Lost in the crowd no longer? Mobile phones and the prospects of continuous geosurveillance

Martin Dodge
Centre for Advanced Spatial Analysis,
University College London

Ordnance Survey, Thursday 2nd December 2004

Defining geosurveillance

- directed observation for the purposes of social control
- goal being to determine ‘who’ you are (positive identification), determine what you are ‘doing’ and determine an appropriate ‘action’ in response
- geosurveillance extends this with explicit concern over ‘where’ the identified individuals are doing the things they are doing
- spatial privacy - notion of control over your spatial identity, the right of control over the release, storage and use of information on geographic location, activities and movement patterns
- the act of knowing where people are is changing
- new surveillance technologies on the person and throughout the environment identify people, where they are, and often what they are doing

Geosurveillance assemblage

1. **Sporadic:** ‘tracking through transactions’

2. **Visual:** ‘tracking by cameras’

3. **Mobile:** ‘tracking through tags’

Type 1 Geosurveillance: Sporadic tracking by transactions

- surveillance at distinct point sources
- strong degree of individual identification in many cases
- generally aware that your position has been ‘caught’
- can give very precise space-time co-ordinates
- but localised, partial. intermittent trajectories
- however, historical logs can build up insightful patterns

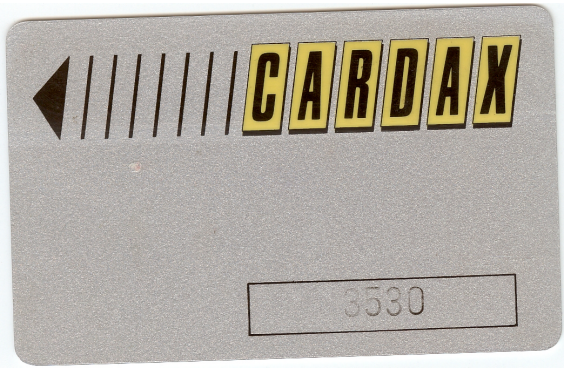
Money and consumption

- growth in volume & diversity of electronic payment transactions
- what would a map of your bank and credit card statements reveal?
- cross sectoral 'loyalty' cards linking purchasing habits across whole range of personal consumption locations
- see CASPIAN (www.nocards.org) for why 'loyalty' cards are 'bad'

4.7 billion payment transactions made with debit & credit cards in 2002 in UK (APACS, 2003)

e.g. Nectar 'loyalty' card linking together supermarket, garage, off-license, dept. store, utilities

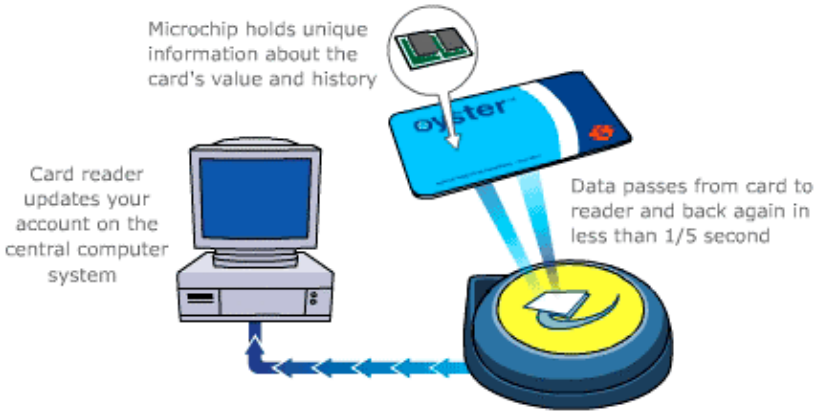
From keys to cards

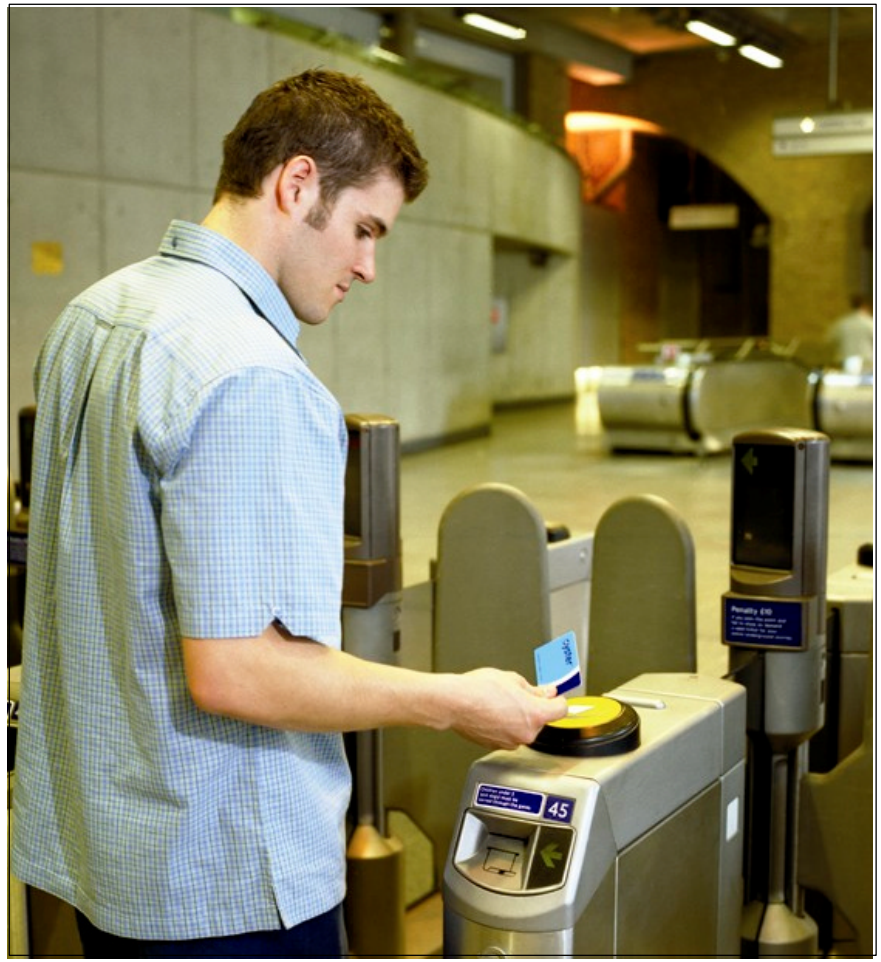


digitally controlled physical access (cards, pin nos.)

```
**  22/04/03  ****************************************
  10:45 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Door Access Granted
  18:00 01 Torr Pl 1-19,Ent,Out Torr Pl 1-19 Ents     Door Access Granted


**  23/04/03  ****************************************
  19:38 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit


**  24/04/03  ****************************************
No Activity


**  25/04/03  ****************************************
  16:51 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit
  19:43 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit


**  26/04/03  ****************************************
No Activity


**  27/04/03  ****************************************
  12:54 01 Torr Pl 1-19,Ent,In   Torr Pl 1-19 Ents     Door Access Granted
  17:38 01 Torr Pl 1-19,Ent,Out  Torr Pl 1-19 Ents     Door Access Granted


**  28/04/03  ****************************************
  19:22 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit


**  29/04/03  ****************************************
  19:17 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit


**  30/04/03  ****************************************
No Activity


**  01/05/03  ****************************************
  18:32 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit
  18:45 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Door Access Granted
  20:18 01 Torr Pl 1-19, Rear    Torr Pl 1-19 Ents     Valid Card Exit


**  02/05/03  ****************************************
No Activity


**  03/05/03  ****************************************
No Activity


**  04/05/03  ****************************************
No Activity
```

Tickets and travel





- summer 2003 Oyster smart card ticket on the Tube and buses
- 16,000+ card readers
- 1/2 million Oyster cards in use (Jan. 2004), 2 million trips a day
- printed paper tickets are deemed obsolete
- enforced swiping on entry and exit

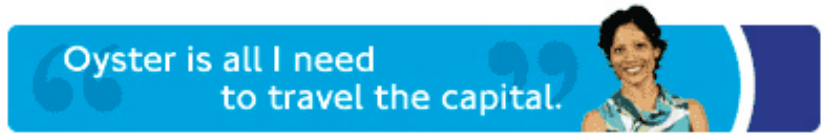
wanna travel in London? then get tracked

No mention of tracking movement patterns of course

www.oystercard.com

oyster™ The smarter, faster way to travel around London.

