HMKV
Hartware MedienKunstVerein

Satellite Voyeurism

Workshop Documentation
Dortmund 2007

Francis Hunger: The Satellite Voyeurism Workshop

Satellite Voyeurism Workshop was initiated to provide a hands-on experience for professional artists and other interested individuals. Hartware MedienKunstVerein uses the 2200 sqm PHOENIX Halle as an exhibition space since 2003 and it does so not only for exhibitions but also workshops, lectures, public events. The workshop gathered an international crowd meeting with artists who are based in the Ruhr-Area, the 5,3 million people aggregation, where Dortmund and the HMKV is situated.

The idea for Satellite Voyeurism grew, when I worked on my project International Sputnik Day, an event which internationally „celebrated" the 50th anniversary of the Sputnik Satellite launch on October 4, 1957. Historical aspects of technological development and its embedding into social and political developments provide an important perspective for understanding current phenomena and interrelations between technology and society. So *Satellite Voyeurism* clearly refers to the recent emergence of satellite imagery in a broad, non-military domain. Google Earth (and comparable software) is the most visible indicator, but the process of emergence in public can be traced back to the mid-1980s when commercial satellite images and data became available in public and latest in the 1990s gulf wars were used to „illustrate" the events in TV news.

Although their everyday significance for contemporary human life, satellites remain mostly invisible – that means, out of sight for the human eye. I'm talking here about satellite communication, Internet via satellite, phone via satellite, satellite radio and TV, global satellite based navigation systems, weather satellites, military and intelligence satellite surveillance – all sending and receiving from and to Earth. Aim of the workshop was to enable more artists to react on this invisibility of the technological infrastructures. The participating artists mostly deal with this issue of visibility/ invisibility of the underlying infrastructure (Marc Böhlen, Joanna Griffin, Kathy Marmor, Manuel Schmalstieg et. al.) or with imagery and data that is produced by satellites (Alejandro Duque, Martin Heckmann, Rona Rangsch a.o.). In the selection process for the workshop participants – following an open call – attention was paid to invite a healthy mixture: people who are deeply involved into the artistic domain dealing with satellites, newcomers to this field, an equal relation of male and female participants, technically experienced and more conceptually oriented artists.

There are a few influencers who were unfortunately not able to attend the workshop but still very important for it. I was lucky to participate in the Acoustic. Space.Lab in Irbene and Riga, Latvia in 2001, organized by Rasa Smite and Raitis Smites from RIXC, the Riga Media Art Lab. That workshop took place at the 32 meter dish of the VIRAC telescope in Irbene, a former Soviet Army facility which then was converted towards scientific use. Rasa and Raitis and their collaborators from RIXC managed to enable some 30 people using the telescope for 7 days of artistic exploration.(1) Also I was impressed deeply by Marko Peljhans makro.lab (1994-2007) which I think is one of the most consequent artistic projects to deal with electromagnetic waves, environmental issues and its artistic exploration.(2) Further I should mention the excellent research done by Lisa Parks, Associate Professor of Film and Media Studies at UC Santa Barbara, Cultures in Orbit: Satellites and the Televisual. Duke University Press, 2005.(3)

The workshop itself consisted of four public lectures on July 20th, 2007, internal presentations and the hands-on part in the following days. A selection of the lectures and the participating artists projects is presented in the following documentation. I would like to personally thank

1 http://acoustic.space.re-lab.net

2 http://makrolab.ljudmila.org; c.f. Arns, Inke: Objects in the Mirror may be Closer Than They Appear: Die Avantgarde im Rückspiegel, Berlin, 2004 http://edoc.hu-berlin.de/dissertationen/arns-inke-2004-02-20/PDF/Arns.pdf

3 http://www.lisaparks.blogspot.com/

the lecturers Regine Debatty (we make money not art), who gave a introduction into artistic projects related to geo-data and satellite imagery, Daniel Schulz (IAIS Fraunhofer Institut) who explained current developments in geo-marketing and Tristan Thielmann (Universität Siegen) talking about the change in perspective that the introduction of satellite imagery caused. Especially I would like to thank Thilo Elsner and his colleague Nicole Remy (Sternwarte Bochum) for their hands-on presentation how to receive a NOAA weather satellite image with just an antenna, receiver unit and a computer.
The workshop would not have been possible without the consistent support of the HMKV team, namely artistic director Dr. Inke Arns, managing director Dr. Susanne Ackers, project manager Darija Simunovic, technical director Uwe Gorski, and best girl Kathrin Hauser. It was supported by Ministerpräsident des Landes NRW, LAG Soziokultur, Kulturbetriebe der Stadt Dortmund and Dortmund Project.
To organize this workshop was a real pleasure for me, especially meeting and collaborating with the participants, lecturers and my colleagues. Satellite Voyeurism (2007) was a follow up workshop to How I learned to love RFID (2006) and I'm looking forward to create a workshop dealing with databases, another important "invisible" technology at a given time.

Support

Der Ministerpräsident des Landes Nordrhein-Westfalen
NRW.
Kulturbüro
Stadt Dortmund Kulturbetriebe
LAG
LEG
dortmund-project
PHOENIX

Imprint

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Workshop participants (photo: Jake Arns)

Fri 19th July

4 pm - 7 pm Arrival
7 pm - open end Meeting at Cafe Max

Sat. 20 July

Public Lectures at PHOENIX Halle

11 am Francis Hunger: Introduction - A few comments on the success of Google Earth (http://sputnik.irmielin.org)
12 am Daniel Schulz: Geomarketing (http://www.iais.fraunhofer.de)
02 pm Regine Debatty: Artist projects using satellite images and geo-data (http://www.we-make-money-not-art.com)
03 pm Tristan Thielmann: Geomedialität - Neue A-Perspekticen auf den blauen Planeten, (http://www.fk615.uni-siegen.de , http://www.spatial turn.de)
04 pm Martin Heckmann: sat.land (http://www.martinheckmann.net)

Internal Presentations and invitation to BBQ at HMKV Office

07 pm Alejo Duque: BereBere (http://www.berebere.info)
08 pm Kathy Marmor and Joanna Griffin: A connection to a remote place, The image of the Satellite, When does one know to much, Bird Watching (http://www.uvm.edu/~kmarmor/; http://www.aconnection toaremoteplace.net)
10 pm All participants: Open Slot, talk, talk talk

Sun 22. July

Internal Workshop at PHOENIX Halle

11 am Thilo Elsner: Hands-On: How to receive NOAA Satellites with a PC, Antenna and Soundcard (http://www.sternwarte-bochum.de)
02 pm lunch break
02.30 pm Marc Böhlen: Telescope control software and practical image processing of astronomical data for hobbyists (http://www.realtechsup port.org)
03.30 pm Sascha Bejer: An experimental drone (http://www.das-labor. org)
05 pm Matthew Biedermann: I-TASC - Interpolar Transnational Art Science Constellation (http://www.i-tasc.org)
06 pm Paula Roush: Tagged surveillance (http://www.msdm.org.uk)
07 pm Manuel Schmalstieg: ONYX recordings (http://n3krozoft.com)
08 pm Katalin Tesch (http://www.teschkata.hu), Peter Simon (http:// www.p3c7.de), Andreas Bär (http://www.kunststiftung.de/net/artist. php?key=10012), David Halbrock, Rona Rangsch (http://www.rangsch. de)

Workshop participants (photo: Inke Arns)

8 Thilo Elsner: Reception of data from meteorological satellites by a low-cost receiving system

Summary

Since 1961 meteorological satellites have been launched by the USA and few years later by the USSR as well. In the Institute of Space Research of the Bochum Observatory Bochum these data have been received – since 1963 – beginning with TIROS 8 and NIMBUS 1 by means of special receiving stations developed by the Institute; they have been recorded and analyzed for geo-scientific problems. Besides the task of enabling the classical geosciences to make up-to-date and far reaching statements by means of the data of meteorological satellites accompanying works of technical and electrical development have been carried out since 1963/64 in Institute. Today, the receiving station for the direct reception of meteorological satellite data in the 137 MHz scale is a real low-cost system.

Introduction

The classical meteorology uses satellites since 1961, beginning with the TIROS satellite series. These satellites record the dynamics of weather conditions on a global scale and more and more cover the task of environmental research. In 1963/64 APT (Automatic Picture Transmissions System) was used for the first time in the US, which also for non-US meteorological services created the possibility to receive meteorological data form polar circulating satellites with relatively low effort and without any registration or decryption. These satellite types are however not so well known, compared to their geo-stationary counter pieces, which can be only received with comparatively more technical and administrative effort. Just five to ten years ago special modems were necessary to decode NOAA satellite signals, but in the meanwhile software is available to execute this task just with the help of a computer and a sound card. Although polar circulating satellites do not transmit such a strong radio signal if compared e.g. to the regular radio program you won't need satellite dishes or extensive technology. Low orbit polar circulating satellites transmit slightly above the VHF radio program band, at around 137 MHz. They circulate around the Earth at a ground distance of about 850 km. Their orbit takes course almost across the poles and on each circulation; each path is slightly offset from the former circle, stemming from Earth's own circulation. Thus the whole earth is scanned segment by segment during the course of time. The satellite sends the imagery at 137 MHz in the APT format, which resembles fax transmissions. There is no begin or end; transfers are indefinite and

turn style antenna, as used in the workshop (photo: Inke Arns)

quadrafilar helix antenna (image courtesy of: Hans-Jürgen Lüthje, http://www.satpix.de)

get only limited by the observer's receiving radius. Receiving these APT signals is simple as can be: All you need is a receiver that can receive the frequency band around 137 MHz – basically for the beginning a simple handheld scanner is sufficient. Given the existence of a computer and a soundcard, you can decode the imagery and make it visible on your computer screen. References for the mentioned software and hardware are given below.

R2FX receiver

Receiver

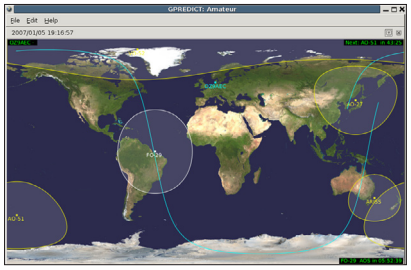
First we need a decent receiver. Using basic scanners is a possibility as well as special APT receivers for the frequencies around 137 MHz. Whether the receiver is sensitive enough, can be tested with our antenna. A usable and cost-effective unit is the R2FX, which was developed especially for APT and comes with the WxtoImg software for decoding (Windows and Intel Mac OS X compatible). We connect antenna and receiver with a decently shielded coax, at the shortest possible distance, to avoid receiving electromagnetic noise as much as possible. The receiver again is connected via a cable with the computers' sound card.

Antenna

Using a simple antenna, e.g. a helical antenna or a short telescope antenna, satellites can't be received continuously from rise to set down over the full range from horizon to horizon. Just when the satellite is directly above our head, at the closest distance from the antenna, it can be received. After all, NOAA satellites orbit in 850 km height, when they are directly above us – at the horizon this distance is more than 2000 km. Therefore we need a sensitive antenna, to receive it during the complete over-flight – otherwise we would pick up the decodable signal only for a short time. As the satellite is moving, a helical antenna is the best solution. There are affordable antennas available which have this functionality, called turn-style antennas. Another option is to use a Quadrafilar Helix antenna. Both types are internationally distributed mostly in the domain of ham operators, see the notes below. One could also use a pre-amplifier but for the beginning we go without.

Orbit calculation

Because of the satellites circulating around Earth and not being „pinpointed" above our location, we need an orbit prediction for our specific location. A NOAA satellite rises at a given time at the observers' horizon on a certain „point", follows his path and sets down on the opposite horizon after about 15 minutes. To decode the data, this is a relatively short time period for the inexperienced observer. So we won't leave it to coincidence but



Gpredict software – screenshot

make use of software, which can predict satellite paths and horizons. Using the software Orbitron (Windows, Linux) or the less comfortable but still functional Gpredict (Windows, OS X, Linux) we can predict the over flight period of a satellite for our specific location. To use the software you have to download and install it and then download so called TLE files, which contain the up-to-date satellite positions. These TLE files are broadly available and after downloading you can import them into your satellite prediction software. Now we can determine when a satellite will fly across our location and try a first test. Therefore we need to know the frequencies.

Transmission frequencies

Currently the following NOAA satellites are active:

NOAA-18 APT - 137.9125 MHz
NOAA-17 APT - 137.62 MHz
NOAA-15 APT - 137.50 MHz

We should calculate all satellites' orbits for our location and tune the receiver to the according frequency. If the satellite can be received at the given time, we should be able to hear a signal at least shortly with simple equipment. The signal sounds like a loop: da di da di da di!

