VGIscience Summer School –
Interpretation, Visualisation and Social Computing of Volunteered Geographic Information (VGI)

TU Dresden, 11.-15. September 2017
Welcome

- PhD students working on research topics related to Volunteered Geographic Information (VGI)
  - Austria, Germany, India, Japan, Switzerland
- invited speaker
  - Prof. Alan MacEachren
    (Pennsylvania State University, Director of GeoVISTA Center)
- participants of the VGIscience priority programme
  - scientists from all 15 projects
VGIscience Priority Programme & VGIscience Summer School

- Nov 2013 – round table funded by German Research Foundation (DFG) „Added value through visual communication of Volunteered Geographic Information (visVGI)“
- Oct 2014 – Application for a Priority Programme “VGIscience” (by Prof. Burghardt, Prof. Nejdl, Prof. Schiewe, Prof. Sester)
- March 2015 – decision of the DFG to set up the priority programme initially for 3 years with a funding volume of 4.8 Mill €
- Oct 2015 – 35 project proposals were submitted of which 15 have been accepted by June 2016
- Nov 2016 – Kick of meeting for the Priority Programme VGIscience
- April 2017 – common workshop for the preparation of VGIscience Summer School
Introductory presentation

1. Volunteered Geographic Information
   • potential and challenges of VGI
   • related research (e.g. ENERGIC, Mapping and the Citizen Sensor)

2. Priority programme VGIscience of German Research Foundation
   • objectives of the priority programme
   • projects within VGIscience
   • VGIscience repository

3. Summer School VGIscience
   • scope of the Summer School
   • relevance of the Summer School for the priority programme
   • planned activities
Availability and retrieval of Volunteered Geographic Information

- broad range of volunteered geographic information (OSM-data, GPS-tracks, sensor data, Wikipedia, georeferenced photographs, social networks, microblogging, ...)
- data sources are often very large, with high update rates (e.g. 500 Mill. Tweets per day)
- include not only factual but also subjective information → noise or signal
- spatial-/temporal reference is given either completely or partially
Term definition

- **VGI** - Volunteered Geographic Information (Goodchild, 2007)
  - introduced by Michael Goodchild (2007)
  - special case of user generated content (UGC) with direct or indirect spatial reference
  - additional value, e.g. free availability
- **Citizen Science (dt. Bürgerforschung) and crowdsourcing**
  - projects carried out through interested people
  - concept „Humans as Sensors“ – utilisation of low cost geosensors for various task
  - **active** participation
Location-based social media data

- social networks provide platforms for the exchange of opinions, experiences and information
  - trail of data that people leave behind, intentionally or not talks about our live
  - it gives insides to decision makers, architects and urban planners
  - creation of spatial data „as a side effect“ (passive)

- characteristics of the data
  - large, heterogeneous
  - continuous
  - user specific → privacy
Challenges of VGI and geospatial big data - 4 x V (Laney, 2001; Robinson et al. 2017)

- **volume**
  - refers to data size and varies considerably depending on the discipline (from million points in a movement data set to petabyte in imagery sources)

- **velocity**
  - is the speed at which VGI can be generated (fast, continuous data streams) and at which they should be analysed (e.g. real time)

- **variety**
  - refers to data heterogeneity such as formats, representations, degree of structure

- **veracity**
  - relates to quality, trustworthiness, subjectivity and uncertainty
ENERGIC
European Network Exploring Research into Geospatial Information Crowdsourcing: software and methodologies for harnessing geographic information from the crowd

• cost-action ENERGIC (2013-2016)
• build a European network of scientist, young researchers and industry representatives
• activities and output
  – Training Schools
    http://vgibox.eu/activities/training-school/
  – VGI Knowledge Portal (Repository)
    http://vgibox.eu/repository/index.php/Main_Page
  – “European Handbook of crowdsourced geographic information”
    http://www.ubiquitypress.com/site/books/10.5334/bax/
ENERGIC
European Network Exploring Research into Geospatial Information Crowdsourcing: software and methodologies for harnessing geographic information from the crowd

• What motivates citizens to provide such information in the public domain, and what factors govern/predict its validity?
• What methods might be used to validate such information?
• Can VGI be framed within the larger domain of sensor networks, in which inert and static sensors are replaced by, or combined with, intelligent and mobile humans?
• What limitations are imposed on VGI by differential access to broadband Internet, mobile phones and other communication technologies, and by concerns over privacy?
• How do VGI and crowdsourcing enable innovation applications to benefit human society?

http://www.ubiquitypress.com/site/books/10.5334/bax/
Mapping and the Citizen Sensor

- cost-action TD1202 from 2012-2016
- help coordinate the activities of citizen sensors with particular regard to VGI data collection and dissemination
- review the current status of mapping
- define protocols to help guide producers and users of VGI data

VGIscience Summer School, 11.-15. September 2017, TU Dresden
Introductory presentation

1. Volunteered Geographic Information
   - potential and challenges of VGI
   - related research (e.g. ENERGIC, Mapping and the Citizen Sensor)

2. Priority programme VGIscience of German Research Foundation
   - objectives of the priority programme
   - projects within VGIscience
   - VGIscience repository

3. Summer School VGIscience
   - scope of the Summer School
   - relevance of the Summer School for the priority programme
   - planned activities
Priority Programme
VGIscience