Get Oyster | Use Oyster | Ask Oyster



About Oyster

- What it is and why we need it
- » How Oyster works
- » Where Oyster can be used
- » How it's being introduced
- » Helping Londoners get used to Oyster
- » Benefits to customers
- » Funding and management
- » What the public thinks
- » London's transport policy

Print page | Email page

What it is and why we need it

What is Oyster?

Oyster is the new ticketing and revenue system that is bringing smartcard travel and all of its associated benefits to Transport for London and its customers. At the heart of this system is the Oyster card which can be used on Tube, bus, Tramlink, DLR and National Rail services within London. Quick, convenient and secure, Oyster is the smarter, faster way to travel around the capital.

Better for customers

Oyster will make getting about London quicker and easier for customers. Oyster is very easy to use. All customers have to do is touch it against one of the new readers - the card can even remain in its wallet.

Customers will save time because they will be able to get and renew their tickets online, over the phone, at touchscreen ticket machines in Tube stations, or at Tube station Ticket Offices.

If cards are lost or stolen then tickets are still safe. This is due to the fact that lost or stolen Oyster cards can be reported by customers to our helpline and the cards can then be hotlisted. Hotlisting a card prevents anyone from fraudulently using it.

Oyster cards are made of tough plastic so you won't have any more trouble from dog-eared paper tickets.

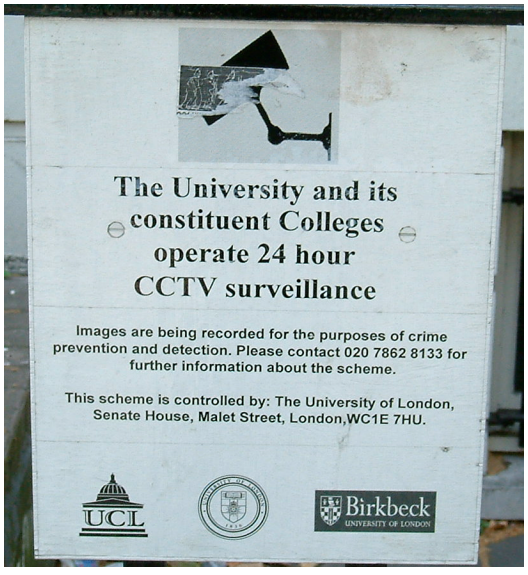
Better for Transport for London

London's public transport system is one of the busiest in the world. Oyster will not only make travelling in the capital easier, it will provide information that will help London to manage its transport system better. For instance, we will be able to identify where people, and how many, are transferring from bus to bus or from bus to Tube.

Oyster will help Transport for London as the sophisticated technology employed by Oyster will significantly reduce the amount of money lost to ticket fraud. The money saved in this area will be able to be used by Transport for London to further improve their service in the future. Oyster will allow us to introduce new tickets and new ways of paying for travel.

Sporadic geosurveillance

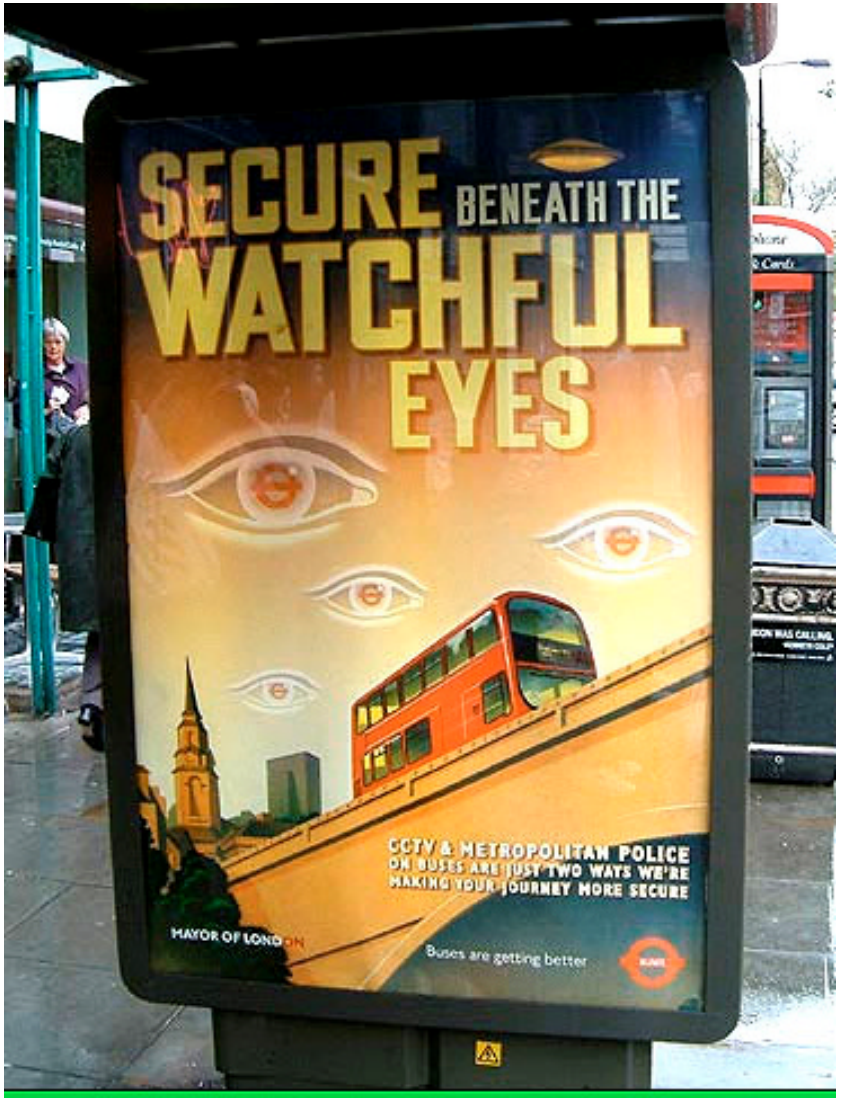
- type 1 surveillance generates a series of scattered ‘dots’ through the space-time trajectory of your day
- can still be very revealing, but you are the only one with a complete picture of your daily space-time trajectories
- clearly, if a third party has enough ‘dots’, they can do a good job at *interpolating* the complete life path
- problem is that interpolation is bad at predicting rapid changes in behaviour patterns. Which are precisely the type of ad-hoc changes of activities that are basis of ‘mobile society’
- easy to duck out of type 1 surveillance (e.g. pay cash)
- although the number of *required* ‘dots’ is growing, as the potential for anonymous transactions is declining



Type 2 Geosurveillance: Visual tracking by cameras

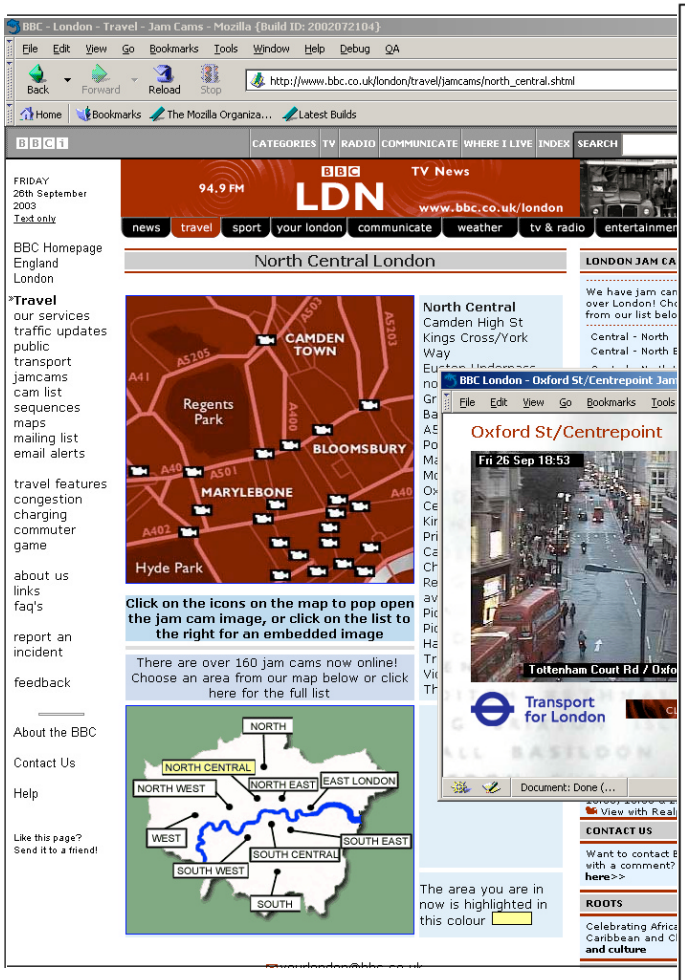
- people tracked through the directed visual gaze of distant observers via video cameras. Potential for continuous surveillance over time
- partial and localised, but networks of cameras covering large areas
- hard to automate, but working towards algorithmic video surveillance. (cars number plates are easy, but faces are much harder)

London - camera heaven!