Decoding

After the test worked well, we just have to record and decode the incoming APT format. You may use the software WXSat or WxtoImg for that purpose. With both programs you have the possibility to first record the signals to hard disk and decode them later. The software is not explained here in detail, because extensive documentation can be found online.
Now I wish you good luck and let me know you questions and comments! (Thilo Elsner)

Thilo Elsner is Director of the Observatory Bochum – Center for Ecological and Future Research, http://www.sternwarte-bochum.de/ (image: Inke Arns)

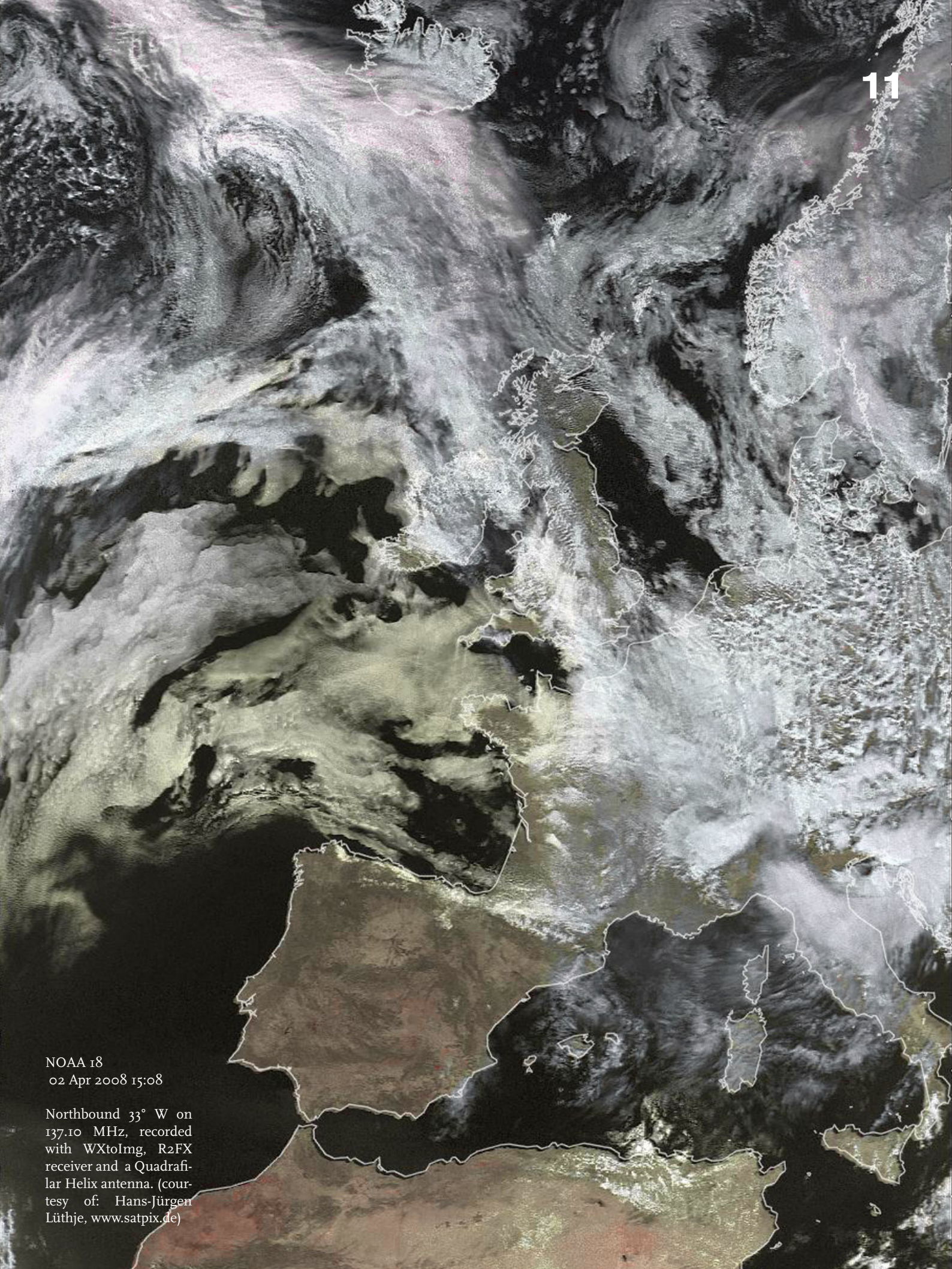
Software & Hardware

Orbitron satellite prediction software for Windows, Linux (using wine emulation) – freeware | http://www.stoff.pl/

- Gpredict satellite prediction software for Windows, OS X, Linux (must be compiled by yourself) – freeware | http://groundstation.sourceforge.net/gpredict/
- TLE files for satellite prediction software | http://www.celestrak.com | http://www.io.com/~mmccants/tles/index.html
- WxtoImg Software, converting received frequencies to imagery, for Windows, OSX, Linux – freeware or 50 Euro (Standard Edition) | http://www.wxtoimg.com
- Quadrafilliar-Helix-Antenna (QFHA) – 450 Euro plus delivery costs | http://www.msrush.de/8.html
- Turnstile antennas – 60 Euro | http://www.thiecom.de/wetterfax-antennen.html
- R2FX Receiver – 179 Euro plus delivery costs | http://www.df2fq.de/produkte/r2fx.html | http://www.thiecom.de/wetterfaxempfaenger.html

Further reading

- NOAA - National Oceanic and Atmospheric Administration | http://www.noaa.gov/
- More hardware configurations | http://www.wxtoimg.com/hardware/
- How-To by Andre Phillips: http://www.phys.unsw.edu.au/~map/weather/notes/buildyourown/
- How-To by Julian Moss: http://www.g4ilo.com/wxsats.html



NOAA 18
02 Apr 2008 15:08

Northbound 33° W on 137.10 MHz, recorded with WXtoImg, R2FX receiver and a Quadrafilar Helix antenna. (courtesy of: Hans-Jürgen Lüthje, www.satpix.de)

12 Regine Debatty: Satellite Voyeurism

1. Flying

2a. The Gryphon wingsuit – Advertisement http://www.spiegel.de/international/spiegel/0,1518,428830,00.html

2b. The Gryphon wingsuit – Company photo

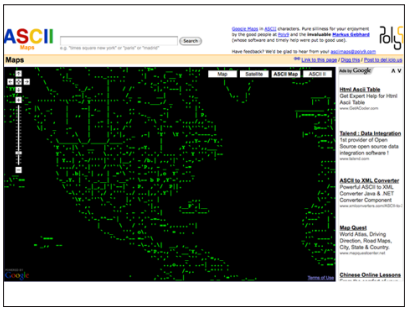
Fetishism for maps

3. Cityscape Stockholm

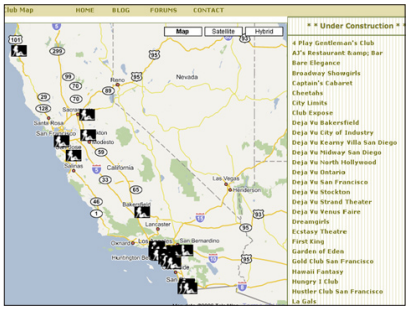
4. London Underground Mirror http://www.suck.uk.com/product.php?rangeID=42

Google Maps Mashups

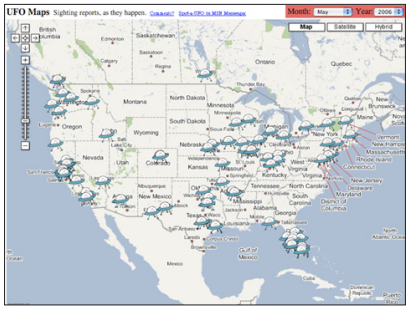
Google Maps Mania is the unofficial Google Maps blog tracking the websites, mashups and tools being influenced by Google Maps. http://googlemapsmania.blogspot.com



5. Google Maps in ASCII Characters – Website http://google.blognewschannel.com/archives/2006/05/02/google-maps-in-ascii/ http://www.asciimaps.com

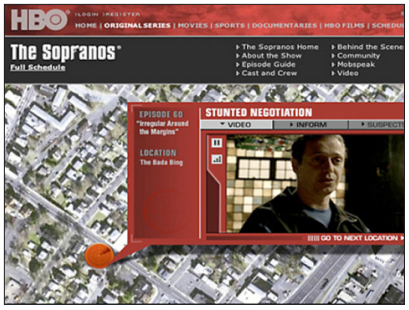


6. US Stripclubs Mashup – Website http://stripclubmap.com



7. UFO Maps – Website
http://www.ufomaps.com

8. Garbage Scout – Website
http://garbagescout.com



9. Sopranos Maps – Webite
http://www.hbo.com/sopranos/map/

Google maps power harnessed by advertisers

10. Fieldvertising – Aerial photo
http://readbetweentheps.blogspot.com/2006/03/new-medium-of-advertising.html

11. Roof Top Advertising – Website
http://www.roofads.com

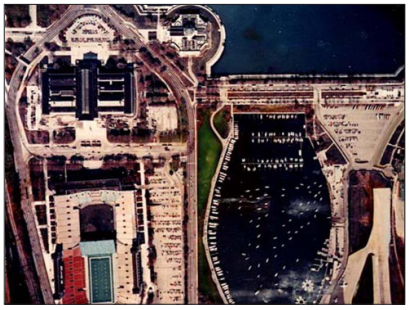
12a. Which has inspired this artistic project: B. Hopfengaertner: Hello World! – Installatin view
http://hello.world.net

12b. B. Hopfengaertner: Hello World! – Cutting the field

12c. B. Hopfengaertner: Hello World!

Art projects before Google Earth

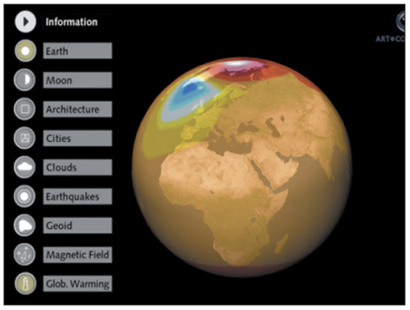
13a. Ch. & R. Eames: Powers of Ten – Screenshot http://en.wikipedia.org/wiki/Powers_of_Ten, http://www.powersof10.com



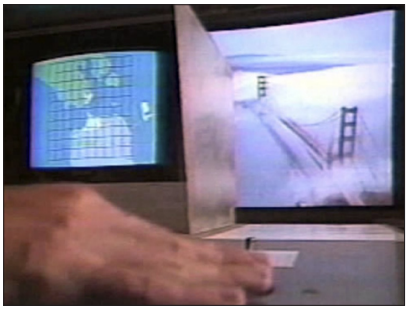
13b. Ch. & R. Eames: Powers of Ten – Screenshot

14. Powers of Ten location in Google Earth: Soldier Field on Chicago's lakefront – Screenshot

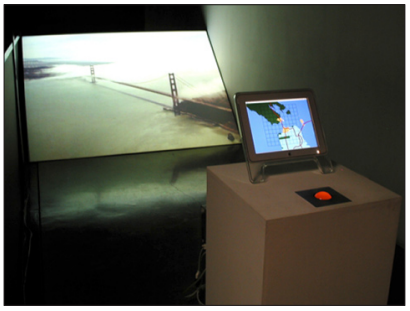
15a. Art+Com: Terravision – Installation view http://www.artcom.de/index.php?lang=en&option=com_acprojects&id=5&page=6



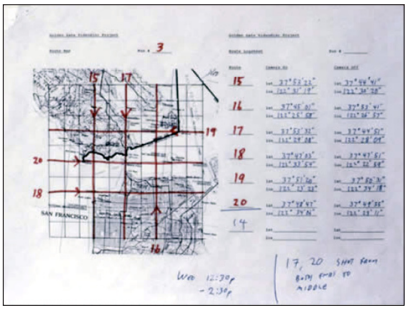
15b. Art+Com: Terravision – Screenshot



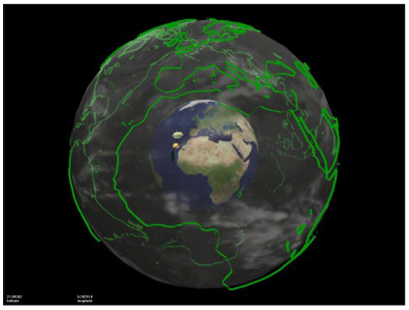
16a. M. Naimark: Golden Gate Flyover - Installation view http://www.naimark.net/projects/goldengate.html



16b. M. Naimark: Golden Gate Flyover – Installation view (2005)



16c. M. Naimark: Golden Gate Flyover – Map for recording

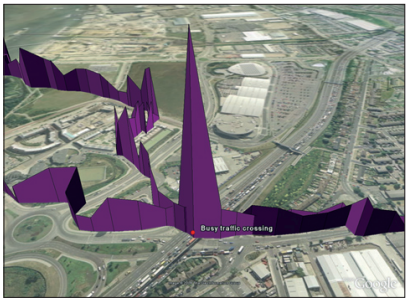


17. John Klima: Earth – Screenshot
http://www.cityarts.com/earth/

Current art projects using locative technologies

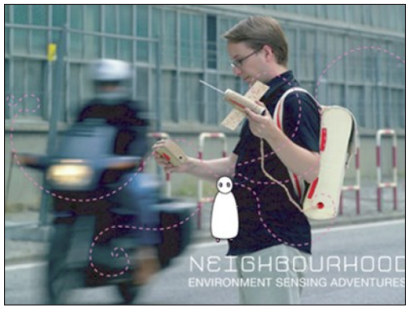
18. Finishing School: Delocator – Website
http://www.delocator.net/

19a. Christian Nold: Biomapping – Documentation
http://www.biomapping.net/

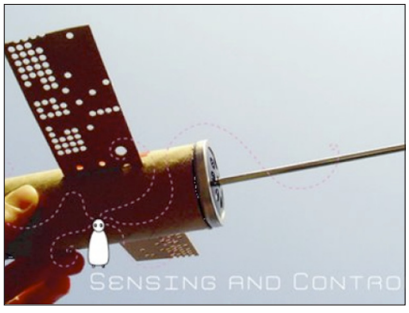


19b. Christian Nold: Biomapping – Screenshot

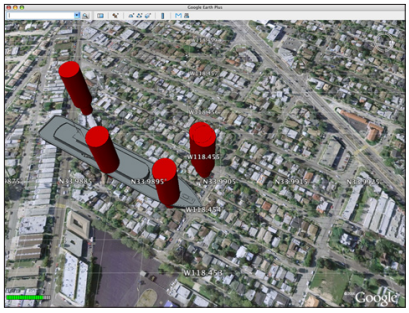
20a. M. Milicevic: Neighbourhood Satellites – Device



