Grassroots Mapping: a toolkit for participatory and politically engaged cartography

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Chapter 1

Introduction

1.1 Overview

1.2 Defining Grassroots Mapping: Toolkit, Practices, or Community?

Exactly what makes up the Grassroots Mapping project? Is it a body of code, available under an MIT license at http://github.com/jywarren/cartagen? Is it a set of mapping practices, or tools, which have been employed in Lima, Peru, or Rio de Janiero? Or is it a community of practitioners and the web site, wiki, and mailing list which tie them together?

Fundamentally this project is intended to make the process of mapmaking easier for lay users, with the intent to broaden participation in cartography. In most places, maps can be seen as a tool of the state and of industry to express control over world we live in. By simplifying the means to create maps, from the data gathering through the editing and publication of digital and print maps, the tools are designed to democratize cartography. In turn, it is hoped that the ability of a broader public to make maps at accessible costs will help to empower bottom-up cartographic activism and to circumvent the current power structure of mapmaking.

The core of the Grassroots Mapping project is the **application** of a novel combination of technology to a specific cultural need. Its success, however, is due to the effort and faith of the organizations and individuals who were willing to adopt these new and strange tools, and who saw their potential for use in the communities in Lima, Peru, and the oil spill crisis on the coast of the Gulf of Mexico. This includes Carla del Carpio of Manzanita "A" and Ernesto Fernandez of CEDRO, both in Lima, Peru, and Daniel Miracle and others from Escuelab, also in Lima. It includes Kris Ansin, Shannon Dosemagen, and Anne Rolfes of the Louisiana Bucket Brigade in New Orleans. It also includes the dozens of participants who tirelessly flew kites and balloons, and untangled and wound miles of string day after day.

To make this possible, the project also evolved to include a variety of teaching materials, printed guides, online videos, and workshops, both by the author and by the diverse collaborators who took ownership of the tools. These materials spanned a broad range of audiences, from 10-15 year old Spanish-speaking students to environmental activists in West Virginia and Kentucky.

Ultimately, even the digital tools, including the Cartagen map rendering framework and the Cartagen Knitter, a tool for orthorectifying aerial imagery, were built with assistance and support of UROPs, colleagues, and contributors in the broader mapping community. That this has become

the norm in technology projects does not detract from the fact that much of this work would have been impossible without such contributions.

Building tools is unlike developing more abstract technologies in that to be successful, a series of compromises and pragmatic decisions must guide the design process, as well as continuous communication with an audience of users. The Grassroots Mapping project has evolved inresponse to these needs and should be examined in the context of the specific uses it has attempted to address, rather as an isolated or 'pure' work.

1.2.1 Audience and process

The tools developed as part of the Grassroots Mapping project address the needs of both committed enthusiasts who need powerful and efficient mapping technology, as well as those who have little experience and expertise but need simple and direct tools to make maps. Therefore, some of the tools, while being simple to use, are intended for 'power users' or those technically fluent in writing and editing code. The Cartagen framework falls under this category. Other tools, such as the balloon- and kite-based platforms for capturing aerial imagery, are intended for a wider audience, as is the Cartagen Knitter, a specific use of the Cartagen framework. A description of the various tools follows.s

1.2.2 Software

Interfaces for participatory cartography

The Cartagen framework

Rendering architecture

1.2.3 Hardware

Balloon Aerial Photography

Photography from Kites and Unmanned Aerial Vehicles

1.2.4 Practice, Community, Support structure

GrassrootsMapping.org

The Grassroots Mapping Wiki

Documentation, case studies, Grassroots Map Collection

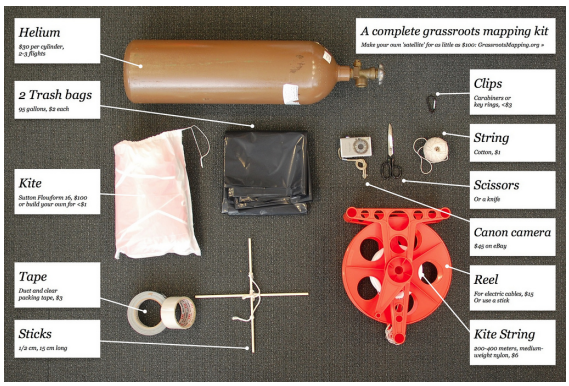
The Grassroots Mapping community and mailing list

