

Real-time Geographies

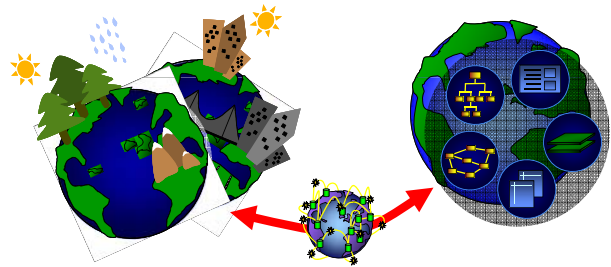
Monitoring and Managing Sustainable Societies and Environments

Josef Strobl



Real < > Virtual Worlds

> Connecting through Location <



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Overview

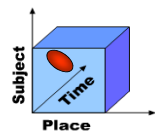
- # Standards for Space-TIME
- # Methods
- # Data types
- # Connection with other services
- # Application ,use cases'

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5 W's

WHO WHAT
 WHERE
 WHEN WHY



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LBS vs. time

- # LBS only make sense with location being a temporal variable
- # Most LBS depend on (near-) real-time information provision and processing
- # Concepts of real-time geography therefore are fundamental for LBS

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Standards (examples)

- # ISO 19115 (Metadata)
 - # time stamp(s), temporal extent (via time attribute)
- # ISO 19108 (Temporal Schema)
 - # focus on ,valid time', no continuous time
- # SOS (mostly attribute change, but -)
 - # ISO 19141 (Moving features)
- # GeoRSS

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Concepts

- # Continuous vs discrete time; ‚Events‘
- # Convergence / divergence
 - # Alternative futures, scenarios
- # Cyclical time (diurnal, seasonal ...)
- # ...
- > Represented in temporal schemas

Sensors, Sensors Everywhere



GeoFence

From
electrical
 to
electronic
 fences



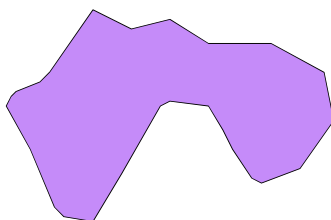
Transgressing a virtual borderline

Triggers an ‚event‘:

- # Message (SMS, ...)
- # Billing (Zone – Ticket, toll)
- # Intervention (Ignition locking)
- # Record (Log-entry)
- # Alarm sounding, no access, ...
- # ...



... remember time as a variable !!!



Geofencing and LBS

- # G. as one application logic within LBS
- # ‚Value added‘ based on LBS
- # Rule based coupling of positioning with geo-databases
- # ‚Realtime Geography‘!

Application domains

- # Personal safety and security
- # Plant security etc
- # Event security
- # Public safety
- # Rental fleets, fleet management
- # Sports / leisure
- # ...

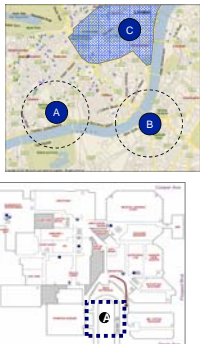
Commercial Applications

For ... FleetOnline service, we have claimed that it can track anything that moves. Now with Geofencing and notification capabilities, customers can use the product for even more applications."

"For example, airplane owners who rent their equipment can use geofencing to ensure that pilots do not stray from their stated flight plans."

"Sprint Family Locator is a valuable tool that can help parents and guardians have a better sense of their children's whereabouts when they're apart."

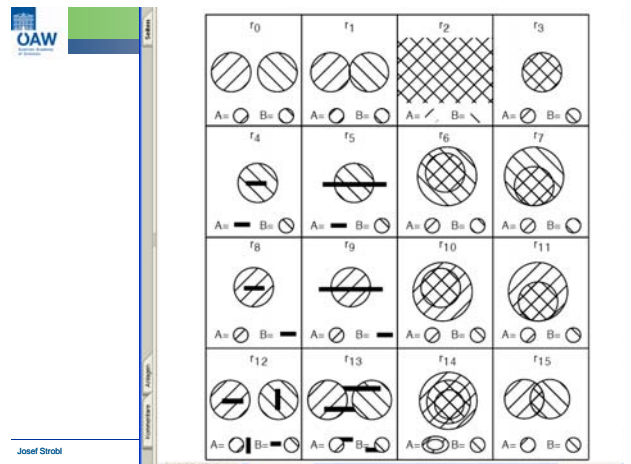
"With the growth of pet culture, GlobalPetFinder offers a solution to keeping your pets safe and stylish."



Geofencing/Alerting: associates events to rules, e.g. allowed/prohibited zones

Functionality

- Specify for each user rules based on location and/or any other sensor information (e.g. forbidden zones, max temperature, distance from another user, etc.)
- Specify alerts corresponding to rule violation, the violation severity and audit trail
- Specify events associated to the violation of a geofence, such as a message, a database trigger, or an alarm.