- many large public and private-operated street schemes
- whole of Tube is blanketed by CCTV
- inside buses, trains
- the City's anti-terror 'Ring of Steel' started in 1990s
- Congestion Charge started in February 2003
- numerous road traffic monitoring and enforcement
- average daily dose of CCTV, 300 cameras, 30 systems (Norris & Armstrong, 1999)
- camera concentration is high, but also highly variable

Watching the roads - monitoring and enforcement



900 buses equipped

.....enforcement images recorded continuously.....

Increasing number have ANPR and data logged

Congestion Charge

- all vehicle movement into and out of 21 square kilometre zone
- networked video system, 500 cameras at some 250 sites with ANPR
- watching at all times, including 49.4% of non-charging time
- classic case of ‘control creep’. Likely to be extended

Towards continuous geosurveillance

- Steve Graham (1998), "… incomplete, fragmented, and patchy, always partial, contingent and unevenly developed across and between the 'life-paths' of citizens."

- both type 1 and type 2 geosurveillance are partial, non-continuous across space

Type 3 Geosurveillance: Mobile tracking through tags

- growing number of locational aware technologies people use in everyday life
- 'intimate and internal' surveillance, generated 'bottom-up'
- promise (threat) of much more continuous and complete geosurveillance of your time-space trajectories

Personalised locational tags

- digital devices that identifies you uniquely and has the potential to actively 'leak' your positional data (at varying resolutions) to a control network and thus to third parties

- mobile phones (wide area cellular; global satellite)
- computer devices (PDAs, laptops),
  - local area networks (wifi); personal area network (Bluetooth links)
- involuntary tags (the vulnerable, the dangerous & the feckless)
- vehicular
  - personal cars (satellite navigation; 'black box' recorders); fleet logistic monitoring (legitimate workplace geosurveillance?), road pricing
- object tags (rfid chips 'hidden' in products) and sensor net to track them. Been used in tagging cattle and 'smart' name tags for conferences
- all have potential for covert reading at a distance

Mobile phones, the ultimate ‘body bugs’

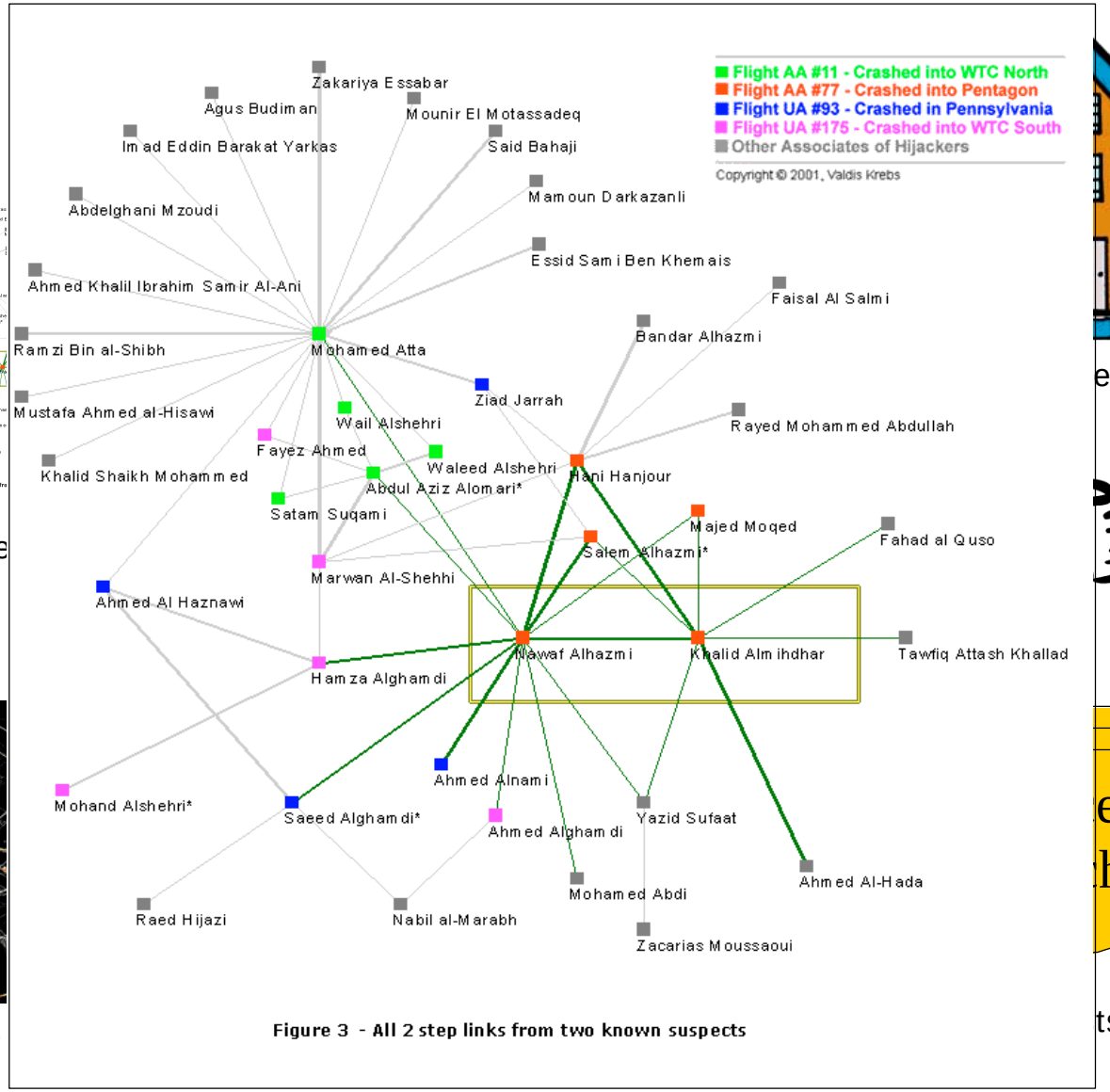
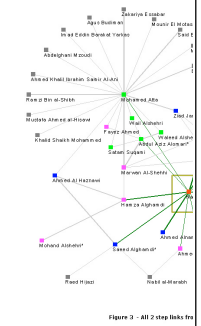


Figure 3 - All 2 step links from two known suspects



Social ne

e (geodemographics)

Space-time

es, info

hased

ts & activities

Court cases using mobile location data

BBC NEWS

You are in: N Ireland

News Front Page
World
UK
England
N Ireland
Scotland
Wales
Politics
Business
Entertainment
Science/Nature
Technology
Health
Education

Talking Point

Country Profiles
In Depth

Programmes

BBC SPORT
BBC WEATHER
CBBC news

SERVICES
Daily E-mail
News Ticker
Mobile/PDAs

Text Only
Feedback
Help

EDITIONS
Change to World

Tuesday, 22 January, 2002, 15:24 GMT

Phone logs linked to bombing

Omagh's devastated main street

By the BBC's Annita McVeigh

It was the 15th of August 1998, a busy Saturday afternoon in Omagh, when the bomb exploded.

The town's streets were packed with young and old, Catholic and Protestant, local people and tourists.

Twenty-nine men, women and children as well as unborn twins were killed - the biggest loss of life in a single incident during Northern Ireland's Troubles.

More than 200 people were injured, some of them maimed or scarred for life.

The device had been packed into a stolen car and left in the County Tyrone town by the Real IRA, dissident republicans opposed to the peace process.

Thursday, 18 April, 2002, 15:12 GMT 16:12 UK

Mobile calls 'key', Damilola jury told

Damilola bled to death on a stairwell

Two brothers accused of murdering Damilola Taylor would have had to run the "four minute mile" if they had been using their mobile phones on the day of the boy's death, a court has been told.

The judge, Mr Justice Hooper, told the Old Bailey jury that if they were sure the brothers had been using their phones they could not have been involved in the 10-year-old's death.