20b. M. Milicevic: Neighbourhood Satellites – Documentation



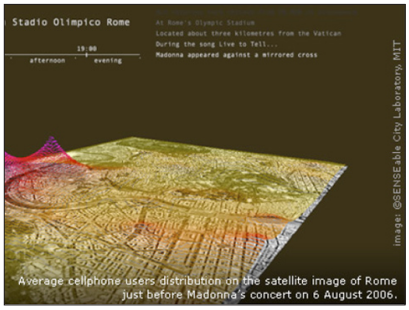
20c. M. Milicevic: Neighbourhood Satellites – Device
http://www.neighbourhoodsatellites.com



21. J. Bleecker: Battleship Google Earth – GE Mashup
http://research.techkwondo.com/index.php?p=240

22a. Beatriz da Costa: Pigeon-Blog
http://www.pigeonblog.mapyourcity.net

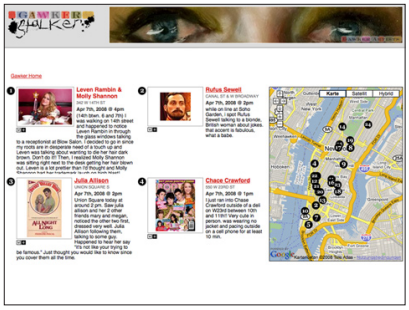
22b. Beatriz da Costa: Pigeon-Blog – Screenshot



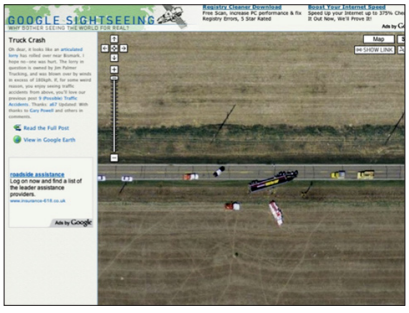
23. MIT: Real Time Rome
http://senseable.mit.edu/realtimerome/

Voyeurism

24. This camera is here for show. You feel safer when you think someone's watching out for you.



25. Gawker Stalker – Website
http://gawker.com/stalker/



26. Google Sightseeing – Website
http://googlesightseeing.com/

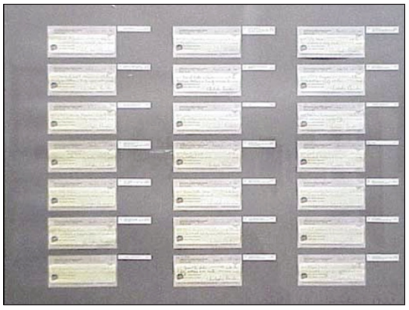
27. Paula Roush: Bowville
http://leoalmanac.org/gallery/locative/bowville/index.htm

Self-Voyeurism

28. Studio Troika: How do i look? – Device http://www.troika.uk.com/spying.htm

29. 01.ORG: Vopos – Website http://www.0100101110101101.org/home/vopos/

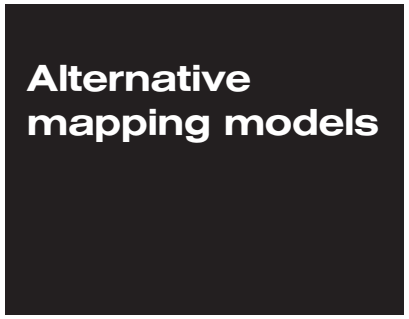
30. H. Elahi: Tracking Transience – Website http://trackingtransience.net/

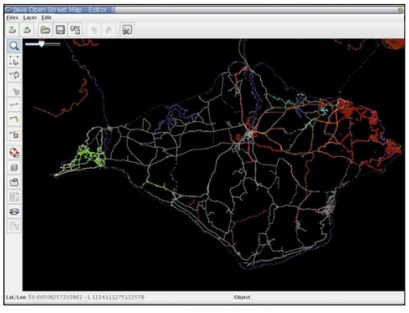


31. Chris Burden: Full Financial Disclosure http://www.janbaum.com/artistShowDetail.asp?itemID=245&firstname=Chris&lastname=Burden

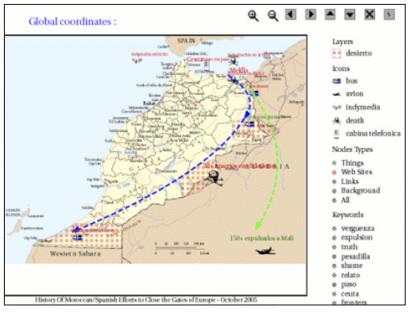
http://en.wikipedia.org/wiki/Sousveillance

32. IAA and Trevor Paglen: Terminal Air – Website http://www.appliedautonomy.com/terminalair/index.html





33. Open Street Maps http://www.openstreetmap.org



34. Hackitectura: MapOmatix http://mapomatix.sourceforge.net

When it gets a bit out of hands

35. Villager Gwilym Jones: “It’s easy to say they should have more common sense, but really if they don’t know the area they have no reason to doubt what the computer is telling them.
http://news.bbc.co.uk/1/hi/wales/north_west/5072450.stm

36. Bruce Sterling: We’ll have to wrangle with: (...)
brooms that bellow ads, mops that demand money; subtle software faults that make even a simple shovel unusable; unstable software; security flaws, hacking, theft, fraud, malware, vandalism and pranking; identity theft; Industrial hazards: spime kitchens that fry the unwary, spime cars that follow outdated software maps and drive right off broken bridges.
Bruce Sterling: When Blobjects rule the Earth

http://boingboing.net/images/blobjects.htm

Francis Hunger: A few comments on the success of Google Earth

„We are sorry, but we don't have imagery at this zoom level for this region. Try zooming out for a broader look." (Google Maps)

The origins of satellite imagery

The launch of the Sputnik Satellite by the Soviet Union, 50 years ago on October 4th, 1957 marks in my opinion the beginning of a technological development, which helped significantly to advance to a phenomenon, called globalization today. Since that, satellites offer broadband resources to send and receive data all around the globe, which contributes to the general acceleration of information flow. The use of satellites allows an acceleration of commodity circulation in the field of transport logistics and it also allows an acceleration of information exchange in the economic field. This at least marks my personal interest in the topic, because I think that relatively new technologies – like satellites, computers, internet, RFID and so on – support the ongoing change from a nationally oriented industrialized capitalism to a globally acting, transnational and post-fordistic capitalism.

We had a very interesting workshop on RFID technology here at PHOENIX Halle last year, which allowed us also to directly talk with engineers at Fraunhofer Institute Dortmund about what they understood as the practical problems of RFID technology, but for me the exchange with them was rather interesting on the meta-level of global logistics and circulation of commodities.

I already mentioned the first satellite, which had very limited capabilities. Sputnik was only able to send a radio signal that was receivable with normal radio receivers, but soon technology emerged, which had significantly more abilities. The secret satellite programs Corona (from 1960/ USA) and Zenit 2 (from 1962/ Soviet Union) delivered reconnaissance images for the first time taken from outer space and enabled a first estimation of the rivals' arsenal of nuclear and conventional weapons. Since 1972 the civil US Landsat-Satellites produce satellite images for scientific research. In the mid-1980s the French company SPOT and the Soviet Soyuzkarta began to offer satellite images for commercial applications.

Of the broad field of software, which combines satellite images with geo-data, I'd like to shortly mention the most familiar brands: Google Maps & Google Earth (since 2005), Microsoft's' Virtual Earth/ Windows Live Local (since 2005) and World Wind (since 2004), an open source software produced by NASA.[1] While Google Earth and Virtual Earth address a broad public, World Wind is intended for academic research. There is also the less popular software Argos by ESRI, which is used for scientific and commercial applications and for instance includes an interface to SAP, an important business application. The most popular at the moment is Google Earth, which I describe exemplarily in more detail. The major concepts are similar to Windows Live Local and partially also to World Wind and ArcGis. But we will see, that Google Earth as an embedded product shows also broader implications regarding, how people use the Internet and how they might use it in the future.

Academic research on the use of satellite imagery

To put the following into context I would like to shortly introduce academic criticism on the use of satellite images as developed by the Santa-Barbara/ California based professor for film studies Lisa Parks.[2] She shows on the example of satellite image use in the context of the July 1995 Srebrenica massacre, how the US-Military published satellite images in global new media, applying a media strategy, labeled as „information dominance". Through that it hoped to influence public opinion in favor of a military intervention. Although

1 Publication data for the software is somewhat blurred. Google Earth for instance is based on the forerunner software „Keyhole", produced by Keyhole Corp. and acquired by Google in 2004.

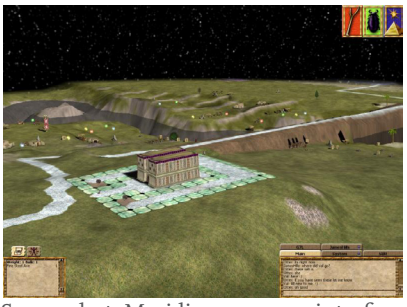
2 Parks, Lisa 2005: Cultures in Orbit. Duke University Press, London, 2005

Google Earth may produce a certain counterbalance – because civil right groups can use it for instance – being able to access up-to date image material for the military ensures the information dominance. Google Earth at the moment only provides public access to material reaching from several months to years ago.
Parks shows that the satellite images, which are constituted as omnipresent, up-to-date, distanced and objective (in the meaning of: giving an overview), match these attributes only partly. The images acquired by satellites didn't become relevant until related ground based reports by NGO und intelligence services, which operated in the region, emerged. Only then, the data archives were searched for relevant images, which then were presented through TV and newspapers in public. In addition to this, satellite images never totally cover a complete area during a time period, but only whilst an over flight of the satellite over a certain area, depending on the satellites' orbit. So there has to be already a military or publicly constituted interest in monitoring a region more closely, to appoint decent resources to cover the region and to analyze the imagery. Satellite images, comparable to video surveillance, cannot prevent atrocities but can rather be used for the investigation of a crime.
Parks puts the strategy of information dominance into a relation to the critical practice of witnessing, which tries to verify or falsify allegations on-site. She discusses exemplarily the on-site investigation of the Journalist David Rhode in August 1995 and her own visit in Srebrenica in 2001. „Perhaps the look of the witness can help to demilitarize the satellite image." (Parks 2005:103).
What I think is important in Park's research that she succeeds to de-mystify the alleged omnipresence of satellite imagery. But she also shows in the subsequent chapters of her book *Satellites in Orbit*, how satellite imagery transgresses our daily life, especially through mass media.

Google Earth Software

Origins

This software, originally named Keyhole Earth Viewer, provides satellites images and aerial photography in different resolutions. The imagery is combined with layers of geographical data, e.g. street names, train stations and so on. The displayed data is transferred on demand via Internet and the majority of the images – at least that's what Google says without giving much detail - is up to 3 years old.
Before co-founding Keyhole, John Hanke was responsible for the marketing of Meridian59, one of the first online 3D multiplayer games in 1996. Drawing on his experience in the computer game business he became the co-founder of Keyhole Inc in 2001 and now works as major developer of Google Earth. He says, that he drew his inspiration for the Keyhole Earth


Screenshot: Meridian 59 game interface


Screenshot: Keyhole Earth Viewer Interface

Viewer among others from Neil Stephenson's novel *Snow Crash* (1992). Stephenson describes a Metaverse, accessed through the software Earth, which in the fiction depicts "a perfectly detailed rendition of Planet Earth." Avi Bar-Zeev, another co-founder of Keyhole, worked for Linden Lab, the publisher of the 3-D online environment Second Live. He agrees that it was talked about Snow Crash but also gives much credit to Al Gores' Digital Earth initiative, which not just helped to open the internet for civil, commercial use but also aimed to make satellite images available to a civil public. Bar-Zeev says a bit pathetically in his blog: „This much is clear: without commercially available high-resolution satellite imagery, Google Earth would not exist. Without the open Internet, Google Earth (and this

blog and a bunch of other things we like) would not exist. And for that, we owe some thanks to Al Gore. So regardless of what you think of his politics, one of the clear motivations behind Google Earth was a shared desire to give people a vision of the Earth as a seamless whole and give them the tools to do something with that vision." [3]

The Journalist Even Ratliff described in 2007 how the forming process of the Keyhole company took place: „In 2003, echoing the Snow Crash plot, John Hanke signed a deal with the government venture arm In-Q-Tel (partially funded by the CIA) that put Earth Viewer in the hands of the National Geospatial-Intelligence Agency, the department that handles maps and satellite imagery for US military and intelligence units, and which remains one of Google Earth's largest customers. »At the time, what was on the globe was fairly lo-res, widely available commercial imagery,« says Gregg Black, director of the National Geospatial-Intelligence Agency's eGeoint Management Office. »But immediately we said, 'Wow, this is going to be powerful.'« Black loved how easy it was to use. »We could do these mashups and expose existing legacy data sources« — intelligence data overlaid on the latest hi-res satellite imagery — »in a matter of hours, rather than weeks, months, or years.«"[4]

It turns out, that the first large costumer in the US was the state-funded military and intelligence services. In my opinion it is another good example of how the US does state-subsidize emerging technology by channeling money through their military-industrial complex. It is the same scheme, which we saw with the development of the Global Positioning System and parts of the Internet (called ARPAnet). Usually liberal and neo-liberal ideology would not agree with state subsidized businesses, because it would distort the "free" market. But it seems that some of the most complex technologies, which were developed during the last 50 years, required state subsidization to actually make the translation from technology maturity to product maturity.

Basic Infrastructure

Google Earth makes use of a large set of satellite based images and geo-data (that is information about a certain location). Unfortunately there is only little information about the infrastructure publicly available. Where the servers are located? How does the database behind it look like? How is the data acquired and who decides about data acquisitions?

Mayor infrastructure servers used by Google Earth, which you can find by browsing information from the Internet, are found under the address: kh.google.com (209.85.137.95), geo.keyhole.com, auth.keyhole.com. These servers forward to a node, named AS15169, which is located at Google, 1600 Amphitheatre Parkway, Mountain View, CA–94043, US. This is only one location of many. Actually you can not exactly determine, in which locations the data is stored, it is distributed around data centers on a global scale.