1.3 Novel Contributions

1.3.1 Novel application of low-cost tools to well-established need for raster imagery

1.3.2 Novel approaches to map rendering

1.3.3 Central merit: technology or culture?



Chapter 2

Subjectivity in Mapping

The need for a more participatory cartography is predicated on the exclusion of many from the practice of map-making as it stands today. Even more importantly, it depends on the point of view that mapping is an inherently non-neutral practice, and that for maps to serve wider and more democratic interests, it must accommodate diverse viewpoints. Maps serve interests, and understanding their role not as documentation of what makes up the world, but as rhetorical, tactical, and *subjective* tools is an important prerequisite to what this document argues.

2.1 Neogeographers, Psychogeographers, and GIS

A brief description of three distinct groups of practitioners is worthwhile, as each embodies a distinct conception of mapmaking.

2.1.1 Psychogeography

2.1.2 GIS practitioners

Professional map makers have used Geographic Information Systems, or GIS since its development in the

2.1.3 Neogeography

With the rise of web-based data and display systems came a group composed primarily of programmers and web designers, who have adopted the name *neogeographers*. This group positions itself in contrast to 'traditional' approaches such as GIS, and

Rana and Joliveau suggest that neogeography rejects the 'prescribed role/interaction between the four main components, namely the audience, the information, the presenter and the subject...'.

Andrew Turner: Introduction to Neogeography coined by Di-Ann Eisnor? http://apb.directionsmag.com/archiv Define-Neogeography.html

"outsiders"

http://books.google.com/books?id=oHgDv4feV-8C&dq=neogeography+turner&printsec=frontcover&source=bn&hl=en&ei=gmDLS6_-KYj98AaY_KWXDA&sa=X&oi=book_result&ct=result&resnum=5&ved=0CBwQ6AEwBA#v=onepage&q&f=false

"NeoGeography and the nature of geographic expertise", Author: Michael Goodchild http://www.informaworld.com/smpp/content~db=all~content=a911734343

Orig. ref to Platial's usage: http://placekraft.blogspot.com/2006/04/neogeography-defined.html

2.2 The mythical 'complete' map

The most famous (yet fictional) version of this fantasy is Jorge Luis Borges' short story

'a mile to the mile!' 'So we now use the country itself, as its own map, and I assure you it does nearly as well.' p.169

This idea was later elaborated in Jorge Luis Borges'

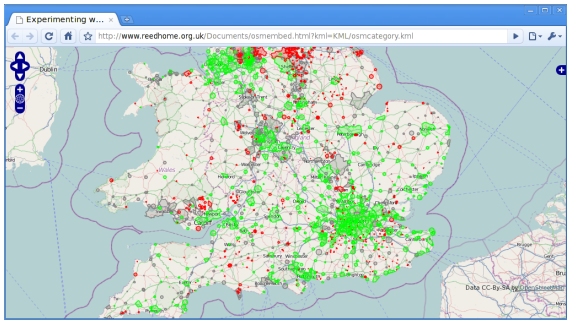
The idea that maps accurately, or even completely depict a location is not entertained in a literal sense, yet amongst

Chris Anderson

2.3 Maps as a 'window' onto the world

2.4 Maps: rhetorical, even tactical

2.5 Ground Truth, or maps as testimony



http://www.reedhome.org.uk/Documents/osmembed.html?kml=KML/osmcategory.kml

2.6 Cartographic ethics

Cartography, ethics, and social theory: https://commerce.metapress.com/content/c21115120603xj14/resource-secured/?target=fulltext.pdf&sid=gb5vtk2lhvt0dj55c1xba4aa&sh=utpjournals.metapress.com

PGIS: Do your best to recognise that you are working with socially differentiated communities and that your presence will not be politically neutral Be considerate in taking peoples time (bibliography/rambaldi-practical-ethics-for-pgis.pdf)