> "It is the four minute mile which was first broken by Roger Bannister a long time ago"
>
> Mr Justice Hooper

The 16-year-old brothers deny murder, manslaughter and assault with intent to rob the schoolboy on 27 November 2000.

Damilola bled to death on a stairwell on the North Peckham Estate, south London, from a

BBC NEWS UK EDITION

Last Updated: Thursday, 18 December, 2003, 11:24 GMT

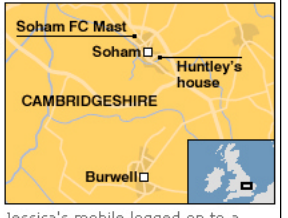
E-mail this to a friend Printable version

Mobile phones - the new fingerprints

By Chris Summers
BBC News Online

Ian Huntley's conviction for the murder of Holly Wells and Jessica Chapman was based partly on crucial mobile phone evidence - which nowadays is almost as useful to the police as fingerprints or DNA.

Huntley was knowledgeable about some aspects of forensic science - such as analysis of fibres - but it was his ignorance about mobile phones that proved his undoing.



Jessica's mobile logged on to a mast at Burwell

He was not alone in being unaware of how powerful evidence from cellular phone networks could be when it comes to proving where somebody was at a key moment.

In the past five years, dozens of murderers have been convicted partly as a result of evidence about their mobile phones or those of their victims.

Detectives now routinely contact the mobile phone networks and obtain details of phone calls made by and to a murder victim and from the prime suspects.

The response varies from network to network.

David Bristowe, the prosecution's expert witness

Trials featuring mobile phone evidence

- Stuart Campbell (Dec 2002): Convicted of murdering Danielle Jones
- Colm Murphy (Jan 2002):

Alibi for the defence, incriminating evidence for prosecution

‘Productizing’ position, ‘monetarizing’ mobility

mapAmobile
...for your peace of mind

Home | Buy Online | Retail Outlets | Help | Terms & Conditions | Contact Us

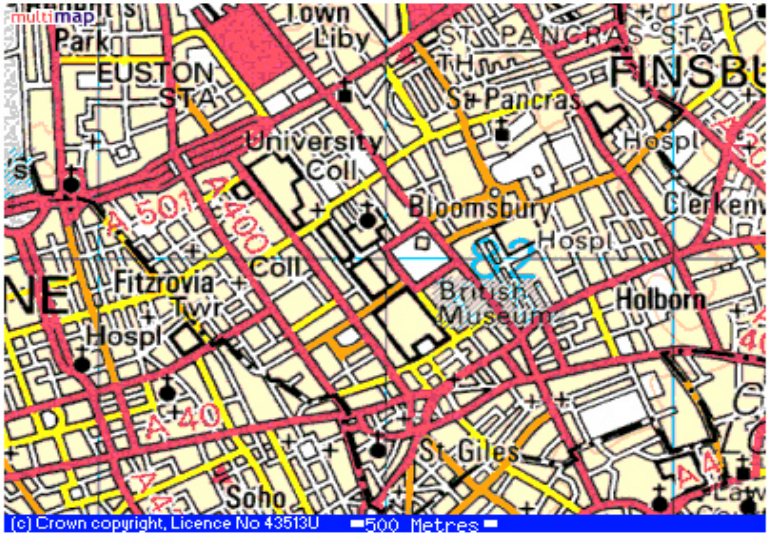
- My Account
- Add/Remove Mobile Phones
- Subscriptions
- SMS Text Messages
- Reports
- Redeem Voucher
- Optional Services
- Edit My Account
- Log Out

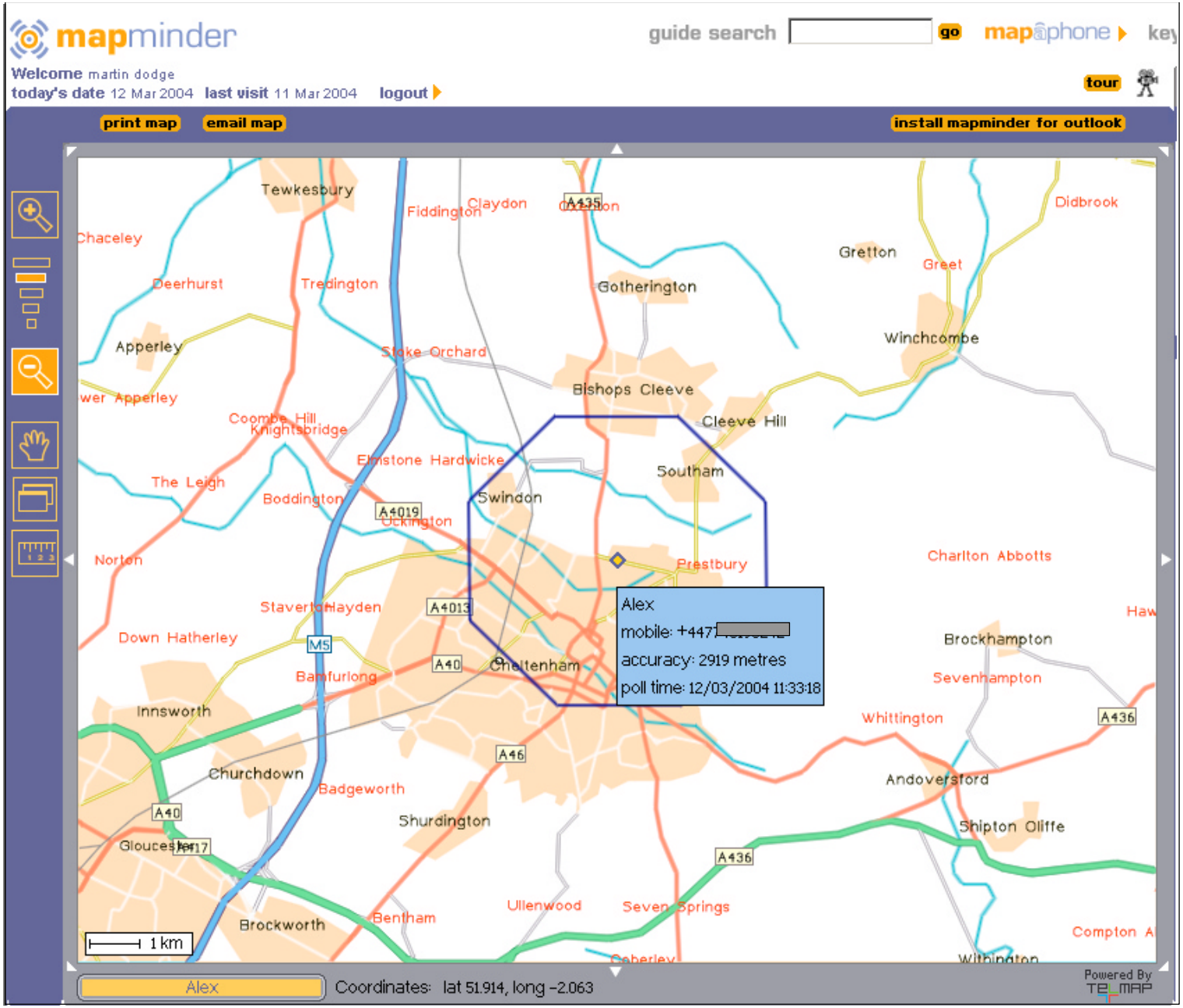
mi.international
SOFTWARE | SERVICES | SOLUTIONS

Location

Steve Coast (07[redacted]91) is in the vicinity of RUSSELL SQUARE, LONDON, WC1B4HR

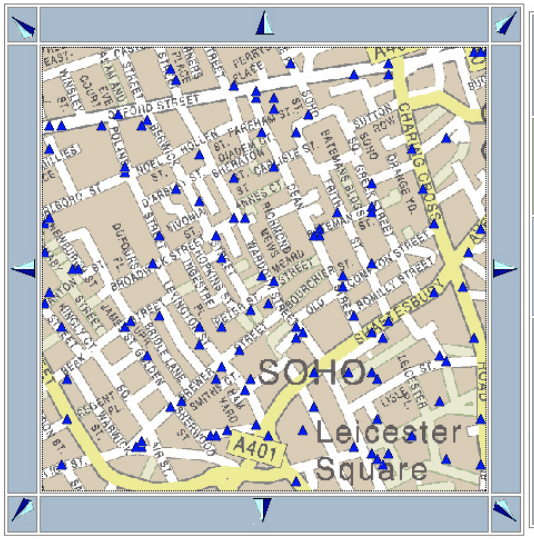
Result	OK
Accuracy	0.7 km
X Coordinate	530152
Y Coordinate	181991
Data/Time of fix	11/03/2004 11:07