Spatial relations

Criterion			
Location			
topological	on point no point	on line not on line	inside border outside
geometrical	within radius	inside corridor	inside buffer
fuzzy	,close to' - ,near ...' - ,likely inside'		

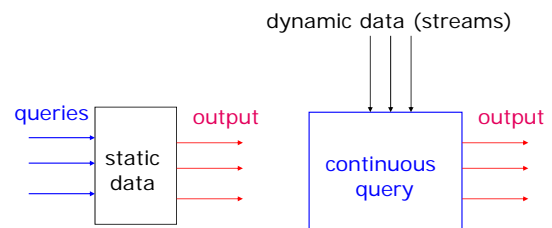
Rules for relative positioning

- # Pos A must not be within 300m from Pos B
- # Pos A, B, and C must be within a radius of 10m from each other to start process x
- # If Pos A and B come within 200m, then trigger > message

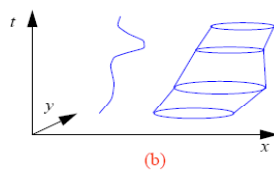
Needs

- ✓ Space-time ,streams' (MO data type?)
 - ✓ real time enabling
- ✓ Alternative futures (,bifurcation' of time)
- ✓ Link sensors – WPS – dynamic fields
- ✓ Operators and rules
- Monitoring!

Trad. DBMS vs. Sensor Network query



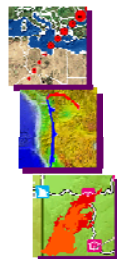
Moving point, moving region



intersection: mPoint x mRegion → mPoint
 distance: mPoint x mPoint → mReal
 trajectory: mPoint → Line
 timeIntervals: mPoint → Periods
 length: Line → Real
 ...

Tracking

- ✓ Event – An occurrence at a place (point, line, or polygon) at a noted time
- ✓ Events Describe
 - ✓ Dynamic – an event that moves
 - ✓ Discrete – an event that just happens
 - ✓ Stationary – an event that changes
 - ✓ Change – an event of change or growth
- ✓ Sources
 - ✓ Fixed-time – Past, Present, Future
 - ✓ Real-time – Present



GPS & mobile Internet



Telecom Based

GPS

Wi-Fi

Smart Tags

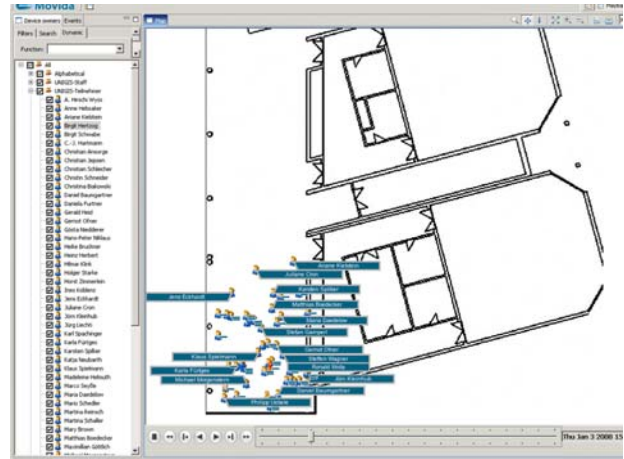
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Positioning / Navigation inside Buildings



- Functionality**
- Locates equipment through low-costs tags (Wifi or RFID)
 - Timestamps and positions it on floor plan
 - Discriminates between rooms and floors
 - Records positions and creates history (if activated)
 - Creates alert zones and location reports
- Features**
- Supports any Wi-Fi device (tags, handhelds, laptops and tablets)
 - Accuracy in the range of 1-3 meters
 - High number of devices can be located simultaneously
 - Operates indoors or outdoors
 - Privacy management when applied to people location

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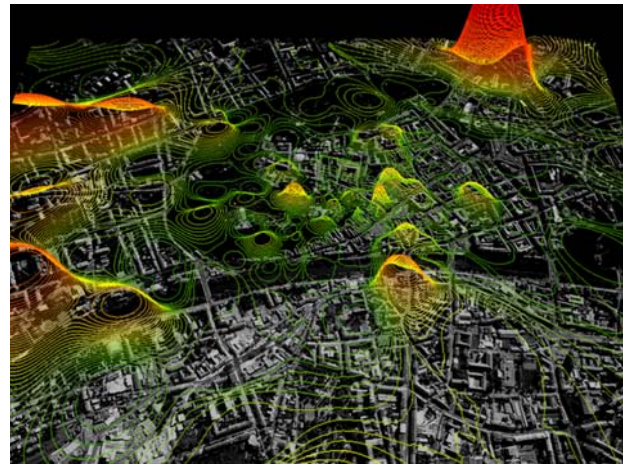