Chambers, chambers-who-empowered-disempowered-gains-loses.pdf Outline of history and benefits of PGIS, but also of ethics and beneficiaries

2.6.1 Subjective cartography in practice

Chapter 3

The Need for Geospatial Data

3.1 Two worlds of mapping

3.1.1 Urban slums, informal settlements

Brief outline of fulfilled needs: chambers-who-empowered-disempowered-gains-loses.pdf, p.4

3.1.2 Tenure mapping

The invasion of Lima, Peru

3.1.3 Mapping: a tool of empowerment or control?

Evgeny Morozov, "How dictators watch us on the web" - http://www.prospectmagazine.co.uk/2009/11/how-dictators-watch-us-on-the-web/ http://irevolution.wordpress.com/2010/01/07/morozov-vs-shirk (Patrick Meier)

many criticisms may represent limited experience mapping... circular? It is easy for activist cartographers who do not live in a community to advocate the use of tools which may put that community at risk.

"empowerment":(great article on definitions for empowerment and framework for discussing empowerment in the PGIS context)

Corbett, Jon M., and C. Peter Keller. 2005. An Analytical Framework to Examine Empowerment Associated with Participatory Geographic Information Systems (PGIS). Cartographica 40 (4):91-102.

3.2 Environmental assessment

3.2.1 Asset allocation mapping and carbon cowboys

3.3 Open geodata and crisis mapping

3.3.1 Crisis mapping and Ushahidi

Chapter 4

State of the Art

4.1 PGIS: Participatory Geographic Information Systems

Traditional GIS technology has been used since the XX's to support communities in developing contexts for purposes such as making tenure claims, environmental defense against petroleum and other extraction industries, as well as for planning purposes. This has become known as PGIS, or Participatory GIS, and typically...

4.1.1 PPGIS

Definition: http://www.ppgis.net/ppgis.htm Bibliography: http://dusk2.geo.orst.edu/gis/student_bibs/slurie.htm

bibliography/rambaldi-participatory-spatial-developing-countries.pdf

4.1.2 Participatory GIS for Development

4.1.3 Shortcomings of traditional PGIS practice

4.2 OpenStreetMap

4.2.1 Humanitarian OSM Team

Free Map Gaza

Followup projects

Challenges

Emphasis on local infrastructure

Chapter 5

Grassroots Mapping as an alternative means of participatory cartography

5.1 Cartagen: an alternative architecture

Chapter 6

Related works

6.1 Beyond symbolic mapping: Data-driven approaches to participatory mapping

Chapter 7

Evaluation criteria

7.1 Participants vs. collaborators

Triangulation

Construct validity

how theory was affected by data

Face validity

how research was received by participants

Catalytic Validity

how participation transforms the situation (self-awareness/reflexivity)

7.1.1 Interviews with local partners

Wiki, mailing list, blog, media coverage (Face validity)

Chapter 8

The Grassroots Mapping tool chain

8.1 Balloon/kite Aerial Mapping (BAM/KAM)

8.1.1 Accuracy and precision in kite and balloon imaging

8.2 Digital maps: reconceptualizing mapping interaction

8.2.1 Beyond raster mapping/Tile politics

8.2.2 Cartagen dynamic rendering

8.2.3 An iterative toolchain development process

Chapter 9

Case Study: Grassroots Mapping in Lima, Peru

9.1 Introduction

In the interest of basing tool development and design on real-world applications, and due to an ongoing conversation with Carla del Carpio of Lima-based Manzanita "A",

traveled to Lima, Peru in January 2010 to conduct field research and to collaborate on the Grassroots Mapping tool set with those who would be likely to use it.