Google created its own database solution called BigTable in addition to the use of SQL-databases. BigTable is able to address large data sets, which are distributed over Googles server clusters around the world.[5] In their article Bigtable: *A Distributed Storage System for Structured Data* Fay Chang and other Google engineers explain about the integration of Google Earth server structure and the BigTable database: „The serving system uses one table to index data stored in the Google File System. This table is relatively small (app. 500 Gb), but it must serve tens of thousands of queries per second per datacenter with low latency.

3 Avi-Bar Zeev: Notes on the origin of Google Earth. http://www.brownianemotion.org/2006/07/24/notes-on-the-origin-of-google-earth/, July 24, 2006, accessed June, 06, 2007

4 Evan Ratliff: Changing the way, we see the world. Wired Magazin no 15, Condé Nast, New York, 2007, http://www.wired.com/techbiz/it/magazine/15-07/, accessed June, 06, 2007

5 David F. Carr: How Google Works. In Baseline Magazine, Ziff-Davis, July 06, 2006 http://www.baselinemag.com/article2/0,1540,1985047,00.asp, accessed June, 06, 2007

As a result, this table is hosted across hundreds of tablet servers."[6] So here they say, that the image data and geo-data used for Google Earth and Google Maps covers about 500 Gb – in a talk, which was given in September 2005. This database consists only of the processed and ready to use image- and geo-data, which can be accessed in Google Earth. For the pre-processing they have another database ith raw data, which is the data acquired from NASA, Terratec, GeoEye and other companies, containing about 70 Terabyte of data (in 2005).

Image sources

It evokes the question, where the data that is used in Google Earth does stem from. I have to limit the answer to some major sources of the imagery, and at this time will not dive deeper into the origins of geo-data, which nevertheless is a very interesting and important question. NASA's Modis Aqua and Modis Terra satellites are used for daily updated imagery. They cover large regions of the earth on a daily basis, for satellite imaging but also for any other spectrum that can be recorded. They are used for images of up to 250 m resolution.[7]

Nasa's Landsat-7 is a major image producing satellite with a resolution of up to 15 m. It's imagery was used in 1999 to create one of the first complete mosaiced virtual earth views. In Google Earth, Landsat-7 imagery is visible, whenever you see the copyright of the Terrametrics company. Google Earth doesn't use Landsat-7 imagery directly, but Terrametrics acquires the raw image data from NASA, processes it, corrects mistakes, adds geo-data and then sells it.

Digital Globes' Quickbird-2 was launched in 2001 and delivers imagery in up to 2,5 m resolution.

GeoEye Inc. (Former Space Imaging Inc.) uses the Ikonos Satellite, which since 1999 delivers an imagery of up to 3,5 m resolution. GeoEye plans to launch a satellite called GeoEye-1 this year which shall allow to re-visit each point on earth latest within 3 days and which captures color images of a 1,65 m resolution.

These satellite image resources are completed through aerial photography that delivers a resolution of up to 3 cm. Aerial photography also is more flexible than the fixed orbit satellites and allows avoiding cloud cover, by flying below the clouds. Major producers in Germany are GeoContent GmbH and AeroWest GmbH (with Headquarters in Dortmund). To acquire and process aerial photography so that it can be used in commercial applications is a complicated, cost intensive process.

So what we you see, when you zoom in, can be either satellite images or aerial photography. Of course this high-resolution material does not exist for all areas of the world, or maybe it exists but is too expensive to obtain. Obviously this resembles the relation of the metropolitan and the periphery – socially and economically. In Central Europe and North America at the moment you have the best resolution of satellite imagery available in Google Earth.

This disproportion gets also visible for geo-data (city maps, place marks etc.), which at the moment only exist for the economical centers. Obviously Google works on filling up major gaps (like recently Moscow) and is also adding more languages and non-Latin characters.

Google Services and user generated input

There is a major amount of data and infrastructure originally provided by Google Earth: satellite imagery combined with geo-data, e.g. street names; driving directions; high resolution images of certain areas; selected availability of image data – so called "sensitive" (mostly military) locations are blurred; interface for Global Positioning System data import and export; Picasa (Google owned) geo-tagged image integration; 3D buildings at certain areas; APIs, that is a programmers term for interfaces that a software provides for interaction with other software, to

6 Fay Chang et. al.: Bigtable – A Distributed Storage System for Structured Data. OSDI'06: Seventh Symposium on Operating System Design and Implementation, Seattle, WA, November, 2006, http://labs.google.com/papers/bigtable-osdi06.pdf, accessed June, 06, 2007

7 resolution in m per pixel

integrate Google Maps with your own data and software solution. In Google Maps, the Web browser version of Google Earth some of these features do not exists but you get: additional content to use with Google Maps (you must log in to use this); code for including Google Maps in own website; Google street view[8]

Selected Availability: "Sensitive" Areas are pixelated or blurred, Soesterburg Airbase, Netherlands (http://maps.google.de/maps/mm?ie=UTF8&hl=de&ll=52.133857,5.276957&spn=0.025183,0.072184&t=h&z=14)

The possible intervention and interaction by users is limited to what the software allows and proposes, but still can be very complex. Place marks can be set and published and accessed by other users. The Keyhole Markup Language, which describes these place marks, is structured comparable to HTML, based on the XML standard. In addition to the location itself, it can also describe vector data (to draw lines), include images and 3D-shapes or refer to web pages and image overlays.

Depending on the version of software (Google Earth, Google Earth Plus, Google Earth Pro) you can also export movies or single images, or import and export GPS data. It is possible to use the copyrighted imagery and geo-data for private, non-commercial use under the condition, that the source must be mentioned.

Google however reacted allergic to developments originating from the open source community to de-code the data stream, which sends the satellite image data from the server to the client software. A Russian programmer was „convinced" by Google, without taking juridical action, to stop the public description of the Google Earth data stream and to discontinue his software project Gaia, an alternative data browser for Google Earth data. [9]

I think, that the model of user supplied content integration as applied by Google is very interesting and relevant to look at. In my opinion it is a contemporary, very smart model, how to exploit collective knowledge.

User-generated content creates value for Google; the total amount of information grows significantly and thus up-values the software. The frequency, with which a certain region is equipped by users with additional information, can be taken as a basic measure for the audiences' interests and for possible commercial applications. In-house synergies are created through combining Google Earth with Google Search and other services, especially the advertisement service Adwords/Adsense.

The basic user input consists of geo-tagged images, videos, panorama images, 3 D overlays which create a rich and locally based view on the world. Users add geo-data to the information layer, e.g. a system of tram stations in a city where not provided by Google. This locally based view of the user is especially important for Google, because Google aims to provide for the future, what they refer to as *the knowledge* of a certain local area

8 e.g. http://maps.google.com/maps?f=q&hl=en&geocode=&layer=c&ie=UTF8&ll=40.749679,-74.00249&spn=0.008518,0.01987&z=16&om=0&cbll=40.74772,-74.00631

9 http://gaia.serezhkin.com, accessed June, 06, 2007

or community, as it is common among taxi drivers. Michael T. Jones, chief technologist of Google Earth, Google Maps and Google Local Search explains the interest of Google in a specific location based knowledge:
„Consider the question, where is the IEEE corporate office? A Google Web search for »ieee corporate office« finds 1,050,000 matching documents in 0.12 second. Due to Google's PageRank, the first set of search results has the link to the IEEE's homepage. Exploring further yields the address as »3 Park Avenue, 17th Floor, New York, N.Y., 10016-5997 USA.« Thanks to Web document search, we have our answer in a fraction of a second— but how well do we understand it? Several addresses appear on the first page of the search results, with locations ranging from New Jersey to California and even Singapore. Seeing them refines our question and inspires further curiosity. Are any locations within reasonable driving distance of each other? How might we best navigate between them? What nearby businesses might be of interest? Moreover, how will we recognize the IEEE headquarters when we get there? Such understanding is known as *the knowledge* among London taxicab drivers, whose reverence for the term reflects its essential value in that occupation. The knowledge is what separates locals from visitors and ignorance of it makes the simplest trip an ordeal, so why should only locals and taxi drivers understand these things?"[10]
The importance of such a bottom-up knowledge, which has to be generated by the "taxi drivers" – in this case the Google Earth users – and not by the land registry office or any other official institution, is manifested in Google's submitted patent called *Determining Advertisements using user interest information and map-based location information*.[11]
„In particular, there is a need to allow businesses to better target their ads to a responsive audience. For example, it would be useful to determine ads relevant to locations of interest that may differ from an end user's location. [...] [The software may do] so by determining and using location information, such as a bounding area defined by a map, as well as information indicating a user interest (e.g., keywords from a search query, a category, a concept, a topic, document content, etc.), to determine ads. [...] The present invention may also use location information when determining a relevancy score of an ad. [...] »User information« may include user behavior information and/or user profile information. [...] »E-mail information« may include any information included in an e-mail (also referred to as »internal e-mail information«), information derivable from information included in the e-mail and/or information related to the e-mail, as well as extensions of such information (e.g., information derived from related information)."
A look into Google's privacy policy allows a further impression about how uses user-submitted information. It states, that Google can cross combine user account information, i.e. name, email address, credit card or other payment account information with "information from other Google services or third parties". Google further uses data like Internet Protocol address, browser type, browser language, date and time of a search request cookies that may uniquely identify the browser to combine it with information from Google's website outgoing trackable links.[12] So the general privacy policy, with which every user of Google services agrees by using it, provides a broad database, which can be combined with the user generated input. I think we see a completely new dimension here of how data can be collected, processed and capitalized.
It fits into this picture, that in addition to single user contributions, Google Earth also created a NGO outreach program, where NGOs are provided with Google Earth Pro Versions for free to "support their publicity work". I'm not sure if saving one or even ten Google Earth Pro licenses of $400 per year is a equivalent value for the data,

10 Michael T. Jones: Google's Geospatial Organizing Principle. In: IEEE Computer Graphics and Applications, v 27, no 4, July/August 2007, ISSN 0272-1716

11 Google Inc.: Determining Advertisements Using User Interest Information And Map-Based Location Information, filed on 21.6.07, patent application WO/2007/070358, pending, http://www.wipo.int/

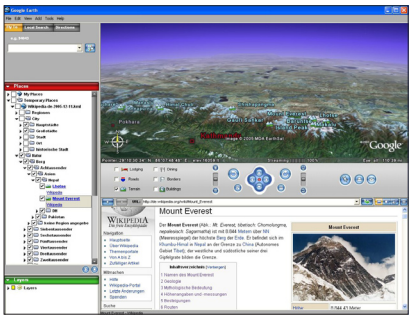
12 http://www.google.com/privacypolicy.html, accessed Oct, 10, 2007

which participating NGOs will enter into Googles' database. In fact NGOs are those legal bodies covering the specific kind of data and knowledge, which can be best compared to the taxi drivers knowledge (unlike for instance scientific, military, governmental and corporate bodies).

Capitalizing on the collected data

How is capital driven out of the user entered data? Google's' general terms of services[13] which also affect Google Earth and Google Map user interaction, may allow a glimpse into this question. Google states that you maintain the copyright for whatever you add. By simply adding a place mark, you give Google the irrevocable, worldwide, royalty-free license, to publish it – okay seems fair, they are paying for the infrastructure - to adapt or modify it and to make it available to other companies, organizations and individuals. And of course making it available also means earning revenue – for Google, but not for you. I think this is a very smart business model, which perfectly fits into a postfordistic scenario, and which significantly learned from the Cathedral and Bazar model of Eric Raymond. I cannot go into further detail here, but only little imagination is necessary, to understand the implications. Generally it can be said, that a formerly commonly available good – location knowledge – gets privatized, monetarized and restricted with licenses.

Some ideas about future uses



Screenshot: geo-browsing (KML overlay for GE by Stefan Kühn)

Apropos imagination – let's return to the question, why the development of Google Earth is so relevant for our present and future world view through speculating about possible future uses of Google Earth.

It can be combined with any other Google (and third party) services, where geo-localization makes sense. Compare localized stock photography to Microsoft's Corbis. What about geo-browsing[14] – using Google Earth to browse information in a spatial context, e.g. Wikipedia articles attached to certain places? Panoramio, which was acquired in May 2007 by Google, allows the inclusion of geo-tagged panoramas and images into Google Earth – why not sounds, moving images or any other digital data? The close relationship of Google Earth and the military was already mentioned. It is predictable, that surveillance technologies like unmanned, unarmed drones which are currently implemented in military forces and police, make much more sense if combined with geo-data from Google Earth and other sources.[15]

Let's further speculate about the use of Google maps on mobile devices and how it will change our overall spatial orientation.

