, a series of interviews and kept research diaries to reflect upon the project. Each methodology was intended to add detail, building on other methodologies and adding layers of complexities. Here, we present a detailed overview of each methodology, noting any associated limitations. We then reflect upon the positionality of the research team and outline the project’s ethical considerations.

**ICT use survey**

Our first survey was developed to establish a base level of understanding of Information and Communication Technologies (ICTs) used in Uganda and of their importance to the user. It was hoped that the findings would identify appropriate technologies for the collection and dissemination of the UCRC’s community mapping data. The survey also acted as a preliminary study through direct engagement with the needs of the wider community.

100 participants were surveyed over two days using stratified sampling methods to select participants from a range of social groups. Discussions with UCRC staff helped to identify target groups according to occupation, including: shopkeepers, health workers, farmers, home-keepers and NGO staff. Within these groups we sought to fairly represent gender and age. Local UCRC staff administered the survey in collaboration with the research team. Four questions were developed alongside a series of cues and prompts with care being taken not to influence outcomes of the questionnaire. Personal details were also collected to monitor the demographics of the participants.
Example: Dresden - here we see the top 24 changeset contributors. There appears to be patterns.

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NZ Area: Activity area of an OSM Contributor [http://www.mdpi.com/2220-9964/1/2/146](http://www.mdpi.com/2220-9964/1/2/146)

Change Ratio: Number of changes globally divided by number of changesets

Dresden Changesets: Number of changesets involving editing in the Dresden urban region
Data extraction and analysis

➔ A mixture of Planet.osm History, Pascal Neis’s HDYC tool, wiki lookups, changeset xml processing, simple data mining etc

➔ 6 Locations

➔ Extract contributors with >= 10 changesets (this can be changed)

➔ Remove known bots and bulk upload accounts

➔ Historical data available to March 2013

➔ Include some manual lookup for current information
OSM Contributor Characteristics

We extracted the following attribute information automatically and manually:

- # changesets
- # number of changes
- Types of changes
- # (create, delete, modify) changes
- Most frequent mapping areas (via Pascal Neis’ HDYC tool)
- Most recent OSM edit (via HDYC)
The number of contributors in each city - by changeset numbers

For comparison: Dresden 1550 contributors - 1175 (or 75%) had 5 changesets or less
Africa Study Areas

South Africa: Cape Town (41)
Kenya: Nairobi (30)
DR Congo: Kinshasa (10)
Rep. Sudan: Khartoum (14)
Burkina Faso: Ouagadougou (14)
Cameroon: Yaoundé (7)
Tanzania: Dar es Salaam (25)

Total Contributors 141
Removed 14
### Africa: Summary of top 10 contributors by total changesets over all 7 cities

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<td>South Africa</td>
<td>Kenya</td>
</tr>
<tr>
<td>Country 2</td>
<td>Uganda</td>
<td>Germany</td>
<td>United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country 3</td>
<td>Germany</td>
<td>Madagascar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last Edit</td>
<td>2013</td>
<td>2012</td>
<td>2013</td>
<td>2013</td>
<td>2013</td>
</tr>
</tbody>
</table>

Identifying 47 “Exclusively Local” Mappers in the seven cities

South Africa: Cape Town (15 from 41)
Kenya: Nairobi (17 from 30)
DR Congo: Kinshasa (0 from 10)
Rep. Sudan: Khartoum (2 from 14)
Burkina Faso: Ouagadougou (0 from 14)
Cameroon: Yaoundé (1 from 7)
Tanzania: Dar es Salaam (12 from 25)

“Exclusively Local” - Contributors whose mapping activities are exclusively in a given city or region. [My definition]
Motivation issues? Leaving OSM?

- 54 of the 141 contributors have not contributed to OSM in 2013.

- From this 54 there are 24 contributors who had only worked on OSM in one of our 7 case study cities.

- 27 contributors have not contributed since 2011.
Contribution Characteristics

OSM Changesets

```xml
<?xml version="1.0" encoding="UTF-8"?>
<osmChange version="0.6" generator="OpenStreetMap server" copyright="OpenStreetMap and contributors">
  <create>
    <node id="331411557" version="1" changeset="776705" lat="12.3850182" lon="-1.4770245"
      user="diecher" uid="75778" visible="true" timestamp="2009-01-12T09:11:16Z">
      <tag k="amenity" v="hospital"/>
      <tag k="created_by" v="Potlatch 0.10f"/>
    </node>
  </create>
  <modify>
    <node id="331411593" version="1" changeset="776705" lat="12.3747987" lon="-1.4715314"
      user="diecher" uid="75778" visible="true" timestamp="2009-01-12T09:11:35Z">
      <tag k="amenity" v="hospital"/>
      <tag k="created_by" v="Potlatch 0.10f"/>
    </node>
  </modify>
  <delete>
    <node id="831411654" version="1" changeset="776705" lat="12.3830565" lon="-1.5073399"
      user="diecher" uid="75778" visible="true" timestamp="2009-01-12T09:12:17Z">
      <tag k="amenity" v="shop"/>
    </node>
  </delete>
</osmChange>
```


We calculated **Create, Delete, Modify** percentages for each contributor from their changeset data to understand the patterns of contribution.

97 : 50% of work => CREATE
18 : 90% of work => CREATE
25 : 50% of work => MODIFY
3 : 50% of work => DELETE

“Exclusively Local” Contributors (47)
39 > 50% CREATE
23 > 75% CREATE
7 > 90% CREATE

9 > 50% MODIFY

Negligible DELETE rates

“No Data This Year” Contributors (54)
CREATE (44) >= 50%
MODIFY (7) >= 50%
Some preliminary conclusions

1. “Senior mappers” (alpha contributors) make significant contributions globally in VGI. Contributors working locally provide impetus to VGI ‘on the ground’
2. Previous results are borne out that only a small percentage of contributors are performing the vast majority of the mapping work.
3. Further research needed to investigate how much maintenance and update work is being performed once initial data creation has taken place.
4. In this face of this - how can we retain contributors to VGI projects, sustain their motivation, and motivate new contributors?
Immediate Future Work

Complete this analysis -> produce journal paper

Extend to several more African cities. Investigate and compare mapping behaviours (create, modify, delete, tags) of contributors in African cities vrs 1st World Cities in OSM.

Are contributions from: aerial imagery tracing, on-the-ground survey, bulk import?

Spatial processes involved - how are these African cities mapped? (Corcoran, Parfitt, Parsons)
Current Journal Papers on VGI and OSM (published and in preparation)

Mooney, P. and Ballatore, A. and Jiang, B. *Geocomputation in Volunteered Geographic Information* - a critical review (submitting October 2013)

Ballatore, A. and O'Callaghan, D. and Mooney, P. *Negotiating geo-semantics: The OpenStreetMap Wiki development and social structure* (submitting September 2013)


Jokar, J. and Mooney, P. *Accuracy assessment of the contributed landuse features in the OpenStreetMap in selected areas of Germany* (submitted, in review, August 2013)

Mooney, P. and Corcoran, P. *Analysis of Interaction and Co-Editing Patterns Amongst OpenStreetMap Contributors. Transactions in GIS* (Accepted June 2013).