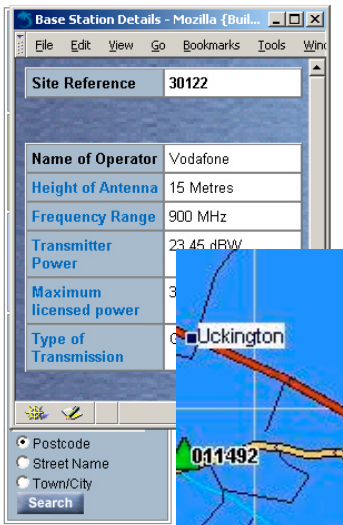



mapminder
guide search
go
mapaphone
key
Welcome martin dodge
today's date 12 Mar 2004 last visit 11 Mar 2004 logout
tour
print map
email map
install mapminder for outlook
Tewkesbury
Fiddington
Claydon
A435
Didbrook
Chaceley
Gretton
Greet
Deerhurst
Tredington
Gotherington
Winchcombe
Apperley
Stoke Orchard
Bishops Cleeve
Coombe Hill
Knightsbridge
Cleeve Hill
Elmstone Hardwicke
Southam
The Leigh
Boddington
Swindon
A4019
Ockington
Norton
Prestbury
Charlton Abbotts
Staverton
Hayden
A4013
Down Hatherley
M5
Brockhampton
A40
Cheltenham
Bamfurlong
Sevenhampton
Innsworth
Whittington
A436
A46
Churchdown
Badgeworth
Andoversford
A40
Shurdington
Shipton Oliffe
Gloucester
A417
A436
Ullenwood
Seven Springs
Brockworth
Bentham
Compton
Withington
Alex
mobile: +447
accuracy: 2919 metres
poll time: 12/03/2004 11:33:18
1 km
Alex
Coordinates: lat 51.914, long -2.063
Powered By
TB_MAP

