Graphical Overview and Navigation of Electronic Health Records in a prototyping environment using Google Earth and openEHR Archetypes

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Full paper including references can be found in the the Medinfo 2007 proceedings, page 1043-1047. Further material and the paper will be available from http://www.imt.liu.se/~erisu/ after the conference.

EHR = Electronic Health Record
WARNING!

This presentation may contain...

- Non-validated ideas and non-scientific speculation
- Navigation that makes you seasick
- Abuse of software beyond its initial intended purpose

...in a slightly rushed tempo
Information Visualisation

- Some theory
  - Striving to engage the (often underutilised) human visual perception system and reduce cognitive load.
  - Humans can rapidly scan, recognise, and detect changes in visual properties. Andrienko [7] summarize them as being
    - **dimensional** (referring to position in space and time plus various arrangements of display space)
    - or **retinal** (size, shape, color, texture, orientation etc.)
  - …this prototype so far mainly regards dimensional properties

- Some methods (bag of tricks)
  - Focus on details without loosing context
  - “Semantic zooming”
  - Smooth animated transitions (promotes object constancy)

An entire research discipline with publications & conferences

Aims:

- Act as a **large menu**, streamlining access to details
- **Reduce risk** of missing information
- **Ease spotting** of trends and anomalies

- **Timeline, facets of information, aggregation, focus + context**
Bade, Schlechtweg, Miksch, (2) 2004
Representing time graphically using dimensional properties

- Linear (e.g. lifelines)
- Polar: angular or radial
- Added dimension (3D)
- Animation (time-lapse etc)

- Livnat, Agutter, Moon, Foresti, 2005
Non-geographic maps/diagrams?

- E.g. Clinergy [6] (used for data entry)
Google Earth and similar applications

- Fairly intuitive interaction style
  - Resembles the physical world + hyperlinks + timelapse/animation
- Focus + context
- Search, browse or both?
  - Presenting search hits within the "browsing context"
- Can these interaction and visualisation styles and previously shown time representations be used for EHRs?
  
  Maybe…
In the live presentation at Medinfo 2007 there was a demo here using Google Earth (downloadable from http://earth.google.com)

The file that had been loaded into Google Earth will be available from Erik Sundvalls research page after the conference if you want to take a look http://www.imt.liu.se/~erisu/
Future: Icons & pictograms

- Better icons and graphical languages could improve perception but have not been in focus (and are pretty bad) in the presented prototype.

[13] Lamy, Duclos, Rialle, Venot
Future?

- Tests of visualisations tailored for specific clinical purposes.
- Easier tools supporting visualisation creators with less programming knowledge.
- Conversion examples and advice regarding going from prototyping in Google Earth to implementation in more flexible visualisation platforms (e.g. http://www.prefuse.org/)
- Reducing redundancy in EHRs? If it’s easier to find and refer to existing data, will that lead to less redundancy in the records?
- Incorporating advice and traditional decision support within visualisations?
WANTED! 😊
(alive)

Contact with groups interested in user studies and further exploration of the ideas presented here.

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Reasonably priced multi-touch screens / devices

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Extra slides for Q&A etc. follow
What help does openEHR offer?

- Reuse of design patterns for representing **time**

**FIGURE 20** Time in the EHR
What help does openEHR offer?

- **Possible facets**
  - **archetypes used**, based on groups manually listed when creating the visualization, or by **archetype class** (observation, evaluation, instruction etc.) or **external ontologies** and systems [11] for classifying archetypes.
  - openEHRs ‘**folder’ structure** that e.g. can be used for linking entries to health problems, care episodes etc.
  - **terminology system entities** used in EHR entries e.g. ICD diagnosis codes or codes from SNOMED CT’s main categories and/or grouping according to the target of relationships like ‘finding site’.
  - **provider** of the entry (organization, **role or profession**, person).

- **Aggregation** (needed e.g. in zoomed out views) can be based on **facets and/or time**.
  - In some cases (e.g. in the openEHR class ‘History’) some events may already have been manually summarized at the time of data entry and this could of course be used.
Reviving *some* features of paper based health records

- Traces of frequent reading. Lost in transition to EHRs?
- Can related forms of peer-based traces/clues be recreated even better in EHRs?
- Sidetrack: Logging EHR-browsing.
- Other desirable features?
Visualise goals, plans etc?

Figure 5.1: Goal-graph for Diabetes Management (simplified).

- Thesis by Eric Donald Browne