The most recent version of the Keyhole Markup Language now allows linking between KML files and features searchable KML files, so the search finds keywords or tags in a KML file. Location based information ranking may lead to promoting „good" KML files and „good" local information and promises to reduce geo-spamming. A KML File that is saved on a particular server, can be constantly updated with up-to-date remote location information e.g. GPS data. This fixed server address can be accessed by users to find information about the current location of any object, or individual, that can send its own location information to the server – compare to Bruce Sterling's Spime: "The most important thing to know about Spimes is that they are precisely located in space and time. They have histories. They are recorded, tracked, inventoried, and always associated with a story. Spimes have identities,

13 http://www.google.com/accounts/TOS, accessed Oct, 10, 2007

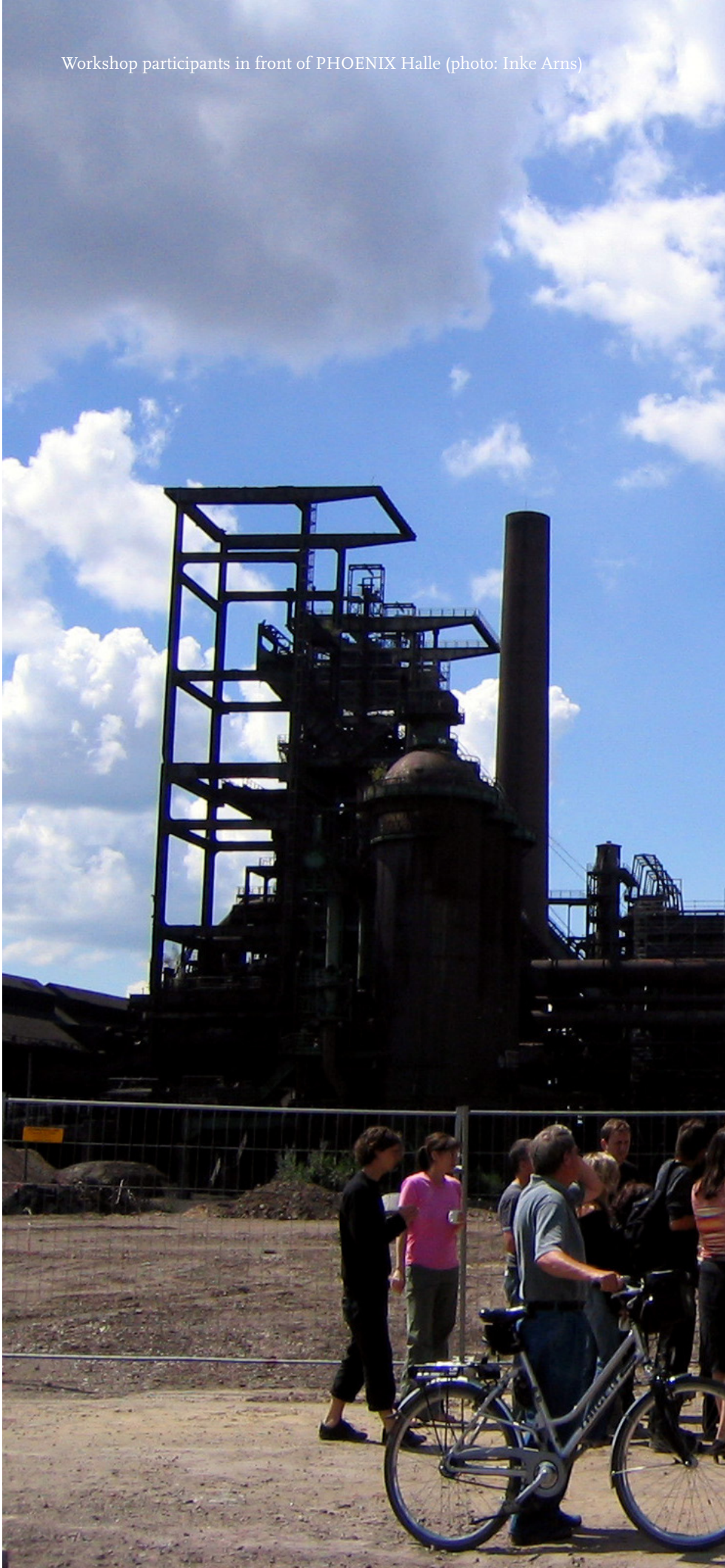
14 e.g. http://www.webkuehn.de/hobbys/wikipedia/geokoordinaten/index_en.htm

15 for example: http://www.youtube.com/watch?v=h28gTMCir7Q

they are protagonists of a documented process. They are searchable, like Google. You can think of Spimes as being auto-Googling objects."[16] Strategy games and simulations are possible with Google Earth – recall the origins of John Hanke in the Game business – but currently no major projects of Google are visible within this domain. Third parties however already developed mash-up games, so there is no reason why Google shouldn't acquire such a start-up if anything promising emerges.

Conclusion

The example of Google Earth software was chosen to exemplify the current changes in satellite imagery use. A closer examination of how geo location information is cross combined with other user provided data aimed to raise the general awareness regarding the capitalization of common knowledge. I tried to demonstrate how user generated knowledge from the public domain gets restricted and commercialized through licenses, a process which should be taken into consideration by media artists developing Google Earth based mapping projects. The alleged omnipresence and objectivity of satellite imagery needs further critical investigation.
A further investigation into how the extensive use of geo data and other data in relation to satellite imagery changes our social relations is pending.



Workshop participants in front of PHOENIX Halle (photo: Inke Arns)

16 Bruce Sterling 2004: How Blobjects Rule the Earth, Los Angeles, 2004, http://www.boingboing.net/images/blobjects.htm

www.hmkv.de
www.irmielin.org

28 Katherine Marmor: Bird Watching. An Introduction to Amateur Satellite Spotting

Space satellites are a potent symbol of the information age and their versatility makes them a compelling technology. Yet, satellites remain somewhat mysterious. Their invisibility puts them out of mind, but the data they collect and transmit in the form of images and communications greatly influence political, economic and social practices worldwide. Indeed, space satellites are often discussed as vital components of globalization. What is interesting about satellites, specifically remote sensing satellites, is the dialogue they initiate between the observer and the observed. This dialogue is often translated into a discourse about the manifestation of power in surveillance. Remote sensing satellites are also optical devices and as optical devices they shape visual perception and cognition. Thus, the dialogue between an observer and the observed is complicated by the interconnection between visual experience and perceptual understanding.

Even though we have access to both commercial and non-commercial products of satellites such as media broadcasting, weather maps or more recently, their images through internet applications like Google Earth; we are no closer to understanding how satellites work or how their data is interpreted. The scientific functions, sophisticated technology and the history of espionage keep satellites inaccessible to the layperson and perpetuate the idea that satellite images objectively document the earth and sky.

With these concerns in mind, I have created a multimedia installation called *Bird Watching* that represents remote sensing satellites as interactive homemade cardboard boxes. I use sound and interactivity in the installation as a means for determining location and representing the interconnection between local and global. *Bird Watching* engages the practice of satellite spotting to interrupt the transparency of satellite technology, thus making their relations to us apparent. The old equation that technology equals control has been supplanted by a new rhetoric that extols the democratization of technology and global transparency.

Bird Watching, Installation view (Photo: Kathy Marmor)

The politics of transparency

A combination of scientific and military aims has resulted in the production of over two thousand space satellites in orbit and the United States government funds more than half of them. Remote sensing satellites, which are the primary focus of this article, acquire information about the earth through electro-optical sensors. The data is then transmitted to ground stations where it is typically converted into a visual form for analysis. This process of synthetic imaging underscores the paradox of remote sensing: satellite images are often perceived as indexes of the earth and as such they are powerful legitimating tools; yet in the words of Lisa Parks, "the satellite's image's aesthetics of remoteness and abstraction make its status as a document of truth very uncertain and unstable".[1]

The history of remote sensing satellites reinforces the construct that a satellite image *is* the data transmitted from the

1 Lisa Parks: Cultures in Orbit. Satellites and the Televisual. Durham and London, Duke University Press, 2005, p. 84

satellite's instruments. The conversion of electromagnetic radiation into a visual form fuels the idea that satellites depict what they independently "see". The notion that satellites are capable of autonomous vision is embedded in the rhetoric that satellites render the earth and its atmosphere transparent. Here, transparency is defined as easy to see through or to see with clarity.

However, advances in satellite technology redefined the rhetoric of transparency. The convergence of digital media and the digitization of satellite data increases public and private access to satellite imagery. This new meaning of transparency offers the promise of shared power and responsibility.

I suggest that today global satellite surveillance by governments, corporations or NGOs is just a matter of fact, in contrast to the late 1950's when satellite surveillance was a closely guarded secret. It could be said that now satellite technology itself is transparent. The public sees satellites' extraordinary products but not its instrumentation. Transparency does not connote power the same way that surveillance does. It is a benign term and its meanings and connotations facilitate the public's acceptance of an overt surveillance that is remote and global in scope. Satellite images are virtual images. The complexity of the earth and its peoples is filtered through an assortment of sensors to produce a vast array of information. It is important to note that information is not the same as knowledge. As Nico Stehr states in Knowledge Politics, "knowledge is conduct".[2]

To have a complete understanding of a satellite image there must be both data and context. It is the filtering of data and the manipulation of the context that makes it easy to politicize the veracity of a satellite image. The Iraq's WMD clearly demonstrate this. In 2003 Colin Powell, then Secretary of State, addressed The U.N. Security Council about Iraq. During his presentation he stated "Let me say a word about satellite images before I show a couple. The photos that I am about to show you are sometimes hard for the average person to interpret, hard for me. The painstaking work of photo analysis takes experts with years and years of experience, pouring for hours and hours over light tables. But as I show you these images, I will try to capture and explain what they mean, what they indicate to our imagery specialists".[3]

He then proceeded to use the satellite photos as evidence that Saddam Hussein was moving banned materials from a number of Iraqi weapons of mass destruction facilities. These two examples, point out the opaqueness of satellite imagery and how their meanings are manipulated in the name of economics, and national security.

The visual imagery from remote sensing satellites is similar to that of medical imaging. Both are based on the premise that to see through something is to uncover the truth - a truth provided through expert analysis. The idea that truth is a universal fixed phenomenon is given more validity than the notion that the process of analysis and interpretation, measuring and categorization gives meaning to what is seen. Transparency, I argue, is a cognitive construct that teaches one *how* to see.

Optical technologies and visual perception

In this way, remote sensing satellites are like other optical devices. For Descartes, the telescope perfectly described the relationship between visual experience and cognition. The image perceived through the telescope was a sensory illusion created through light, mirrors and lenses that required the mind to make sense of it. Thus, vision could not be equated with knowledge. Ac-

2 Nico Stehr: Knowledge Politics Governing The Consequences of Science and Technology. Boulder, CO. Paradigm Publishers, 2005, p. 35

3 Colin Powell: U.S. Secretary of State Colin Powell Addresses the U.N. Security Council. The White House, February 2003, Transcript, http://www.whitehouse.gov/news/releases/2003/02/20030205-1.html

cording to Descartes, vision was technical and knowledge was acquired through a consciousness of self and the certainty of God. This model emphasized the individual as a subject separate and distinct from the physical world. Descartes' view was reified by the camera obscura until new physiological studies indicated that the body was the site of visual production. Simultaneously, new optical apparatuses such as the stereoscope were developed that physically incorporated the viewer into the machine itself.[4] Incorporating the body as the site of visual perceptivity collapsed the distinctions between inner and outer worlds. This helped to establish vision as subjective and temporal and enabled the observer to partake in the processes of modernization.

According to Paul Virilio, vision is a variable of space and time that has been affected by what he describes as the phenomenon of acceleration. He claims that the telescoping lens of the optical device replaces the human body as the basis of vision. Thus, optical devices reconfigure vision by delocalizing it and when vision is severed from the body it can be institutionalized within a machine. The computer's unification of the factual and the virtual is the foundation for synthetic vision, and automated perception. Computer graphics represent a "paradoxical logic…when the real time image dominates over the thing represented, real time prevailing over real space, virtuality dominating actuality …".[5] This is particularly true of remote sensing satellites. Their real-time systems provide a continuous view of the present and the possibility of foreseeing the future. It is this ability to both prevent and predict that makes the satellite useful as a restraint.

Satellites are but one of many digital and global communication technologies, privately and publicly owned, whose capacity for image production, reproduction and dissemination enable a constant stream of visual material to enter the public realm. However, public access to scientific representations does not make scientific knowledge more available. In fact, global technologies bring people "together long distance around standardized opinions and behaviors".[6] Hence, the very technologies that produce and distribute communications also provide a conduit for surveillance between peoples.

A creative tactical response: amateurism

As producers of culture, contemporary artists grapple with the issue of visual saturation and homogenization of meaning in society. These artists, like the Dadaists and the Situationists before them, are responding to specific social, political and economic conditions. Art collectives like The Institute for Applied Autonomy, Critical Art Ensemble and the biotech hobbyists, Natalie Jeremijenko & Eugene Thacker and individual artists such as Marko Peljhan, Steven Holloway and myself implement a variety of tactics that expand upon the Situationists' "detourne", (appropriating and rearranging cultural signs to create new meaning) and "derive" (a merging of psychology and geography – to drift without a goal)[7] or define new strategies such as "amateurism: a willingness to try anything".[8]

The amateur's approach – a shared interest, a willingness to try, and genuine curiosity, has influenced the content and methodology I employ in my artistic practice. My installation *Bird Watching* consists of flock of cardboard "boxes" whose elongated flaps resemble the wings of birds and the solar panels of space satellites. Each homemade satellite houses an

4 Jonathan Crary: Modernizing Vision. In: Steve Yates (ed.): Poetics of Space, a Critical Photographic Anthology. Albuquerque, New Mexico, University of New Mexico Press, 1995, p. 85-97

5 Paul Virilio: The Vision Machine. Bloomington, Indianapolis Indiana University Press, 1994, p. 63

6 Paul Virilio: The Vision Machine. Bloomington, Indianapolis Indiana University Press, 1994, p. 65

7 Nato Thompson: Trespassing Relevance. In: Nato Thompson and Gregory Sholette (eds): The Interventionists. Exhibition catalog, Massachusetts Museum of Contemporary Art, North Adams/ Cambridge, MIT Press 2004, p. 16

8 Ryan Griffis: Tandom Surfing the Third Wave. Critical Art Ensemble and Tactical Media Production. In: Lumpen newsletter, #81 February 2001, http://www.lumpen.com/magazine/81/critical_art_ensemble.shtml, last accessed 2001

audio speaker and inexpensive proximity sensors. My choice of materials reflects my belief that approaching science and technology with a do–it–yourself mentality interrupts passive consumerism and acquiescence to authority.

The usual definition of an amateur is a person who pursues an interest without pay. However amateurism is not merely acquiring information or appropriating concepts and skills; it is what

AMSAT (Radio Amateur Satellite Corporation) represents: a diligent commitment to the "politics of knowledge": "knowledge is the capacity for action. Knowledge is conceptual doing".[9] For the amateur, the acquisition of knowledge requires an investigative stance that results in an act of communal discovery.