Density of mobile antennas

Sitefinder

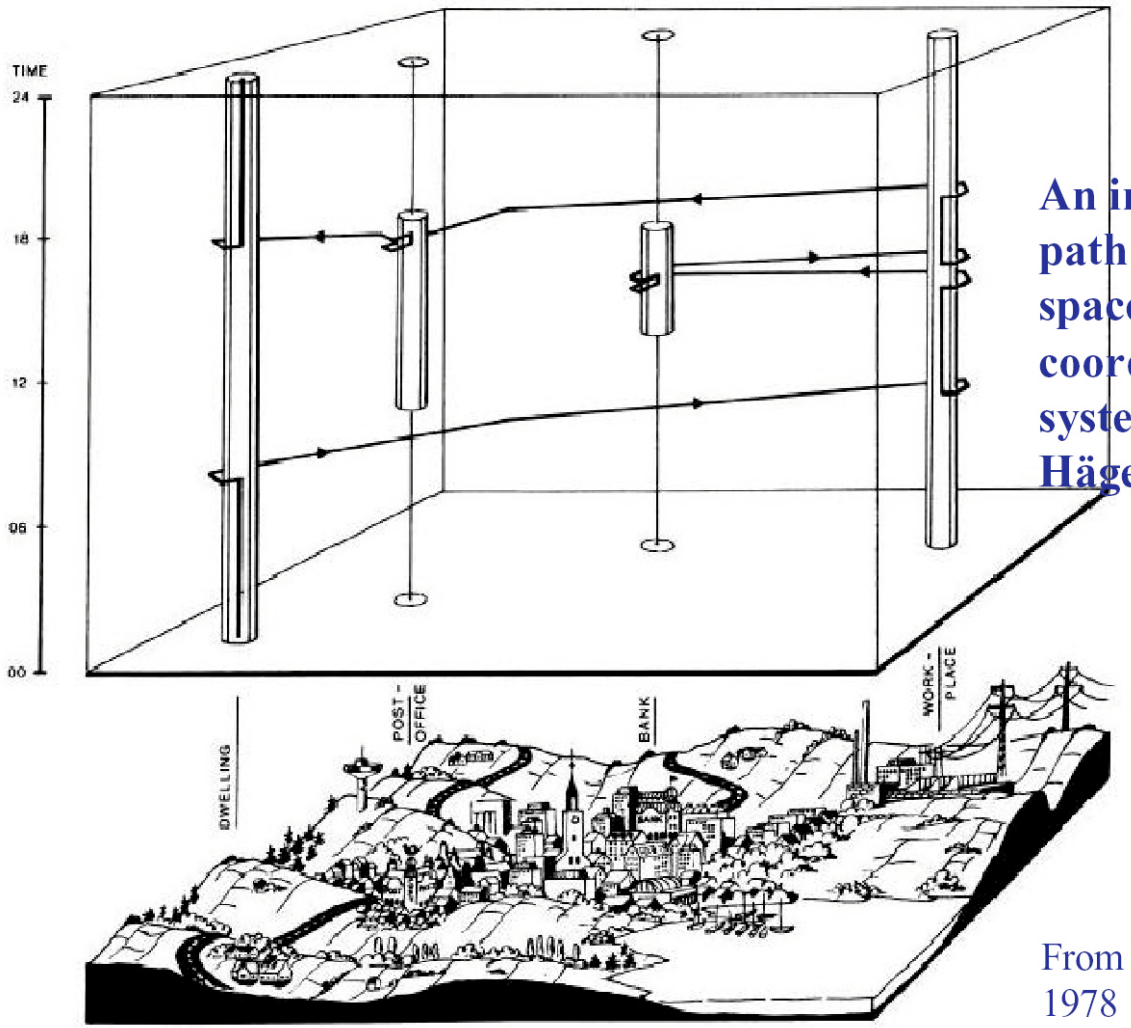




www.sitefinder.radio.gov.uk

www.webmap.o2.co.uk/

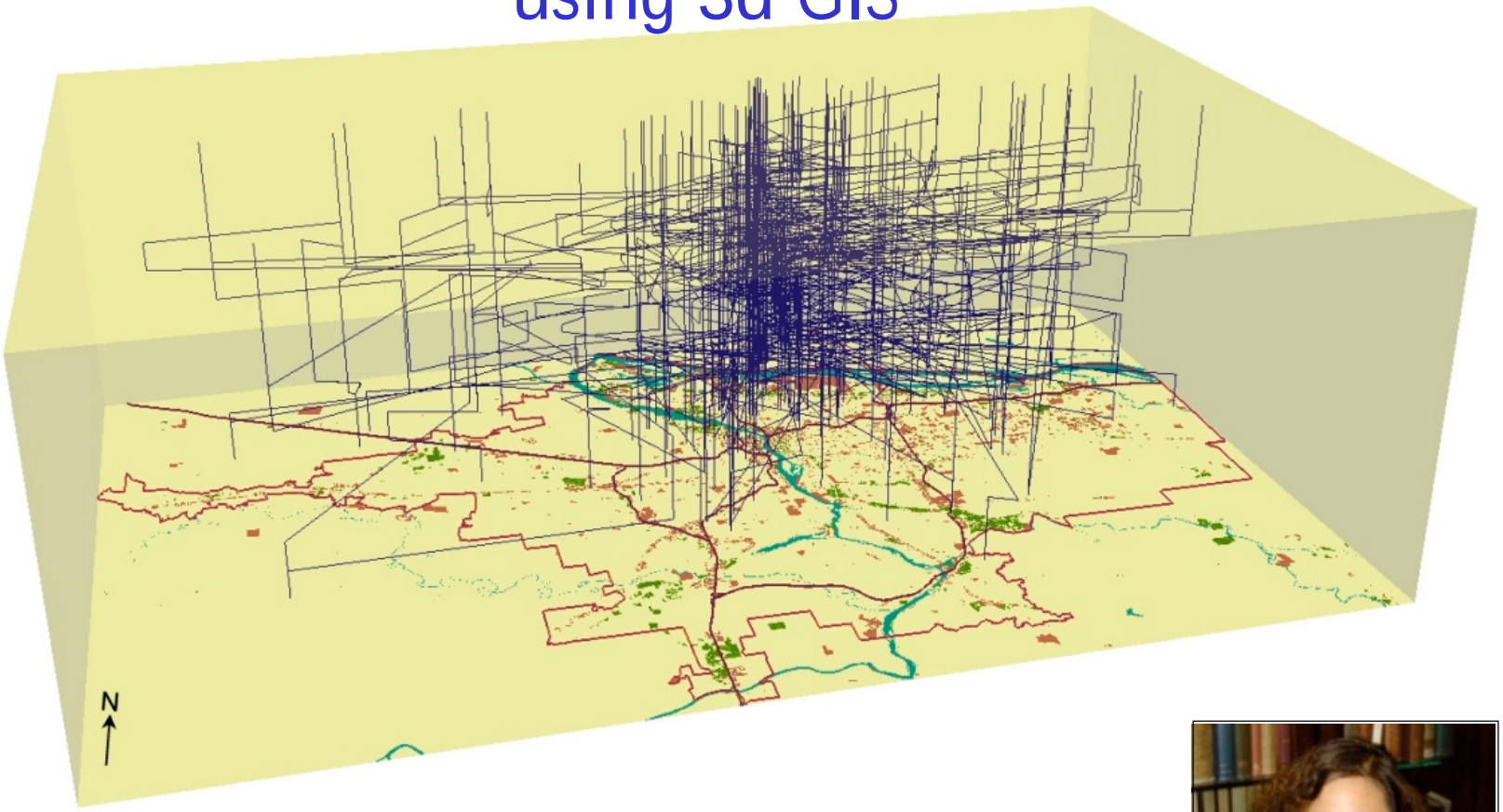
Visualising trajectories



An individual's path in time-space coordinate system -- after Hägerstrand

From B. Lenntorp 1978

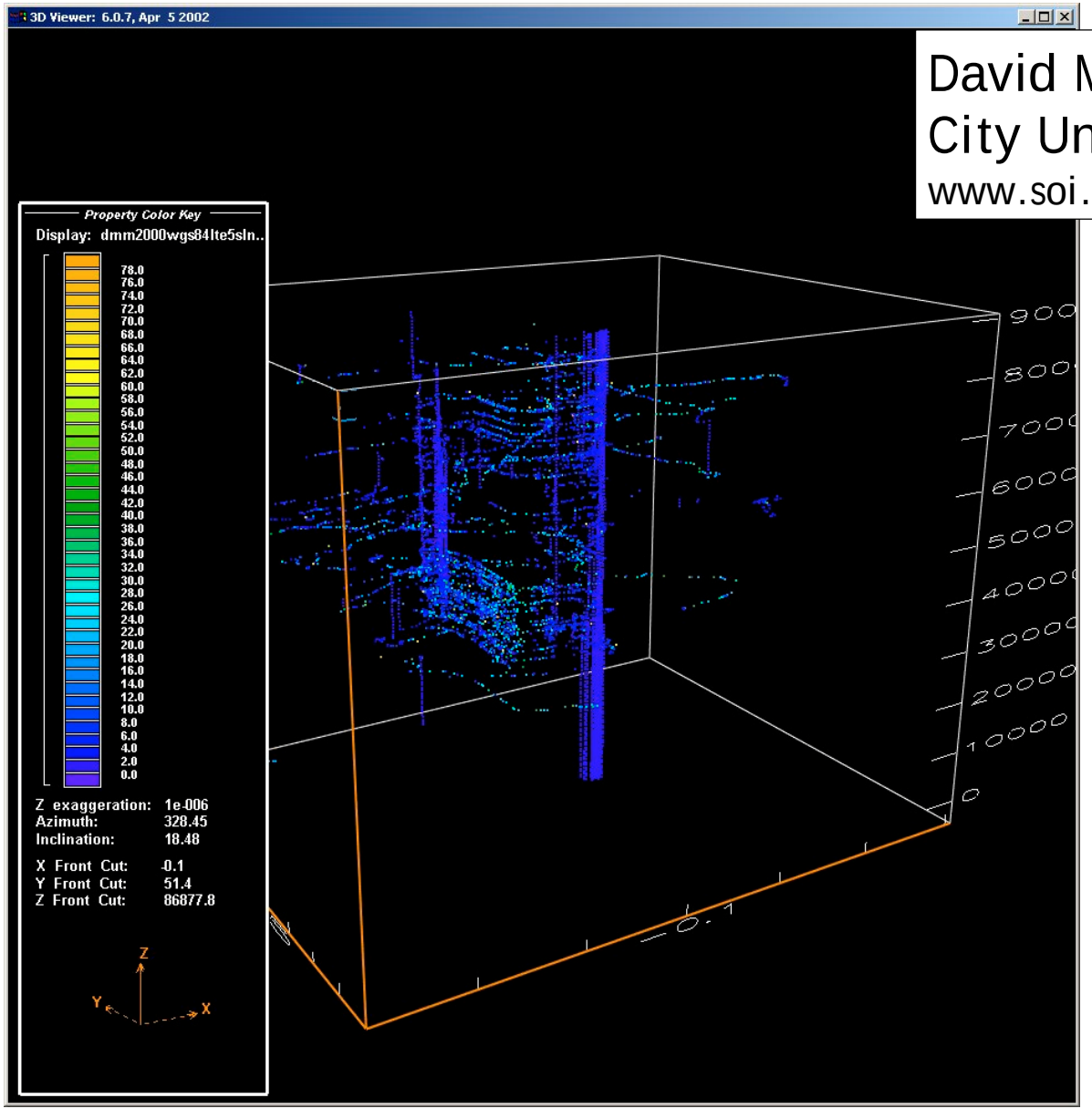
Geovisualisation of activity-travel patterns using 3d GIS



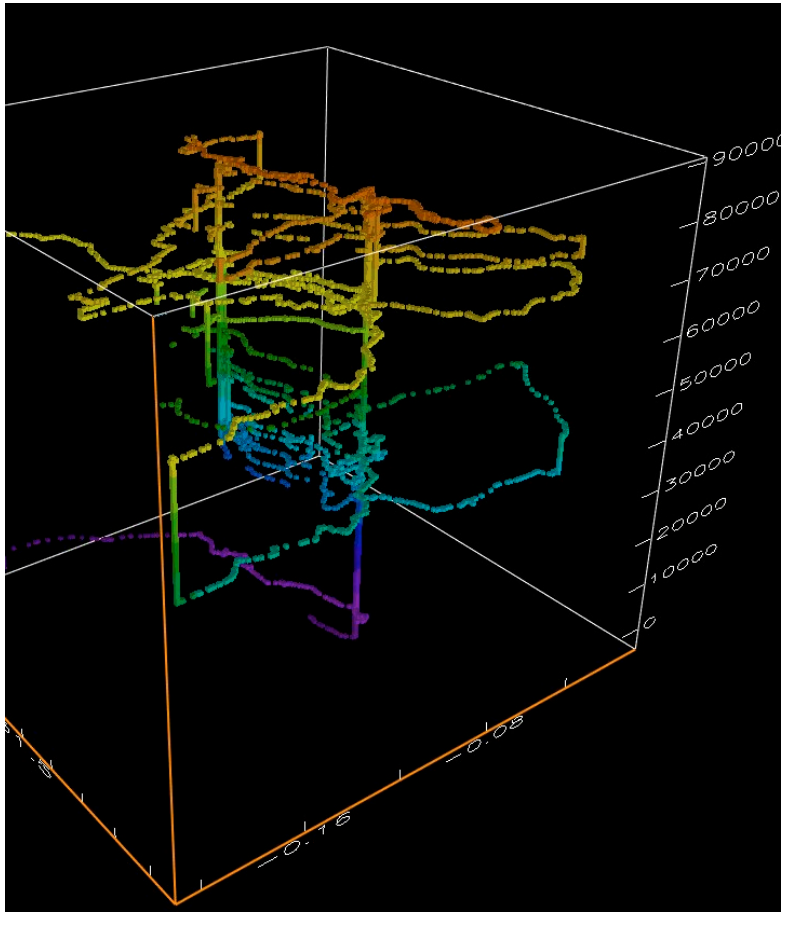
Space-time aquarium showing space-time paths of African and Asian Americans in Portland