9.1.1 Designing with, not for

Needs assessment

Potential beneficiaries/collborators: Hector, Carla/Manzanita A, CEDRO, Escuelab, Shuawa

9.1.2 The Other Path: Lima's history of informal settlement

9.1.3 Valuation and 'grey' economies

9.1.4 Limits of state-sanctioned mapping efforts

9.1.5 A Grassroots Mapping curriculum

9.1.6 Mapping with Juan Pablo II

- Introduction to mapping - discussion: literal mapping difficult due to different mental models - tape-measure technique – bodystorming - introduction to Google imagery not relevant

First flights in Juan Pablo II

Situating mapping practice

Stitching maps with Juan Pablo II

- Stitching exercises - with kids - 'rubber sheets' - with teachers (secondary audience) - Map Warper, discussion of difficulties (see ahead)

9.1.7 Mapping with San Ignacio Loyola

- Manzanita "A" - usage of Photoshop primarily; fast mapping; 2-3 hrs flight, 1-2 hrs stitching - Hector: ideal user: - lives in an informal settlement - teacher, interested in using this in curriculum - community leader - interest in tech, willing to try map warping - difficulty in trackpad/menu usage, took notes - engaged despite workload - sees applicability for mapping tools in settlements

9.1.8 Mapping with Cantagallo

- Escuelab - technology, art, society - engaged with a creative group, Shuawa

The Shipibo in Lima

- narrative of 10 year stay, claim to land, contested claims, and riverbank site - Escuelab sought political neutrality, but obviously interested in political situations: ex: shipibo language - Drawing exercises - 'amazon' home vs current home - non-literal mapping - related to issues of veracity re: Wherecamp sugg. of children mapping with stickers

Flying balloons with Cantagallo

- fastest yet - total images - usage of hugin/SIFT/Photoshop

Lower Cantagallo and local geographic dispute

- Escuelab and Sara/CEDRO - two cantagallos (three?) - Sr. Ricardo - possible political engagement/entanglement - entry into SETAME site; playfulness seen as neutrality? Or just no resistance at low levels to mapping activity? - not perceived as claim-related?

9.1.9 Computing literacy challenges with orthorectification

- map warper - designed for printed maps - large loop of interaction - overcorrection easy, no immediate feedback upon assigning GCPs - difficulty in explaining GCPs, and necessity of javascript hack for areas without base data - amazing for intended use, even note application in Mumbai - Photoshop better, but barely - stuart long uses photoshop, maybe bruce owen (see emails)

9.1.10 Evaluation

- based on criteria - Interviews!!!!!!! transcribe them - Applications of maps we made - legal role - import to OSM? - World Bank mandate to map every home? do we support that goal? - education, urban planning, NGO planning support, demonstration project

9.1.11 Needs (Re)assessment

- Goals for a true 'pilot' that goes beyond information gathering and use of existing State of the art tools - planning of new, easier interfaces and techniques - Map Warper difficulties, speed - discussion and 'designing with' leading to Cartagen Knitter (see later discussion) - http://en.wikipedia.org/wiki/Rubbersheeti
- needs assessment - user-centric design, appropriate design - Possibility of mapping a fast-changing community History/future assignments make explicit the value of mapping as an activity

Chapter 10

Citizen mapping of the BP oil spill

10.1 Grassroots mapping in crisis response

In late April 2010, the Deepwater Horizon oil rig exploded and sank, initiating what may be one of the worst environmental disasters in US history. As the spill grew in size, the author contacted Stewart Long of GonzoEarth.org and Oliver Yeh of 1337arts.com. Long has used remote control aircraft to produce maps, and Yeh specializes in high-altitude photography using weather balloons, having captured imagery from a balloon at altitudes of over 90,000 feet. The three decided to travel to the Gulf Coast area to spearhead a citizen effort to map the oil spill's effects. After making phone contact with Anne Rolfes of the Louisiana Bucket Brigade (LABB), a New Orleans-based environmental activist group, Yeh and the author flew to New Orleans on May 5th 2010, followed by Long on May 6th.

With the cooperation and extensive support of the LABB and other interested New Orleans residents, the team began leading almost daily trips to use balloons and kites to map coastal areas. While not attempting to produce imagery of the entire at-risk coastline, which stretches several thousand miles from Louisiana to Florida, the mappers focused on acquiring high resolution imagery of specific sites, with the goal of producing 'before and after' maps. The trips relied on the availability of free transport to affected areas, but in the initial days of the project this was not a problem, as fishermen and charter companies began calling in to offer their services for free. Increasingly large areas of the Gulf of Mexico were being closed to fishing, and with their livelihoods at risk, many in the fishing industry were eager to participate in the documentation of the spill.