I thought I could unpack satellites as instruments of power by demystifying them. I had no idea how many different types of satellites there were and how varied their payloads. This made it difficult to get an accurate historical overview and as a nonscientist the obscure technical information and dry scientific writing stymied me. I found the websites created by satellite aficionados both amateur and professional very useful and full of practical information including how to track satellites, communicated with them, and decode their telemetry. I even discovered that I could hear data transmissions from satellites on a hand held radio receiver.

This piece of information became an integral component of Bird Watching. In the installation hearing displaces the dominance of sight to describe the interchange between the local and the global. The radio scanner emits a low continuous hum until it detects a satellite. The scanner then broadcasts the intercepted space satellite's telemetry through the audio speakers of my satellites. Thus, a distant foreign sound becomes local and personal. Sound also entices the viewer to physically interact with my cardboard satellites. Each bird (satellite) is embedded with proximity sensors that respond to the viewer's distance and when a sensor is triggered the computer plays a recorded sound. If a person is close to the sensors then the sound is like a chirping bird but the sound becomes more comprehensible as the viewer moves away from the sensor. At a certain distance the sound becomes distinctly human, thus referencing the local and immediate. The pre-recorded sound of a woman crying or children laughing recalls the satellite's ability to sense human presence. The sound of the scanner's hum establishes a spatial reference point and the sound from the sensors emphasizes the relationship between the body's geography and the installation space. When combined with the sound from a

Kathy Marmor and Joanna Griffin (Photo: Inke Arns)

9 Nico Stehr: Knowledge Politics. Governing The Consequences of Science and Technology. Boulder, CO. Paradigm Publishers, 2005, p. 35

satellite passing overheard this cacophony of sound creates an environment that situates the human body in a specific place.
Amateurism represents an opportunity to understand the principles that define a discipline whose knowledge is often under the providence of experts. I willingly immerse myself in these "closed" systems of knowledge to educate myself and use this education as a source of action. Amateurs must be willing to put their awareness into practice and I suggest that such practice produces new forms of knowledge. For instance I learned how satellite's sensors worked and this information became knowledge as I devised the installation's interactivity Foucault suggested, "that power produces knowledge…"[10].
Surveillance and the power it implies are masked by the supposed benefits of transparency. The ideology of transparency constructs surveillance as a necessary function of satellites.
In *Bird Watching*, satellites and the practice of observation are employed to explore the interconnection between power and knowledge. Power in my installation is perceived as complex overlapping networks that engage individuals, technology, and culture as different but supporting mechanisms. Knowledge creates, sustains and transforms these mechanisms. Once viewers discover that my satellites are interactive they become enthusiastic participants who soon control the sound. Here, sound defines an exchange of power. However, participants soon realize that the satellites are also monitoring their interactions. The sensors embedded in the "birds" track the participant's movement and this data is projected back in real time into the installation space. This visual map makes participants more wary of their interactions with the boxes. The interplay of power between the boxes and participants mirrors the dynamics between actual space satellites and the installation itself.
I use satellite tracking software that announces the times and orbits of satellites passing near by. This automated voice and the ensuing live telemetry inverts the usual relationship of an invisible satellite watching us to one where the audience is anticipating the satellite's presence. Anticipating the satellite echoes the watchfulness of an amateur satellite enthusiast. "To watch carries with it the connotation of a scrutiny… To watch is to look for something that is not immediately apparent".[11] Thus, *Bird Watching* asks the participant/viewer to be fully conscious of the power dynamic between the observer and observed and by acknowledging this power relationship my installation seeks to disrupt it.

I suggest that it is a combination of watchfulness and knowledge that politicizes transparency so that it is not a directive for uncovering truth. Instead, transparency is the act of implementing knowledge. Google Earth's layers of Global Awareness provide invaluable information but it is the citizen who watches and acts on their knowledge that models reality or as the artists Natalie Jeremijenko & Eugene Thacker note, democracies depend on transparency.[12]

Art as agency and action

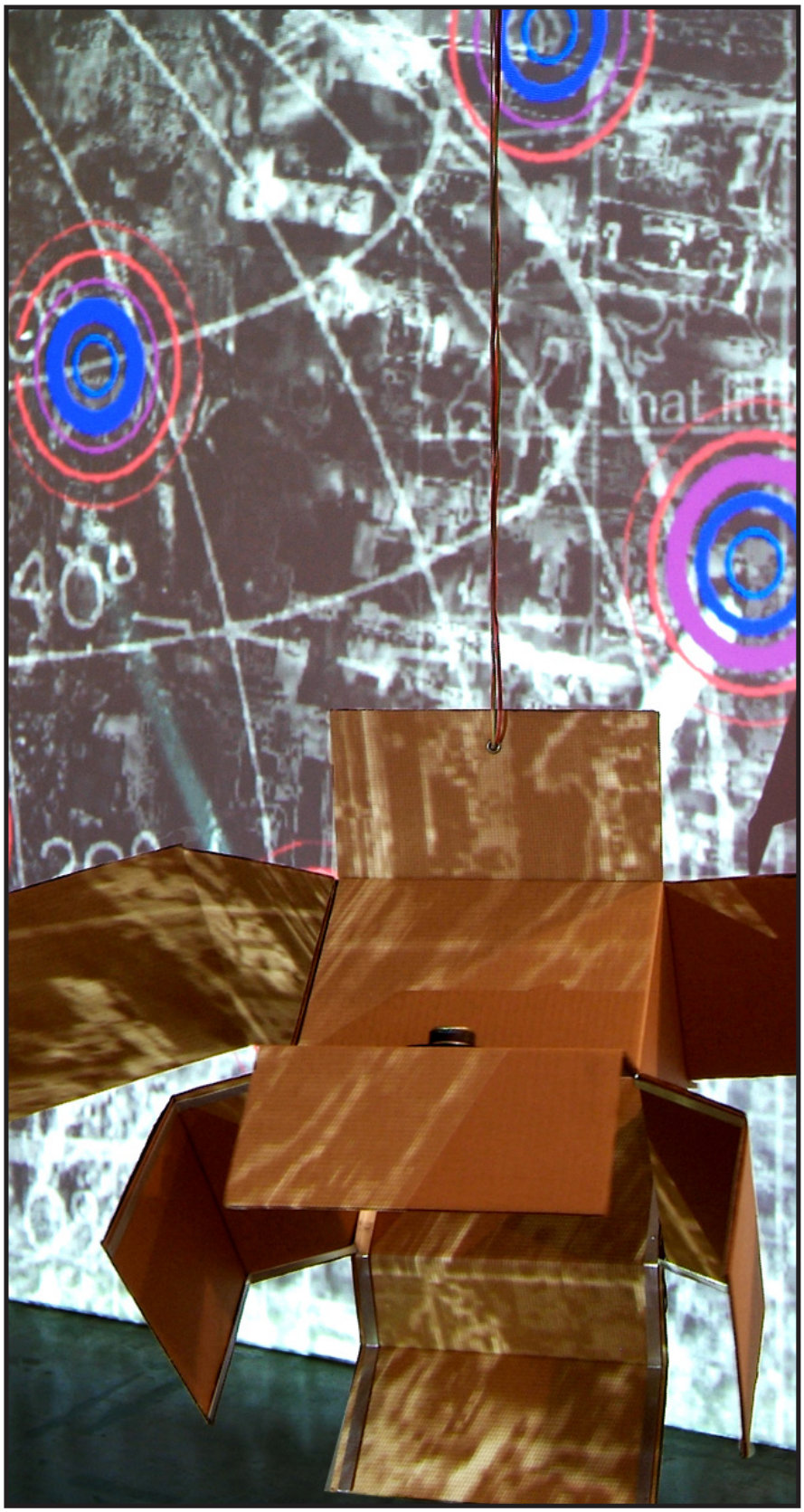
Remote sensing satellites have historically been used as instruments of surveillance because of their ability to transmit data about the earth to ground stations at regular intervals in real time. A variety of interests, corporate and state invest in satellite technology for the global transparency they provide. Today, the sky does not belong to one supreme observer instead satellite imagery makes the earth available to all. Political treaties such as the Convention on the Registration of Space Objects Launched into Outer Space (1976) or the Open Skies treaty (2002) for aerial observation plus worldwide advances in telecommunications of-

10 Alan Sheridan: Michel Foucault: the Will to Truth. London, UK, Tavistock Publications LTD, 1980, p. 138

11 Weber Sam: Mass Mediauras – Form, Technics, Media. Stanford, California, Stanford University Press, 1996. Quoted In: Lisa Parks: Cultures in Orbit – Satellites and the Televisual. Durham and London, Duke University Press, 2005, p. 102

12 Natalie Jeremijenko and Eugene Thacker: Amateurity and Biotechnology. In: Creative Biology – a User's Manual. 2004, Locus+, http://www.locusplus.org.uk, last accessed 2006

fer greater transparency. Here, the term transparency implies openness but it also describes a way of looking. Satellite images are thought of as objective documents, which reveal truth. Transparency on the other hand also implies accountability, and accountability is impossible without knowledge. Knowing something doesn't necessarily lead to the ability to affect the situation even though knowledge and power is often perceived as interrelated. If knowledge is the capacity for action then there must also exist power – "the control over some of the circumstances of action".[13] When these two conditions are met, then there exists the possibility of agency.



13 Nico Stehr: Knowledge Politics. Governing The Consequences of Science and Technology. Boulder, CO. Paradigm Publishers, 2005, p. 25, p. 35

34 Martin Heckmann: sat.land

Interview by Michal Hoge for www.defekt.cz January 2008

How did you strike concept or idea about sat.land film?

It was during the second gulf war, that more and more satellite images appeared in the media. Mainly from weapon facilities in Iraq or disaster areas after the tsunami. I was fascinated by the nature of these images: they are abstract in one way and documents of reality in another way. The perspective is sublime. Like "god contemplating his work", and also like a child's view on a sandbox. And I was alienated about myself: to look from an aesthetic point of view on these documents of suffering. So I decided to work something out that reflects these different layers of reception.

Was it difficult for you to get the satellites shots?

The images in the beginning of the movie are from NASA's Landsat and they completely free to download for everyone: http://landcover.org The resolution is 1px=30m, so you won't see any cars or smaller buildings. The images later in the movie (from villages and cityscapes) are commercial (=expensive) high resolution images from the Quickbird satellite. The resolution is 1px=0,6m. I worked out an agreement with the company distributing those pictures in Germany. They received other satellite image animations from me for their presentations at fairs.

How often do you use animation in the sat.land film?

The whole film is animated. There is a base layer of images from different parts of the world, stitched together and then animated to one seamless flight. As soon as villages and roads appear I animated cars on the roads and some airplanes in the air.

Why did you choose these concrete locations?

Because they are connected by the "war against terror" anyway. And the place where the satellite crashes is the house of my parents in a suburb of Hamburg. So the big world out there is connected with my small world also!

Can you say something about the sound scape in this film?

The Belgian musician Yves De Mey did the sound for this film. http://eavsilence.blogspot.com It is done in Dolby Digital Surround and Yves derived most of the complex electronic sounds from some simple guitar chords. The idea was to have an atmosphere where you can't say of which origin the sounds are. And to develop the sound like the film does: from very pure and simple desert landscapes to complex and chaotic city structures. Until the crash.

Do you think that there is the danger at this time of Orwell / Big Brother is still watching you?

I must admit: I am ambivalent in this matter. On one hand I see the dangers of surveillance and the technical evolution in general but on the other hand I do love machines! And I like satellite images... But as the satellite crashes at the end of sat.land movie, I believe that all those machines are always imperfect. We love and we fear the idea of perfection but we won't get there. Ikarus never reaches the sun but crashes in the end.

(The reprint of this interview appears with kind permission of defekt.cz)

38 Marc Böhlen: Automating Little Nighttime Obsessions – satellite spotting for the amateur

a cookbook to get you started

I am but a casual astronomy aficionado and I assume you are as well. Checking the night sky for satellite passings requires a few things we usually take for granted: clear skies and good weather, knowing exactly where you are on the planet and knowing exactly what time it is. If you like to watch satellites in the city then your life gets a bit more difficult as you need to find a dark corner with no street lights.

Some very bright satellites can be found without any optical gear. Most require at least a pair of binoculars. I have a good but utterly hobbyist telescope (LX200gps, 8in aperture). It is not small but easily fits with the tripod, my dog and some gear into a Volkswagen beetle.

Automating the viewing requires a camera to capture the images and a computer to control everything. Surprisingly, you can get away with rather cheap cameras. I have two. A $100 camera in a plastic housing and a $300 firewire camera that is enjoyably more sensitive to the light in the sky. You have to mount the camera(s) to the telescope through either the viewfinder to make use of the amplification of the telescope or on top of the telescope if you have a separate lens for the camera.

I usually put the cheap camera on the viewfinder of the telescope and use the better camera in piggyback mount on the telescope with a variable zoom lens (30 to 70 mm). This is best for suboptimal viewing conditions as when the sky is a cloudy and light pollution is present. Both cameras are based on the IEEE1394 IIDC or DCAM specifications. That means they deliver raw, uncompressed digital data that you can process any way you wish.

Most any old computer will do. A laptop is preferable if you work out in the field. The computer code is cross platform (it works on linux and windows). It can be ported to Mac, by you without too much effort if you know your way around the Apple system.

You will need to have access to the internet to get the exact time and sync your computer. Also, you need to find your GPS location. Finally, you need to download the satellite trajectory data (TLE files) used to calculate the position of a particular satellite at a particular time (seen from a particular location on the earth). Most of this is done by the startup routine included in the code.

The control and processing software is open source. I wrote a collection of telescope control algorithms, image capture and processing routines in python that make use of the astronomy package Xephem (by Elwood Downey) in its python cast (pyephem by Brandon Rhodes). All the computer code is available on the same site you found this introductory document. All relevant online resources are listed below.