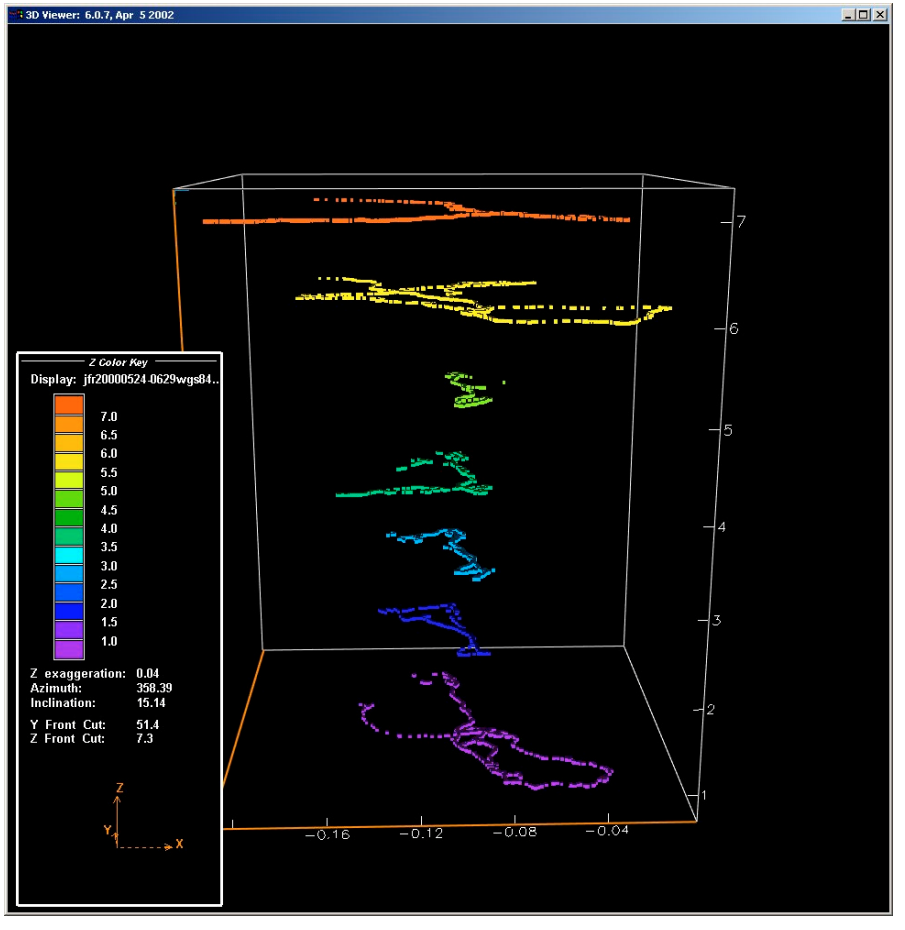
http://geog-www.sbs.ohio-state.edu/faculty/mkwan/


N



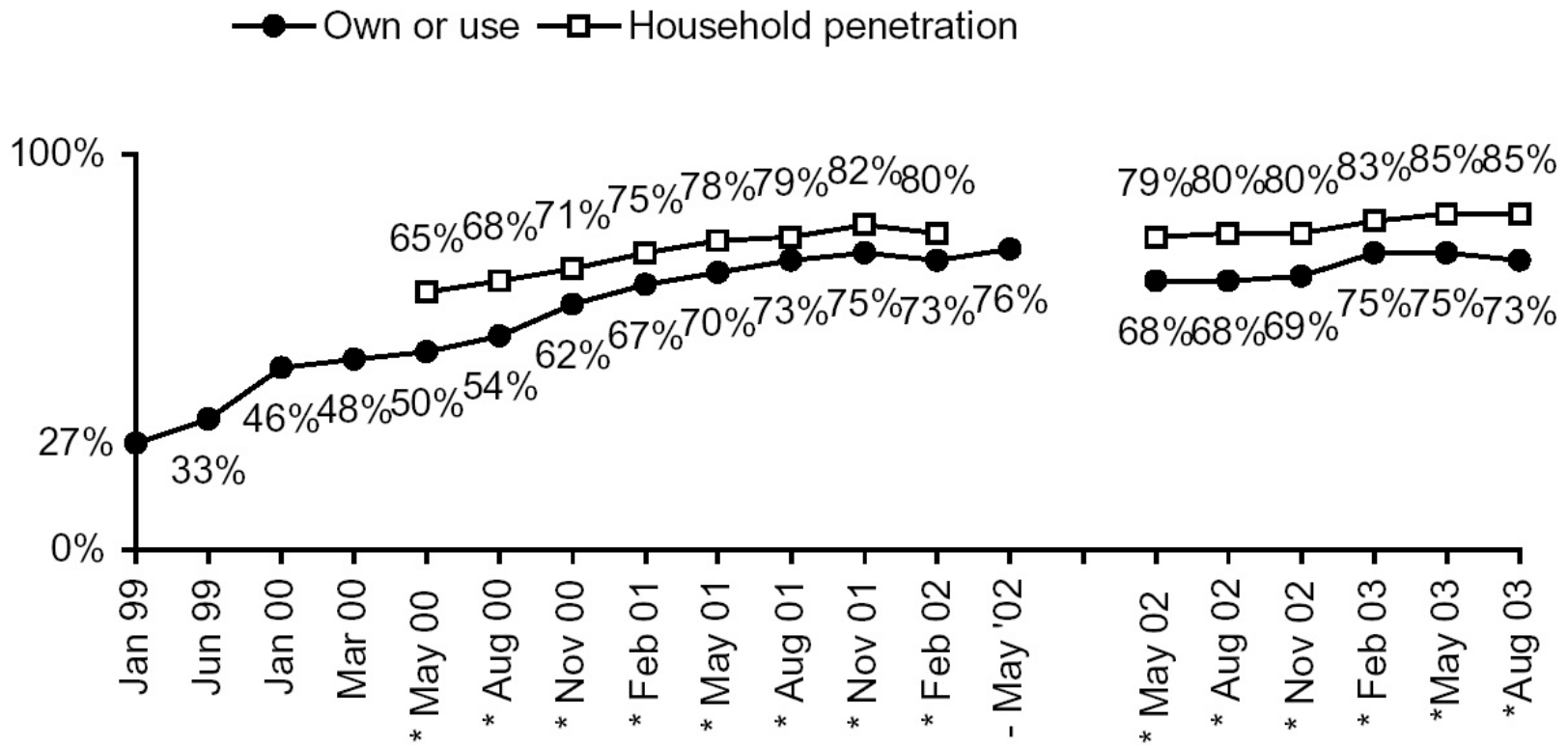
David Mountain,
City University
www.soi.city.ac.uk/~dmm/


