Conceptual Aspects of 3D Map Integration in Interactive School Atlases

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Discussed Points

School Atlases
- Printed school atlases
- Digital school atlases

3D Representations in Atlas Information Systems
- Atlas of Switzerland
- Google Earth

Project of "Swiss School Atlas – interactive"
- Research project
- Didactic concept and guidelines
- Thematic content
- Technical concept
- Integrated map types

Integration of 3D Maps (3D Map Example: "Klus von Moutier")
- Didactic concept and requirements
- Characteristic and
- Intended functionality, interactivity and navigation
- Data and map content

Conclusions and Outlook
Printed School Atlases (1)

Examples:
- Swiss School Atlas (CH) (2004);
- The Atlas of Slovenia for Schools and Homes (SLO) (publ. year ?);
- Alexander Weltatlas (GER) (1996);
- Diercke Weltatlas (GER) (2002);
- Westermann Schulatlas Österreich (AUT) (2006);
- De Basis Bosatlas (NL) (2004).
Printed School Atlases (2)

Characteristics
- Comprehensive map collection (different scales and generalization degree)
- Depiction of different spaces (localities, regions, continents, world, celestial bodies)
- Extensive part of nation-oriented thematic aspects
- Exemplary approach (physical or thematic phenomena)

Map types and content
- Topographic maps
- Thematic maps
- Map related representations (e.g. cartograms, info graphics, satellite images, aerial views, block diagrams, schematic maps)
- Static map content
- Wide range of map content complexity (depending of school level)

Technology and products
- Digital data (different formats, systems inhomogenous)
- Modern pre-press and print techniques
- High quality print media
Digital School Atlases (1)

Examples:
- United Soft Media (2003): Der grosse Kosmos;
Digital School Atlases (2)

Didactic concept
- geographic information by maps and text
- no guided lessons or e-learning tools

Maps
- map out of print version
- limited numbers

Characteristics
- rasterized maps (from print version)
- same map content
- static representations (maps, images, legends, ...)

No perspective views / 3D maps!
Digital School Atlases (3)

Technology
• stand-alone applications on CD-ROM (e.g. with Macromedia Director)
• limited functionality and interactivity ("Hot spots" with hidden links)
• conventional navigation (selecting, panning, zooming)
• search engines

Functionality and Interactivity
• Navigation (selecting, zooming, panning, ...)
• Positioning (centering) (by places, by coordinates, by favourite positions)
• Displaying of layers
• limited: Searching (of places, of objects, ...)

No free navigation!
Atlas of Switzerland (1)

Characteristic
• Stand-alone application
• Established as teaching-tool in Swiss schools (higher levels)
• For complex analytical tasks with statistical data
Atlas of Switzerland (2)

Content
- "Small" scale representations
- 2D maps and perspective views
- Generalized geodata
Atlas of Switzerland (3)

Technology
• Complex stand-alone application with Macromedia Director and C++ applets
• Map calculating out of data base
• Texture mapping

Functionality and interactivity of 3D modes (panorama, block diagram)
• High performed navigation
• Terrain modelling
• Texture selection
• High developed natural and atmospheric effects
• Fast rendering

but:
• Only static images (no real-time navigation or animation)
• Limited interactivity within the map image
• Limited design interactivity for texture and object design
Google Earth (1)

Characteristic
- Web-based atlas information systems
Google Earth (2)

Technology
• Web-based atlas information systems (applicable nearly everywhere/anytime)
• Free download viewer

Functionality and interactivity
• High performed real-time display
• Easy and intuitive selecting and navigation tools
• Useful search engine

Limitations:
• Image quality for special localities
• Vector-based objects
• Cartographic symbolization

But:
Great potential!
Project of "Swiss School Atlas - interactive" (1)

Research project
• Begin 2006; for next 3 years
• Development of a prototype and a first version
• Supplement of the printed Swiss School Atlas
Project of "Swiss School Atlas - interactive" (2)

Didactic Concept

• Geographic information by mix of maps, text, images, ...
• Use of same map data like printed version:
  - adjusted/adequate data quality
  - high standard map graphic

• Flexible map structure (complete maps, outline maps, "thumb" maps, analytical maps, wall maps, ...)