Software

python with pyephem, pyserial, scipy, opencv and customized algorithms (satellite trajectory data fetch from the web, position calculation, mathematical functions, telescope control, image capture and processing).

Online Resources

- ubuntu | http://www.ubuntu.com
- python | www.python.org
- pyephem | http://rhodesmill.org/pyephem/
- scipy | www.scipy.org
- matplotlib | http://matplotlib.sourceforge.net
- opencv | http://www.intel.com/technology/computing/opencv/
- unconventional imaging | http://www.megastronomy.150m.com/New-QCUIAG/
- LX200 command set | http://www.meade.com/support/CommandSet.html
- NORAD elements/ TLE files http://celestrak.com/NORAD/elements/ | http://www.space-track.org/perl/login.pl
- exact time | http://www.time-anddate.com/worldclock/ | http://www.pool.ntp.org/
- satellite pass times, local coordinates, general astronomy | www.calsky.com

- satellite trajectories | http://groundstation.sourceforge.net/gpredict (visual paths) | http://www.heavens-above.com
- high end satellite tracking | http://www.astrospider.com

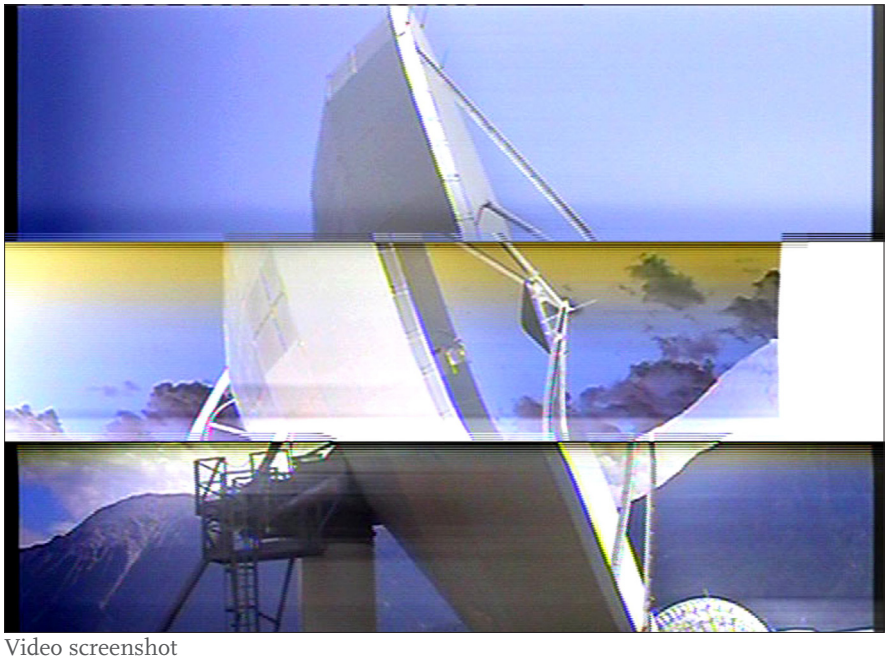
Hardware

- LX200gps or similar with microprocessor and serial-usb interface,
- unibrain fire-i or imaging source DMK 21AU04.AS camera (both b/w as the single band ccd is more light sensitive),
- laptop computer (old pentium 3) with linux (ubuntu) or windows (xp),
- 12V lawn mower battery, battery charger
- 12V to 110V converter
- compass, flashlight, cables and connectors

Marc Böhlen (Photo: Inke Arns)

40 Manuel Schmalstieg: ONYX.0+33

In 1999, the swiss population was informed of the existence of the ONYX project – a spying programme instigated by the swiss secret services, whose task is to scan and analyse international satellite traffic (e-mail, fax and telephone communications).
The results of N3KROZOFT's investigation into this national surveillance project where presented to a wide audience through a series of video and sound installations.



Video screenshot

Background

"Onyx is a Swiss intelligence gathering system. It is similar in concept to the American ECHELON system, but at a much smaller scale. The costs of the system are not public, but the number of 100 million Swiss francs has been mentioned several times, in particular in 2000 by Werner Marti, SP deputy to the National Council of Switzerland.
The Onyx system was launched in 2000, originally under the name SATOS-3, and was completed in late 2005. Two new antennas will be installed in Leuk in 2006, for a total of four antennas at this site.
The goal of the system is to monitor both civil and military communications, such as telephone, fax or Internet traffic, carried by satellite. In a way similar to ECHELON, Onyx uses lists of keywords to filter the intercepted content for information of interest, and the choice of keywords by the intelligence community must be approved by an independent commission. The system is not supposed to monitor internal communications; however, the monitoring of a communication between a person in Switzerland and someone in another country is allowed. The Swiss Federal Council has indicated that Onyx is not linked to other foreign systems such as ECHELON; according to the Council, the confusion and rumours about this issue are due to the sale by Swisscom to Verestar (now SES Americom) of the ground satellite communication station of Leuk (next to the Onyx site) in 2000."

Government Information

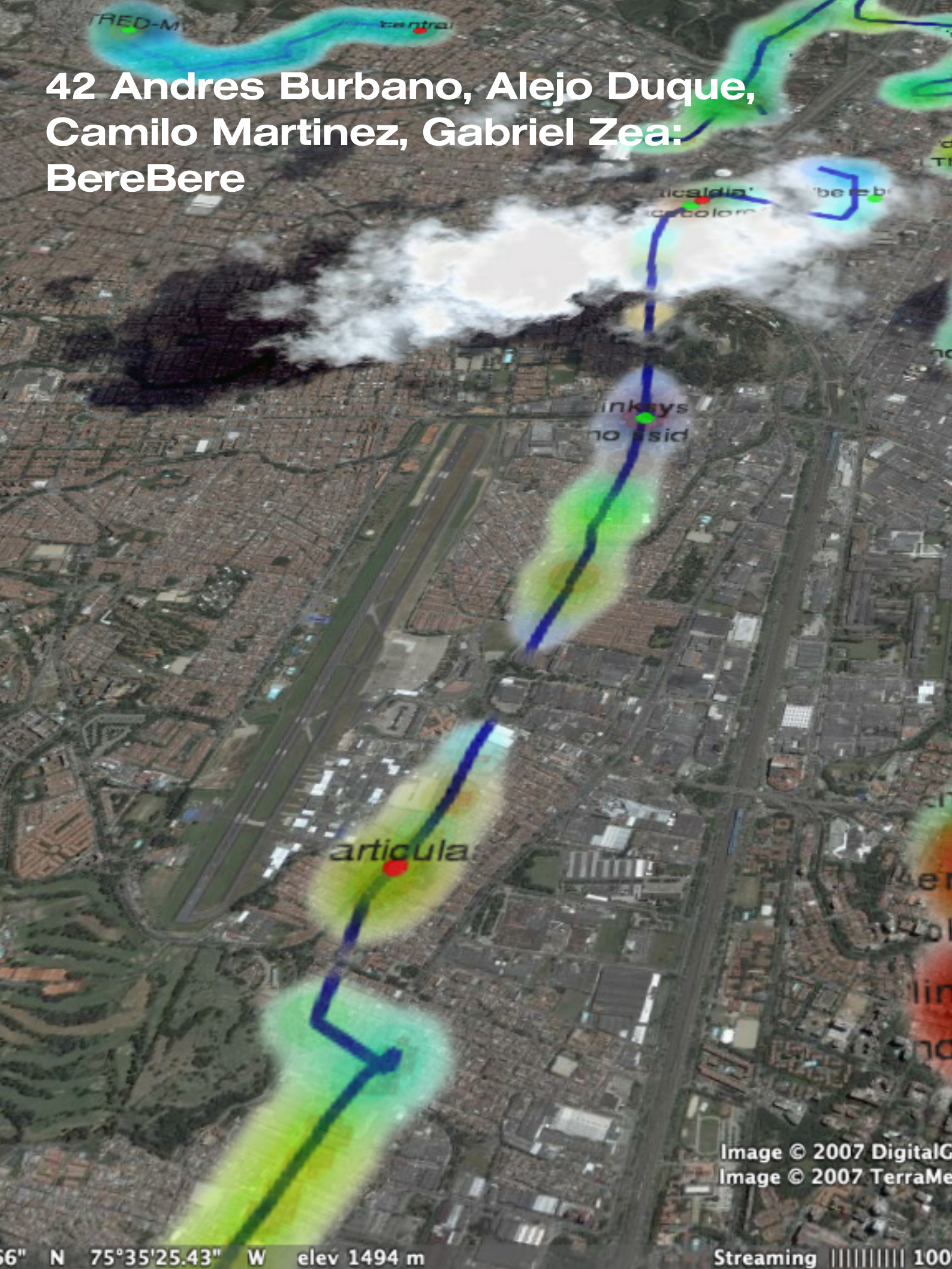
"Onyx was launched in April 2000 and currently functions in an experimental mode. It will enter its operational phase during 2004 and will be truely functional in the end of 2005/ beginning of 2006. By then, the number of antennas must be doubled."
"Besides some minor discussions, the Onyx project was never submitted to political debate at the Parliament regarding its opportunity and its financing. The investments, spread out over several years, were carried out while resorting to various different budgetary categories without the Parliament never receiving an overall picture of the total costs of the project."
(Raport de la Délégation 2003)

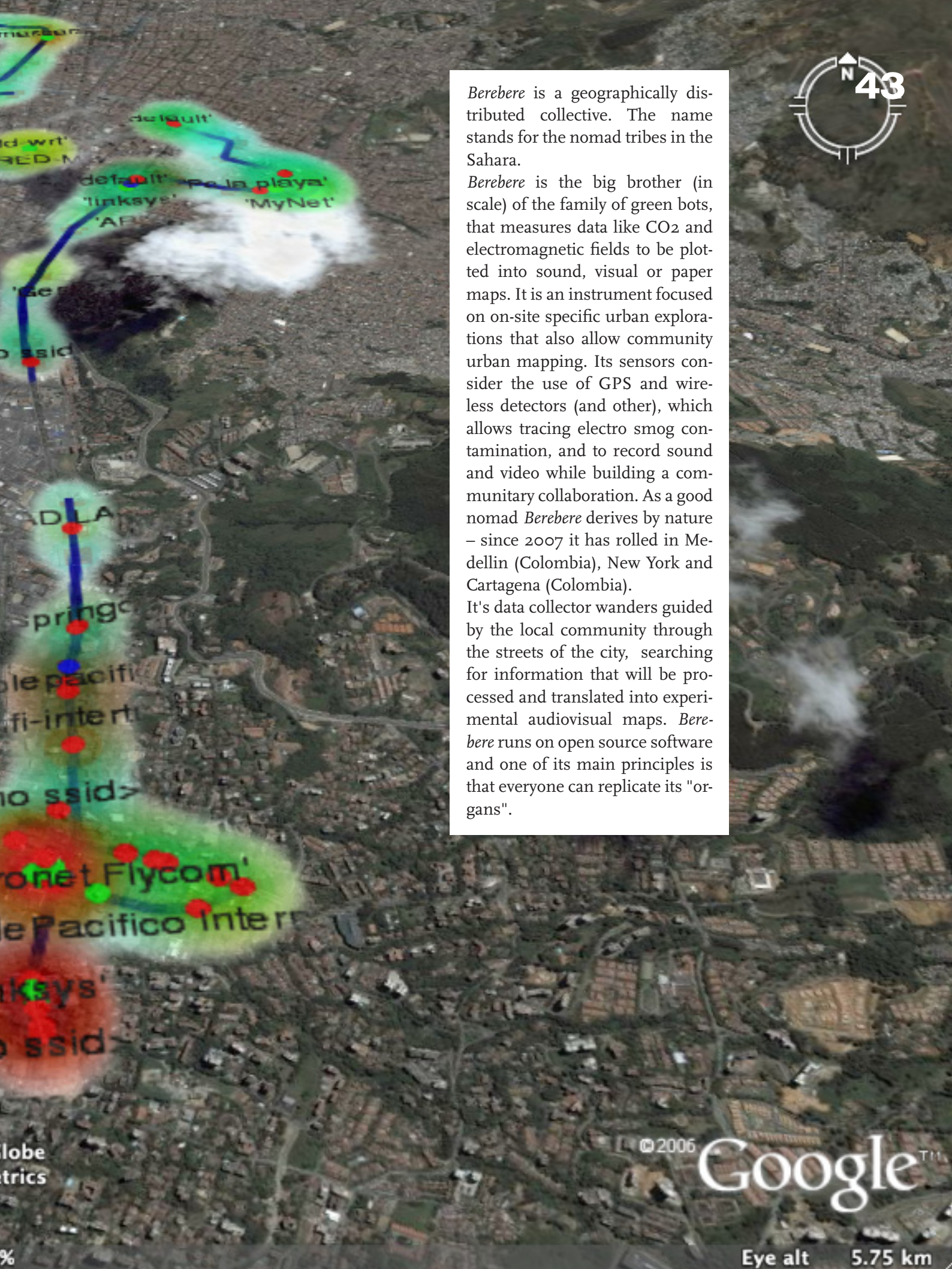
Bibliography

Rapport de la Délégation des Commissions de gestion des Chambres fédérales 2003: Système d'interception des communications par satellite du Département fédéral de la défense, (projet «Onyx»)", http://www.parlament.ch/f/ed-pa-gpd-onyx-d.pdf (french)

Daniel de Roulet: "Double. Un rapport", Canevas Editeur, St-Imier/Frasne 1998

Andres Burbano, Alejo Duque, Camilo Martinez, Gabriel Zea: BereBere


42 Andres Burbano, Alejo Duque,
Camilo Martinez, Gabriel Zea:
BereBere
Image © 2007 DigitalG
Image © 2007 TerraMe
Streaming



Berebere is a geographically distributed collective. The name stands for the nomad tribes in the Sahara.