90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-0.16
-0.05

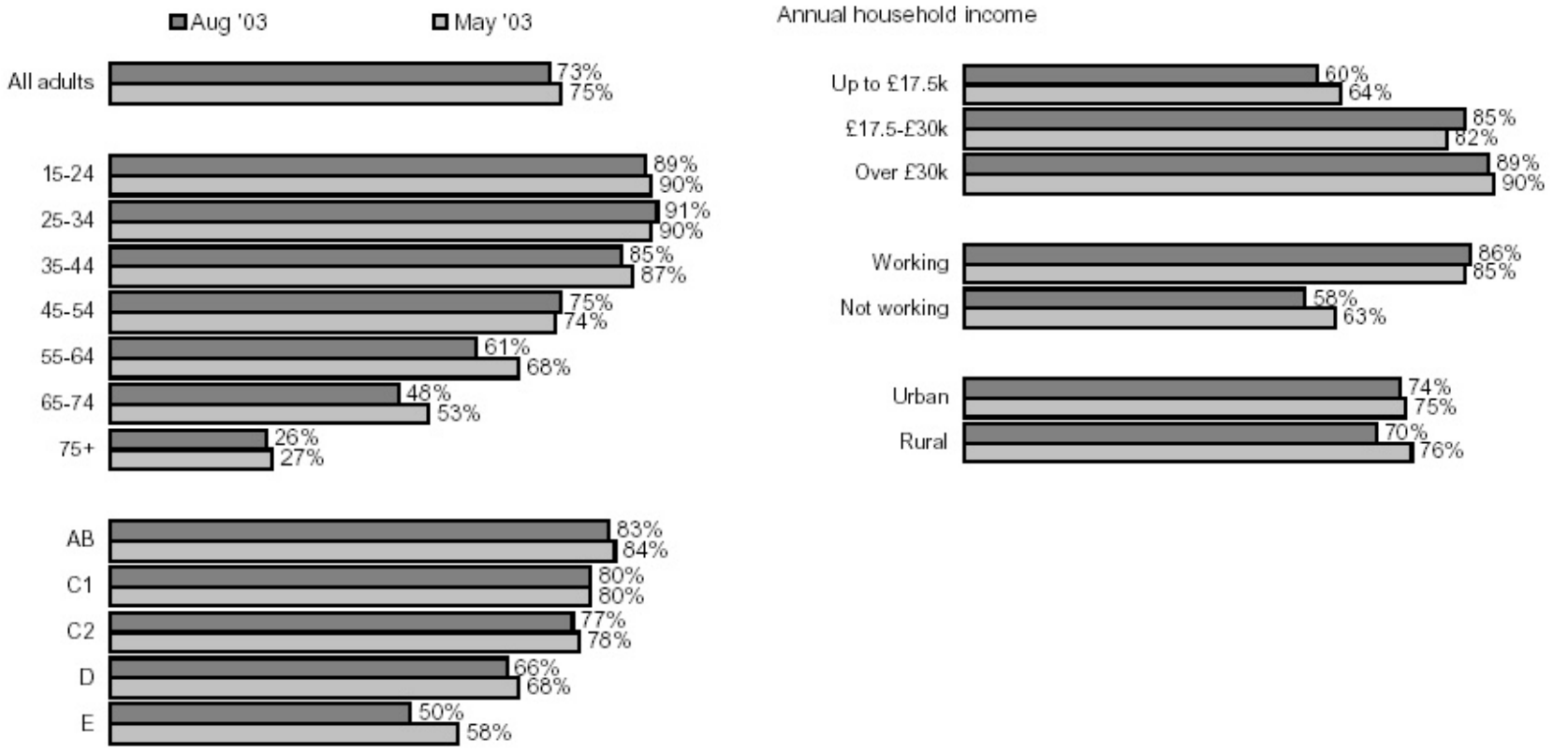

3D Viewer: 6.0.7, Apr 5 2002
Z Color Key
Display: jfr20000524-0629wgs84..
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
Z exaggeration: 0.04
Azimuth: 358.39
Inclination: 15.14
Y Front Cut: 51.4
Z Front Cut: 7.3
Z
Y
X
7
6
5
4
3
2
1
-0.16
-0.12
-0.08
-0.04

Feasibility of ‘whole’ population continuous geosurveillance

Mobile phone usage in the UK



% UK adults (15 yrs +) and households who have a mobile phone
(Source: Consumers’ use of mobile telephony, August 2003, OFTEL, www.oftel.gov.uk)



% UK adults (15 yrs +) and households who have a mobile phone (Source: Consumers' use of mobile telephony, August 2003, OFTEL, www.oftel.gov.uk)

Discourses of geosurveillance

- will to power to ‘number, weigh and divide’. The unstated goal: *all people, at all places and all the time*
- securitisation, move to the control society. Spurred by ‘signal crimes’ (Innes 2001)
- the ‘position of safety’. Risk reduction is rational win-win for business and consumer. Selling protection from fear, insecurity and sense of urban alienation
- emergency services (911 locate)
- ‘here comes the spatial spam’, consumer services push, (LBS dreams, pay back those expensive 3g licenses)
- efficiency and time-space maximisation
- locative media. ‘Bottom-up’ from artists and activists (lets have some fun, ‘DodgeBall’ game, community empowerment)

‘Pay-as-go society’

NORWICH UNION
an AVIVA company

Text only | Site map

All our products: Please select... Go

Search the site: Go

Existing customer

- Motor
  - Buying your car
  - Breakdown Cover
  - Car Insurance
  - Motorcycle Insurance
  - Pay as you Drive
  - Van Insurance
- Travel
- Home and mortgage
- Health
- Money and investing
- Retirement
- Life cover
- Business

"Pay As You Drive" ™ insurance

Pay as you drive™ overview | Latest updates | Register now

The "Pay As You Drive"™ insurance device

The black box device will be less than the size of a video cassette and will be fitted into your boot or passenger cabin.

There will also be a small aerial, to establish where your car is via Global Positioning Satellite technology and for a mobile telephone signal to send data to us. This aerial will be placed inside your car (in most instances on the inside of your windscreen on the passenger side).

The device will be wired to your car battery and ignition. It will not affect your vehicle's performance.

Your Insurance Policy

To take part in this pilot you will need to have your car insured with Norwich Union Direct with comprehensive cover. The test will probably last until 2006 so you will need to keep your policy with us for 2 years from the date you have your device fitted. We will offer benefits as a reward for participating. During the pilot you will be billed for your insurance in the same manner you are now. We will need to take time to look at all the data and work out how this can be built into premiums based on use of the car to ensure we make this insurance product best for you, our customers.

We will show car usage data (statements for each participant) as the pilot progresses and we will be able to share what your future monthly bills will look like.

Interested in Pay as you drive™?
Please register your interest in Norwich Union "Pay As You Drive"™ insurance

Respond to our invitation
Have you just received a mailing from Norwich Union Direct? If so, please respond to our invitation

BBC NEWS WORLD EDITION

News Front Page

Africa
Americas

Last Updated: Wednesday, 18 August, 2004, 10:05 GMT 11:05 UK

E-mail this to a friend Printable version

Could pay-as-you-drive insurance work?

Motorists are routinely driven to distraction by car insurance bills over which they have little control. A GPS based system aims to end all that, by introducing monthly pay-as-you-drive cover.

A little black box hidden away in the boot of your car could lead to itemised monthly bills for cover, insurers say.

Insurers say they have no fixed ideas of who is most likely to crash

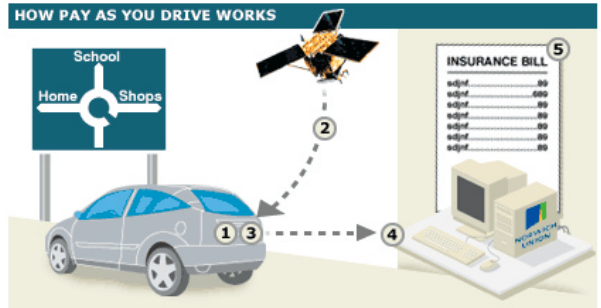
Using telematics - a combination of information and communication technologies - to keep track of your movements, the devices are at the centre of plans to introduce pay-as-you-drive insurance.

It could mean cheaper bills for people who only use their car occasionally, but extra costs for those driving long distances along busy routes every day.

By the end of the year 5,000 cars will have been fitted with the black boxes, to collect data for an 18 month pilot scheme.

Insurers Norwich Union hope to introduce the cover in two years time, so how does the technology work?

HOW PAY AS YOU DRIVE WORKS



1 Telematic device fitted in boot of car
2 GPS satellite used to track car's route and time of travel
3 Information is stored by the device in the car
4 Device then calls insurer's computer with data
5 Computer works out your bill

Concerns

- casual knowledge of position. Becomes as common as clock time
- providers and operators are lacking in transparency. Little specific detail on what they collect, how long they keep it, how they process it, how they apply derived information, to whom they release. Very cagey about what they know and what they want to know
- ‘control creep’ (Innes 2001)

- easily drawn into governmental security systems, commercial consumption profiling systems
- moving from discretionary to mandatory
- stalkers and ‘geoslavery’
- beyond personal privacy. Enabling and disabling potential. Facilitates further discriminatory practices. Mobile sorting of people based on their geographic activity patterns
- continuous geosurveillance through everyday uses of locational tags will become a dimension of the control society. There will be no sense of being lost in the crowd

Welcome to the ‘tin foil’ world

- Is off really off?
- technical ‘solutions’ to foil always-on geosurveillance. New markets for foil lined wallets and bags
- technical arms race via personal shielding of smart cards, mobile phones from covert reading
- but might then show up by ‘going off the map’ and thus be flagged as suspicious….
- will ambivalence to geosurveillance continue?

(source: www.spy.org.uk/spyblog)

Contact

- questions, contact me at m.dodge@ucl.ac.uk
- slides available at
  http://www.casa.ucl.ac.uk/martin/os_geosurveillance.pdf

References

- Graham S (1998) “Spaces of Surveillant Simulation: New Technologies, Digital Representations, and Material Geographies”, *Environment and Planning D: Society & Space*, 16, 483-504
- Innes M (2001) “Control creep”, *Sociological Research Online* 6(3), www.socresonline.org.uk/6/3/innes.html
- Lenntorp B (1978) “A time-geographic simulation model of individual activity programmes”
- Norris C Armstrong G (1999) *The Maximum Surveillance Society: The Rise of CCTV* (Berg, Oxford)
- Amsterdam Realtime by WAAG, www.waag.org/realtime
- 9-11 hijacker social network, Valdis Krebs, www.orgnet.com