The 2010 Gulf oil spill was seen as an opportunity to apply the low-cost mapping techniques refined and documented on GrassrootsMapping.org to a problem of immediate import. While many overflights were occurring, there was no publicly available, orthorectified imagery available in the initial weeks of the spill; up-to-date imagery was supplied mainly by the MODIS (Moderate Resolution Imaging Spectroradiometer) sensors aboard NASA's Terra and Aqua satellites. MODIS is limited to 1000 meter resolution for those bands which are used for ocean imaging, and while the daily images available were very useful in determining where along the coast was being hit by slicks and sheens, it was not of high enough detail to show any specific damage.

By contrast, the imagery collected by the LABB/Grassroots Mapping teams was up to 5 cm/px in resolution, and could be repeatedly captured over the course of days or weeks.

Chapter 11

Field trials in India

11.1 Goals

Chapter 12

Project sustainability and ongoing work

12.1 Wiki, blog and mailing list

Incorporation of new needs through dialogue (see Evaluation Criteria .. Face validity/Construct validity) Examples of community-based reformulation/innovation Crispen's suggestion of lat/lon rectification points (mentioned above) Pat Coyle's videos, bungee-cable design, and camera shut-down research

12.2 Illustrated Guide

Nathan Cooke, Pat Coyle Workshops/flights Community building, matchmaking (mentioned in strategies section above)

Figure 12.1: The Toucan

Chapter 13

ReadingList

Related readings

A collection of readings on kids, playful exploration, and grassroots mapping

Jeff:

New information technologies in the old political economy : an exploration of community-based GIS for improving basic services for the poor in New Delhi, India - 2005 MIT DUSP dissertation by Claudia Canepa

PARTICIPATORY SPATIAL INFORMATION MANAGEMENT AND COMMUNICATION IN DEVELOPING COUNTRIES - Giacomo Rambaldi, Peter A Kwaku Kyem, Mike \McCall, Daniel Weiner, EJISDC, 2006

The child's creation of a pictorial world, Claire Golomb

Curriculum on "Children as Community Researchers" - UNICEF, authored by Children's Environment Research Group

Participatory GIS - A Paradigm Shift in Development? - Jen Osha and Daniel Weiner, 2006

Mapping for Change - 2005 International Conference on Participatory Spatial Information Management and Communication

Weiner, D. and T. Harris, 2003. "Community-Integrated GIS for Land Reform in South Africa." URISA Journal. 15(2): 61-73.

PPGIS on MapTogether.net

Bilingualism and identity: Spanish at the crossroads with other languages - Geographic dispute in Canta Gallo, in Lima, Chapter 7

Intervention: Mapping is critical! - This intervention targets the much heralded demise of the map in geography and the recently proposed rethinking of maps. It comprises contributions from two political geographers, a military geographer, a political scientist, and two activist cartographers and argues that there is not so much a need to rethink maps, but to re-engage with the material practices of mapping, and above all to re-make maps.

Mapping in a Shoebox - A Grassroots Approach for Developing the Geospatial Literacy of Elementary Children - 24th International Cartographic Conference - Jaqueline M. Anderson, Sally Hermansen, Lorraine Innes, 2009

Lots of work by Proboscis: Social Tapestries/Urban Tapestries, 2002-7 - Urban Tapestries investigated how, by combining mobile and internet technologies with geographic information systems, people could 'author' the environment around them; a kind of Mass Observation for the 21st Century. Like the founders of Mass Observation in the 1930s, we were interested creating opportunities

for an "anthropology of ourselves" adopting and adapting new and emerging technologies for creating and sharing everyday knowledge and experience; building up organic, collective memories that trace and embellish different kinds of relationships across places, time and communities.

BEST PRACTICES FOR SHARING SENSITIVE ENVIRONMENTAL GEOSPATIAL DATA - for GeoConnections by AMEC Earth & Environmental, 2010

Kate:

BBC article - train station hires a Director of Fun!

Place-Logging - MIT thesis

Tube iphone app - augmented reality