• 3D maps integration in complete geography lessons
  - for analysis of relations between phenomena and terrain
  - as part of a pool of download resources (images)
Project of "Swiss School Atlas - interactive" (3)

Thematic Content and Data
- Topographic overview over Switzerland, Europe and all continents
  (topics: countries, cities, seas, lakes, rivers, mountain ranges with peaks, main traffic network, ...)
- Exemplary approach
- First version: selection of same map topics and map data
- No guided lessons or e-learning tools

Technical Concept
- Web-based atlas
- Host server for map and data supply
- Use of standard software tools
- Special authorization system for users
Map types and themes
• Classic orthogonal maps (topographic maps, thematic maps)
• Images and schematic maps (satellite images, orthophotos, profiles, sketches, ...)
• 3D representations (aerial views, block diagrams, 3D maps, ...)

Other atlas themes and workflows
• Geodata capturing and structuring (satellite images, aerial photography, geodetic methods, GPS)
• Map design and map making process (layer principle)
Intended Interactivity for 3D maps (development step 1 and 2)

- Map type selection (option for switching from orthogonal map to 3D map)

Navigation (selection of prepared views (out of a list)
- referencing the map section
- zooming
- panning

Selecting layer structure (textures)
- Selecting of thematic content by selecting the texture combinations

Examples of textures:
- terrain model (out of digital terrain model DHM25, ©swisstopo)
- digital topographic map (with separated layers: Situation, rivers and lakes, contour lines, forest areas; different scales) (out of PixelMap PM25, ©swisstopo)
- geology (out of geology map; scale 1: 25'000, ©swisstopo)
- geology combined with topographic map 1: 25 000
- vegetation pattern (out of digital landscape model Vector25, ©swisstopo)
- traffic network (out of digital landscape model Vector25, ©swisstopo)
- orthophoto (out of SwissImage, ©swisstopo; ground resolution 1m)
Project of "Swiss School Atlas - interactive" (5)

**Hot spots** (document activating by mouse-over operation on screen)
- orthogonal map position
- images
- text information
- frame-by-frame movies

**Free navigation**
- for exploring
3D Map Example "Klus von Moutier,,: Situation (1)

(Aerial view: © 2004 Schweizer Weltatlas)
3D Map Example "Klus von Moutier": Situation (2)

(Topographic map: SwissMap 50, © 2005 swisstopo)
(Aerial view: © 2004 Schweizer Weltatlas)
3D Map Example "Klus von Moutier": Terrain

(Geodata: Digital Terrain model DHM25; © 2005 swisstopo)
3D Map Example "Klus von Moutier": Geology

(Geodata: Digital Terrain model DHM25, Geological map 1 : 25'000; © 2005 swisstopo)
3D Map Example "Klus von Moutier": Geology (combination)

(Geodata: Digital Terrain model DHM25, Geological map 1: 25'000, Pixel map PM25; © 2005 swisstopo)
3D Map Example "Klus von Moutier": Topography

(Geodata: Pixel map PM25, Relief out of DHM25; © 2005 swisstopo)
3D Map Example "Klus von Moutier": Topographic map

(Geodata: Digital Terrain model DHM25; © 2005 swisstopo; Topographic map: © 2004 Schweizer Weltatlas)
3D Map Example "Klus von Moutier": Orthophoto

(Geodata: Digital Terrain model DHM25, orthophoto SwissImage; © 2005 swisstopo)
3D Map Example "Klus von Moutier,": "Hot spots"

Conclusions and Outlook

Demands from didactic concept
• Well considered didactic concept (adequate to school level)
• Different representation types

Demands on content of 3D maps
• Multi-layer approach
• Integration of labels

Technical approach
• Web technology (usable with standard web browser)
• Minimal software download (like Google Earth)
• Free navigation (later; but ambitious)
Project of "Swiss School Atlas - interactive" (4)

Intended Interactivity for 3D maps (development step 1 and 2)
  Map type selection (option for switching from orthogonal map to 3D map)

Navigation (selection of prepared views out of a list)
  Referencing the map section
  Zooming
  Panning

Selecting layer structure (textures)
  Selecting of thematic content by selecting the texture combinations

  Texture types: terrain model, topographic map, geology, vegetation and landuse pattern, traffic network, orthophoto, ...

Integrated "hot spots"
  to activate new documents (by mouse-over operation on screen)

  Document types: classic maps, 3D maps, pictures, text information, frame-by-frame movies, ...