Urban Planning and Environment

Transport & Navigation

Social Science & Crowd mobility

Disaster Management

Health & Epidemiology

Democratisation & Participation

Geographic Information Extraction & Retrieval

Visual Cartographic Communication

Geovisual Analytics

Semantic Interpretation

Social Context & Computing

Visual Cartographic Communication

Human Computer Interaction

Context of use, Abstraction, Verification

Interpreted data

VGI

Semantic Interpretation

VGI

Interpreted data

Onologies, User motivation, Privacy

Annotation, Interpretation, Structuring

filtered data

Slide 13
I) Research on geographic information extraction
- Extraction of the spatial, temporal and thematic reference
- Fusion of data from various sources and resolution
- Identification of correlations and pattern within large amount of data and data streams
- Search and exploration of VGI

II) Research on geovisualisation and cartography
- Development of innovative, adaptive visualisation metaphors
- Visualisation methods suitable for VGI (multivariate, metadata, quality)
- Real-time visualisation, abstraction
- User feedback, collaboration and interaction
- Empirical verification and theoretical foundations

III) Research questions on social context and computing
- Quality and generalisability of information: subjectivity vs. general ontologies
- Context dependency of data acquisition, abstraction and interaction
- Reliability and trustworthiness, information quality
- Motivation, intention for participation and privacy
Projects within VGIscience

- active participation and capturing of geodata (COVMAP, LearnEnviMaps, topikos, TrajectoryVGI, OldMapsVGI)
  - conjoint GPS and Video collection for traffic management
  - participatory sensing and collection of environmental data
  - extraction of metadata from Old Maps

- quality issues / assurance and improvement of VGI (QualityOSM, HC-VGI, LearnEnviMaps)
  - fitness for purpose of OpenStreetMap data
  - data quality issues of collaborative mapping in VGI from an AI / cognitive systems perspective
  - optimizing sensor measurements by advanced calibration mechanisms
Projects within VGIscience

• data analytics and visualisation
  (VA4VGI, EVA-VGI, ENAP, SpatialCorrelationVGI, UncertaintyTrustVA, VaguePlaceVGI)
  – real-time event assessment from social media data
  – analysis of people’s reactions
  – spatial correlations in social media data
  – interpreting vague place descriptions

• social aspects and human perception
  (MotivationHumanVGI, UncertaintyTrustVA, LandmarksVGI, EVA-VGI)
  – motivation and participation in Humanitarian Assistance
  – perception of landmarks in VGI-based maps
  – trustworthiness and privacy issues
Projects within VGIscience

- applications
  - disaster management, emergency response and flood damage models (COVMAP, QualityOSM, UncertaintyTrustVA, MotivationHumanVGI, ENAP)
  - urban / city planning, environmental management and traffic management (LearnEnviMaps, OldMapsVGI, QualityOSM, EVA-VGI)
  - analyse human activities and crowd mobility (TrajectoryVGI, UncertaintyTrustVA, EVA-VGI, VA4VGI)
  - navigation and orientation, indoor navigation (topikos, QualityOSM, LandmarksVGI)
  - VGI and land cover mapping (HC-VGI)
## VGIscience repository

<table>
<thead>
<tr>
<th>Data</th>
<th>Software</th>
<th>Methods / cookbook</th>
<th>Publications</th>
<th>Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### internal
- **project partner**
- **program partner**

### external
- **scientific community**
- **general public**

---

VGIscience Summer School, 11.-15. September 2017, TU Dresden
Introductory presentation

1. Volunteered Geographic Information
   • potential and challenges of VGI
   • related research (e.g. ENERGIC, Mapping and the Citizen Sensor)

2. Priority programme VGIscience of German Research Foundation
   • objectives of the priority programme
   • projects within VGIscience
   • VGIscience repository

3. Summer School VGIscience
   • scope of the Summer School
   • relevance of the Summer School for the priority programme
   • planned activities
Scope of the Summer School

- to give PhD students who are at an early stage of their academic career insights in to current research topics related to VGI
- establish cooperation between researchers from different research groups
- active research and development work related to VGI – we aim on visible outputs
  - conceptual work (outline of a paper)
  - sharing code / tools → repository
  - ideas of common VGI-based applications
Relevance of the Summer School for the Priority Programme

- groups of VGIscience priority program
  - this week is our chance to work actively together
  - a priority programme is more than a single DFG research project
  - the success and continuation of the VGIscience priority programme depend on our common research
- intern / extern
## Structure & Activities

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 - 9:45</td>
<td>Welcome and fast forward</td>
<td>Lecture I</td>
<td>(Geo-) Visual Analytics – Keynote</td>
<td>Lecture I / Practical</td>
<td>Presentation of group work I (15 + 15 min)</td>
</tr>
<tr>
<td>9:45 - 10:30</td>
<td>Introduction VGIsence-SPP</td>
<td>Invited talk</td>
<td>Lecture I</td>
<td>Lecture II / Practical</td>
<td>Presentation of group work II</td>
</tr>
<tr>
<td>10:30-11:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00-12:30</td>
<td>Discussion of scientific research paper</td>
<td>Lecture II &amp; III</td>
<td>Lecture II &amp; III</td>
<td>Group work</td>
<td>Flash light evaluation / final session</td>
</tr>
<tr>
<td>12:30-13:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:30-15:00</td>
<td>Task for the week</td>
<td>Parallel Exercises</td>
<td>Parallel Exercises</td>
<td>Hiking in the Saxon Switzerland</td>
<td></td>
</tr>
<tr>
<td>15:00-15:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:30- ...</td>
<td>Group formation / conceptual work</td>
<td>Group work / concept and prototyping</td>
<td>Group work / prototyping</td>
<td>Hiking in the Saxon Switzerland</td>
<td></td>
</tr>
<tr>
<td>(Open problems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening</td>
<td>Icebreaker</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

VGIscience Summer School, 11.-15. September 2017, TU Dresden
Let’s do research together