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Realtime Geographies

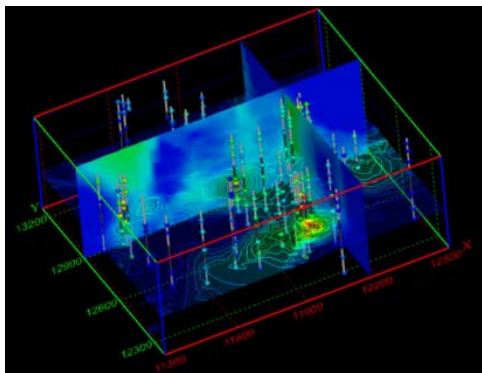
- Live connectivity enables realtime
- Example: cellphone localisation



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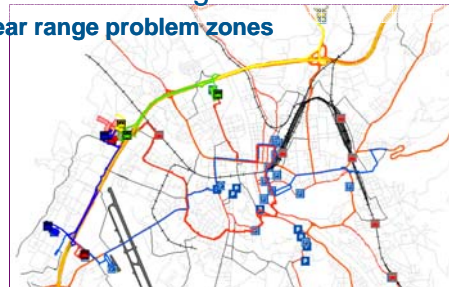


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Situational awareness Euro 2008 - Stadium Salzburg near range problem zones



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Situational awareness Euro 2008 - Stadium Salzburg near range problem zones

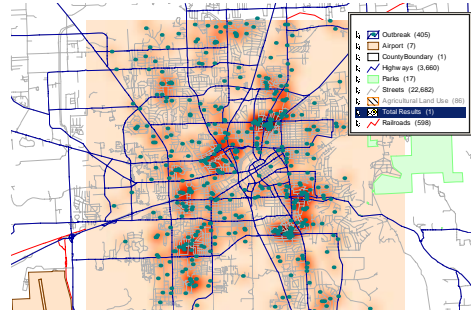


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Health: hot spot analysis



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Geofence Viewer Settings About this Showcase

Geofence Type: Zip Codes

Current Status: On Off

1	818-1722	23-0189	W
2	318-1565	23-7826	W
3	118-2092	23-8844	W

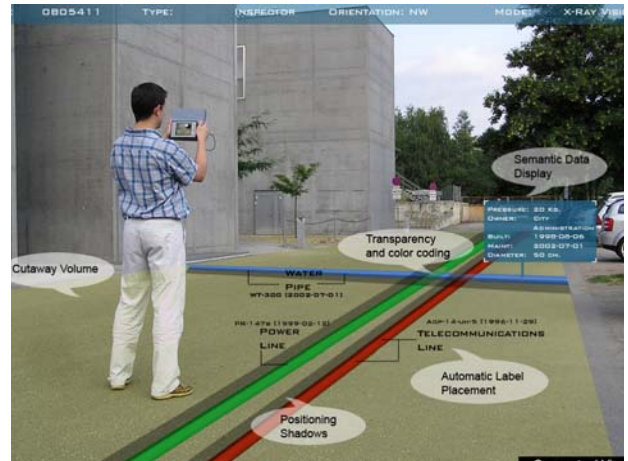
Detailed Tracking: View

Alerts:

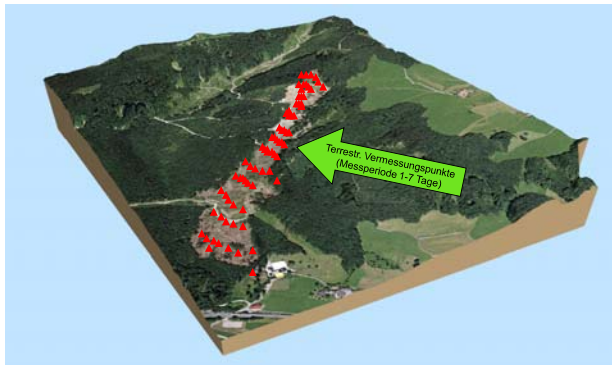
Vehicle 1	Vehicle 2	Vehicle 3
4792987 58252 AMB Enter+6 4792987 58427 AMB Enter+6	4792987 58381 AMB Enter+6	4792987 58313 AMB Enter+6 4792987 58333 AMB Enter+6

(Note: alerts occur when a vehicle exits or enters a fence.)

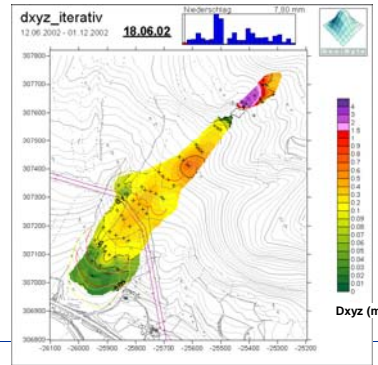
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Positioning and Sensors



Analysis and Visualisation



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Problem areas

- # Privacy protection
 - # Like other tracking applications
- # Employee rights
- # Throughput
 - # High frequency of observations
 - # High number of targets



Requirements

- # Full temporal enablement of services
- # Support for spatiotemporal streams
- # Operators
- # Near real-time processing services
- > Facilitating of monitoring and operational control

