Atlas of Switzerland goes online and 3D – Concept, Architecture and Visualization Methods

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Interactive atlas systems are products of high cartographic quality and user-targeted functionality. During the last two decades, numerous interactive atlas and mapping systems have been developed. These systems offer a variety of mainly statistical 2D map types like choropleths, point symbols and charts, and partly some 3D map types like panoramic views and block diagrams. They also include a bundle of atlas functionalities for spatial and temporal navigation, map visualization, and layer handling. With the rise of high-speed Internet connections, various online atlases appeared facing the challenge of streaming map data with good performance.

The *Atlas of Switzerland (AoS),* an example of a mature digital atlas, tries to advance the trends of 3D mapping, online and mobile applications in combination with existing atlas functions in its next version. The AoS is mandated by law by the Swiss Federation to visualize themes from different fields such as socio-economy, ecology, history and energy, etc. in an ongoing long-term project. Since its beginning in 1961, the aim of this Swiss national atlas is to offer cartographically sound maps in combination with additional information to the general public in order to visualize visible and hidden structures and processes.

The concept of 3D-based cartography will be pursued, where a 2D map is considered as a special case of a 3D map setting. Within this 3D environment, new rules, interactive methods and user-friendly tools for 3D navigation in space and time, map graphics and layer handling, and explorative analysis will be developed. The atlas should stand for a world of experience and discovery, inviting people to explore its thematic content, and interrelations. Conceptual considerations are also dedicated to the *Graphical User Interface (GUI)* of the 3D atlas: the GUI should work for desktop and mobile applications, and consider reduced feature and layout complexity as well as responsive design. A flexible GUI for different platforms has been set up therefore with methods of interaction design (IxD).

As an *architectural framework* for future AoS products and affiliated atlases, the AtlasPlatformSwitzerland (APS) has been implemented. The APS is divided into a back-end and a front-end part. On the back-end, the APS Editor facilitates composing map layers, adding media elements, and creating tile caches (TFS and TMS). Once a map is ready to be published, metadata is exported from the database in JSON documents, which are – together with the map tiles – hosted on a scalable web server. On the client-side, the APS front-end architecture consists of an atlas core (APS Globe) and a Web application UI. An important part of the APS Globe is its 3D visualization engine osgEarth, – a dedicated virtual globe.

The APS aims to provide eye-catching but still readable *3D visualizations* to raise the interest of the public. Depending on the source data type, the APS includes cartographic 3D representation techniques like billboards, 3D solid charts and 3D symbols for point data, curved lines for trajectories, extrusion for areas (Figure 1), and terrain modeling for volumes. Considering the combination of thematic layers with terrain interaction, its LOD behavior, occlusion and performance need to be taken into account. The challenging part is to make an intuitive visualization both in 2D and in 3D. Map readers get an overview from the birds-eye perspective and more details when tilting the globe.
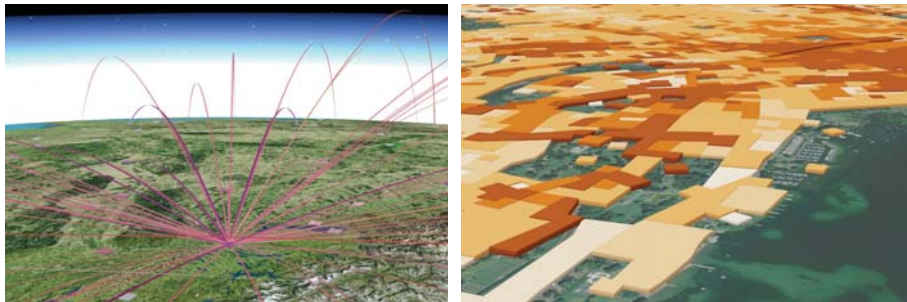

Figure 1. Linear trajectories: Direct flights (left); Extruded polygons: Settlement development (right).

The launch of the new product line *Atlas of Switzerland – online* is scheduled in spring 2016 as a desktop version for Windows. In the upcoming years, the functionality and content of AoS – online will be enriched stepwise according to user needs, and completed with an OS X Mac version. A version for tablets, AoS – mobile, is also planned. Both versions will offer a broad range of thematic maps, visualized with 3D techniques, giving professionals and inexperienced users the opportunity to combine and explore different geospatial phenomena in a modern atlas user interface.