Berebere is the big brother (in scale) of the family of green bots, that measures data like CO_2 and electromagnetic fields to be plotted into sound, visual or paper maps. It is an instrument focused on on-site specific urban explorations that also allow community urban mapping. Its sensors consider the use of GPS and wireless detectors (and other), which allows tracing electro smog contamination, and to record sound and video while building a communitary collaboration. As a good nomad *Berebere* derives by nature – since 2007 it has rolled in Medellin (Colombia), New York and Cartagena (Colombia).

It's data collector wanders guided by the local community through the streets of the city, searching for information that will be processed and translated into experimental audiovisual maps. *Berebere* runs on open source software and one of its main principles is that everyone can replicate its "organs".

44 Lecturers' and participants' CVs

Dr. Susanne Ackers (*1962, Goch/Kleve)

1992 M.A. in art history and philosophy from the Freie Universität in Berlin. 2006 Ph.D. about Charlotte Davies at the Hochschule für Bildende Kunst in Braunschweig, Prof. Hannes Böhringer. Based in Berlin since 1985, involved in art exhibitions and art projects featuring video and electronic arts, including the Old Boys Network. 1996-1998 Senior Lecturer at the University of Skövde, Sweden, reading of the history of art under the pretext of a history of electronic arts. 2001-2003 Research associate and deputy director at the ZKM Institute for Visual Media in Karlsruhe. Managing Director of Hartware MedienKunstVerein Dortmund since 2005.
http://www.hmkv.de

Dr. Inke Arns (*1968, Duisdorf/Bonn)

since 2005 artistic director of Hartware MedienKunstVerein Dortmund (www.hmkv.de); 1988-1996 studied Slavistics, Eastern European studies, political science and art history in Berlin and Amsterdam; 2004 PhD (Dr. phil.) at Humboldt University Berlin. Since 1993 independent curator and author focussing on media art, net cultures and Eastern Europe. Her curatorial work includes international exhibitions, festivals and conferences. She published numerous books and articles on media art and net culture and edited numerous exhibition catalogues. She has taught and lectured internationally.
http://www.inkearns.de, http://www.hmkv.de

Andreas Bär (*1966, Stuttgart)

lives and works as artist and curator in Stuttgart, Germany. Various group- and solo exhibitions in Germany, France, Sweden, Great Britain, Norway, Russia and United States.
Grants: Kunststiftung Baden-Württemberg (2003), Cité Internationale des Arts Paris (2005).
His work is based in a conceptual approach. He basically addresses issues from outside of the art domain (e.g. investigating medial, scientific, social relations), which entangle with issues from inside the art domain. The formal realisation depends on the individual topic, using different media. Some of these are long-term projects, e.g. „Ein Beitrag zur Geranienvermeidung", the biker club „MC o.T.", or the radio program „BÄR ON AIR". Works are presented either in public space or in exhibition spaces.

Matthew Biederman

(*1972, Chicago Heights, USA)
Lives and works in Montreal. He formulates his work through exhibitions, artistic residencies and performances as both an individual artist and collaboratively. His work has been shown at various venues at home and abroad since 1998. He recently has established the Institute of Spectral Ecology, an international group devoted to research and development of the electromagnetic spectrum. He also collaborates on a number of audio-visual performances exposing the spectrum such as SPEKTR (Ars Electronica 2007), and SCATTER! (AV Festival 2008). As an individual he recently attempted to bid on the US 700MHz spectrum auction, hoping to wrest a small slice for artistic research out of corporate hands. 2008 also marks the premiere of the I.S.E. as a public node in Montreal as part of DARE-DARE.org and Oboro.net's programming consisting of public interventions throughout the city.
http://www.mbiederman.com

Marc Böhlen

(*1962, Bern)
is a trained stone mason, an art historian and a robotics engineer. He designs, builds and reflects on systems, situations and machines that query the role of automation in the 21'st century. Böhlen's practice is tightly coupled to robotics research in methodology and succinctly different from it in scope and critical focus; an ongoing effort to diversify machine culture. A winner of the VIDA/ALIVE competition in 2004, his work has been shown internationally over the

last years. His most recent publication, /More Robots with Bad Accents; Living with Synthetic Speech/ will appear in June with Leonardo/MIT Press. Böhlen is currently associate professor in the department of Media Study at the University at Buffalo and Visiting Artist at the AILAB of the University of Zürich.
http://www.realtechsupport.org

Régine Debatty

writes about the intersection between art, design and technology on her blog we-make-money-not-art.com as well as on design and art magazines. She also curates art shows and speaks at conferences and festivals about the way artists, hackers and interaction designers (mis)use technology.
http://www.we-make-money-not-art.com

Alejandro Duque

(*1970, Medellin)
dwelling the „politics of friendship" to draft the rough guideline of the mindset strategies behind smuggling goods and ideas. Since year 2004 I'm a Ph.D candidate at EGS (www.egs.edu). my free/libre time is spent on striving to interface place, location and trajectory across all networks. the body as the default test ground. In S.O.U.P (http://soup.znerol.ch/) we do it using data visualization for „real-time" mapping schemata. The collaborative project Berebere is its the fisrt organic enactment.
http://co.lab.cohete.net/wwwberebere/index.html

Thilo Elsner

Thilo Elsner is Director of the Observatory Bochum – Center for Ecological and Future Research. He is member of AMSAT-DL – International Satellites for Communication, Science and Education, calling sign: DJ5YM.
http://www.sternwarte-bochum.de

Joanna Griffin

(*1967, Stourbridge)
is an artist who studied Fine Art at Edinburgh University and Hypermedia at Westminster University. She has taught at Dun Laoghaire Institute of Art, Design & Technology, Ireland; Srishti School of Art, India; Winchester School of Art and Wolverhampton University in the UK.
Her work has taken the form of radio shows, soundscapes, film, publications, installation and participative projects. These include an event for International Sputnik Day (2007), an award winning project, the 'Universe Gallery' at Mulberry School, London (2007) and 'Moon Vehicle,' a project around Chandrayaan-1 India's moon launch satellite (2008).
Her investigations into connections between people, place and artificial satellites have been supported through residencies at the University of British Columbia and the Space Science Lab, UC Berkeley with funding from the Arts Council England.
http://aconnectiontoaremoteplace.net/

David Hahlbrock

(*1980, Koblenz)
lives and works in Cologne and Berlin. He studied History and History of Architechture at the TU Berlin. Since 2005 he studied Audiovisual Media at the Academy of Media Arts, Cologne (KHM). His works deal with the topics of urban topologies, poetologies and the construction of reality. David Hahlbrock works with mixed media. The artistic statements develop from video and fotomontage to research and interventions in urban space. The interventions are formulated as performances and installations.
http://www.khm.de/~dh

Martin Heckmann

(*1966, Hamburg)
is a film- and video-artist from Hamburg, Germany. Following film studies at Hamburg Academy Of Fine Arts (1989-1995) he produced experimenal films, documentaries and video-installations. His work is shown at international film festivals and in art galleries. He is founder member of the association feld für kunst. http://martinheckmann.net,
http://www.satlandfilm.info ,
http://www.feldfuerkunst.net

Francis Hunger (*1976, Dessau)
lives and works as an artist and curator in Dortmund, Germany. He exhibited at numerous venues including the Columbia University New York, Kunsthaus Dresden, Galerie Metro Berlin, Laden für Nichts Leipzig and many others. His installations and performances deal with the topic of society and technological development, among them: „Krystalia“ (2003), about a female hacker; „The Setun Conspiracy“ (2005) on the world's only ternary – non binary – computer Setun, developed in Moscow; „International Sputnik Day“ (2007), dealing with the 50th anniversary of the earth's first artificial satellite, the Sputnik.
Since 2005 Francis Hunger freelances as a curator at Hartware MedienKunstVerein Dortmund, co-organizing and producing exhibitions and workshops at the 2000 sqm PHOENIX Halle. http://www.irmielin.org, http://www.hmkv.de

Kathy Marmor (* 1959, USA)
Kathy has exhibited widely in the United States. Her work has shown at Ciber@rts -Bilbao, Spain and New Forms festival in Vancouver, Canada. She has been an artist-in-residence at the Visual Studies Workshop in Rochester, New York and Light Work in Syracuse, New York. Kathy has an MFA in Imaging and Digital Arts from University of Maryland, Baltimore County. She is currently an Associate Professor of Art at the University of Vermont. http://www. kathymarmor.com

Rona Rangsch (*1969, Saarbrücken)
studied physics at the Universities of Saarbruecken and Cologne and graduated in theoretical high energy physics in 1996. After research activities at the Max-Planck-Insitute of Colloid and Surface Research in Berlin and the University of Essen she made physics a hobby in order to follow a career as a professional artist in 1999. Working with diverse media ranging from installation and animation to video and photography she can be called a media artist whose concepts are elaborated along guidelines not unlike scientific methodology. Besides exhibiting her own work in Germany and abroad she has organized group shows at the Kuenstlerhaus Dortmund, where she has been a member since 2003. Lately travelling has become a crucial element in her work. She has received grants for artist residencies in The Netherlands, Newfoundland and Quebec. http://www.rangsch.de

Paula Roush (*1971, Lisbon)
is a London-based artist, curator and lecturer. She is the founder of the art and research platform msdm, whose projects feature her interest in mobile strategies of display & mediation. Solo exhibitions include soundtrack for a cctv (2007), arphield recordings (2006), whatarewedoingwhatshappeningtouswhatneedstobedoneiprefernotto (2005) and sos:ok (2004). She co-curated Welcome goodbye adeus obrigada-Journeys, dislocations and imaginary nations at the Blue Elephant Theatre (2006), Post script- Portuguese live art in the age of scripted reality, at Space (2004) and Outsourcing-the creative collision between artist and curator, at inIVA (2002). She is lecturer and researcher on digital photography and social media at the London South Bank University and lecturer on contemporary art theory at the University of Westminster.
http://msdm.org.uk

Manuel Schmalstieg
(*1976, Bern)
operates on the borderline between video, performance and software art. After experimentation in the fields of graphic novel, animation film and audio production that he carried out during his studies in Geneva (ESBA/atelier zero1) and Krakow (Academy of fine arts/animated film department), he turns at the end of the nineties towards realtime video. Through his performances and installations, he explores issues of surveillance, control and censorship, confronting the viewer with uncomfortable truths and concealed motivations. Challenging the traditional figure of the artist, he operates since 2001 as an undercover agent for N3KROZOFT

Ltd, an art collective mimicking the rhetorics of IT corporations and military think tanks. Since 2004 he works as assistant at the university of arts Geneva, where he takes part in establishing the new media facility (pôle art/media).
http://n3krozoft.com

Daniel Schulz

(*1975, Hilden)
studied Geography at the universities of Cologne, Germany, and Gothenburg, Sweden. In 2006 he received his diploma. During his study he focused on Economic Geography and Geographic Information Systems (GIS).
Today he is working as a research fellow at the Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS in Sankt Augustin. His main research interests are in the fields of Spatial Data Mining, Business Mapping and Data Quality. In particular he works in the field of traffic prediction and the analysis of mobility data, e.g. GPS Tracks.
http://www.iais.fraunhofer.de/

Peter C. Simon

(*1969, Czenstochowa)
lives and works as sound and video artist in Cologne, Germany. Exhibitions , amongst others in ZKM, Karlsruhe (Tin Roof, interactive sound installation), Art Space 3015, Paris (Wendekreis, video installation), Skulpturenmuseum Glaskasten, Marl (Absence, interactive sound installation), Galerie Rachel Haferkamp, Cologne (Turing Project, sound installation). Soundart compositions for the Studio Acoustic Art WDR Cologne, for the International Sputnik Day (Kosmochords), theater and movies. Experimental video works at festivals, a.o. Images Toronto, emaf Osnabrück, Kasseler Dokumentarfilm und Videofest, Kunstfilmbiennale Cologne.
http://www.p3c7.de

Darija Simunovic

(*1972, Sarajevo)
studied at the Faculty of Philosophy in Sarajevo until Yugoslavian Civil War in 1992. She received her M.A. degree in Cultural Studies at the University of Lüneburg in 2002.
Darija Simunovic was a member of the production/design team for the project 'Sound Art in Germany', German Association for Electroacoustic Music (2000). She was a trainee at the ZKM - Institute for Visual Media, Karlsruhe from 2003 to 2005, and worked at the same time in the education department of the ZKM - Media Museum. Since 2005 Darija Simunovic coordinates and manages projects for the Hartware MedienKunstVerein, Dortmund. She is presently writing a book about avant-garde tendencies in German comic art since the nineteen-nineties (to be published in 2008).
http://www.hmkv.de

Katalin Tesch

(*1980, Budapest)
Katalin Tesch's studies has started with both of the field of music and arts. Since 2003 she has combined her works with digital interactivity. After graduating in the Moholy-Nagy University of Art and Design, Budapest in 2005, she has continued her studies in the HGK in Lucerne and Zurich. Her digital artworks (videos and interactive installations) have been shown in Budapest, Zurich and Seoul. Katalin Tesch currently lives and works as a multimedia designer/artist in Budapest.
http://www.teschkata.hu

Tristan Thielmann

(*1971, Herborn)
Studies of Media Planning, Development and Consulting, of Audiovisual Media Sciences, of European Cultural Studies and Experimental Media Design in Siegen, Babelsberg, Bradofrd, Kassel and Berlin. Scholarschip Holder of Hanns Seidel Stiftung and the Graduiertenkolleg Psychische Energien bildender Kunst at Johann Wolfgang Goethe University Frankfurt/ Main. Conferral of a doctorate at Ludwig Maximilians Universität München. Thielmann currently works on his habilitation on Media Geography and is spokesmen of the junior scientists group Mediatopographies of Social Spaces.
http://www.spatialturn.de/