From analog atlases to ubiquitous atlassing

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0. Preamble

A user-oriented creation/acquisition of space/time/theme-related knowledge is a mayor challenge of the 21st century. In view of this, the digital atlases can be an important format of knowledge transfer. Currently, atlases are the object of study and research of many disciplines, not just cartography. Analogue and digital (electronic) atlases in terms of semiotic (space-, time- and theme-related) knowledge models assume an important role in modern information societies. As holds true for other media, the digital atlas has started to replace its analogy pendant. However, from a semiotic point of view it is important to consider not only technical issues but also to develop theoretical and conceptual aspects as well.

1. Definitions of atlases

Different definitions of the term "atlas" have been proposed during the last decades, approaching this concept from cartographic, semiotic, encyclopaedic etc. viewpoints.

1.1. Map-related definitions

The German cartography textbook by Hake et al. (2002, p. 509) specifies *atlas* as follows: "Atlases are systematic collections of topographical and / or thematic maps at selected scales, of a particular area, and with a particular objective." (authors' translation). The English textbook by Kraak & Ormeling (2010) supports this notion, defining atlases as "... intentional combinations of maps or data sets, structured in such a way that specific objectives are reached". Consequently, we can consider any approach of understanding atlases as system of maps to be an "orthodox" definition, widely accepted during the 20th century among cartographers and geographers.

1.2. Semiotic definitions

From a semiotic point of view, an atlas can be understood as an analogue or electronic knowledge model. Map, text and image are the meta-variables used to conceptualize and create this model (cf. Wolodtschenko, 2012). One might notice that – in contrast to the cartographic notion – an atlas seen from the semiotic perspective not necessarily has to be built upon maps. Regarding these atlases with non-cartographic traditions, cartography cannot claim any particular competence.
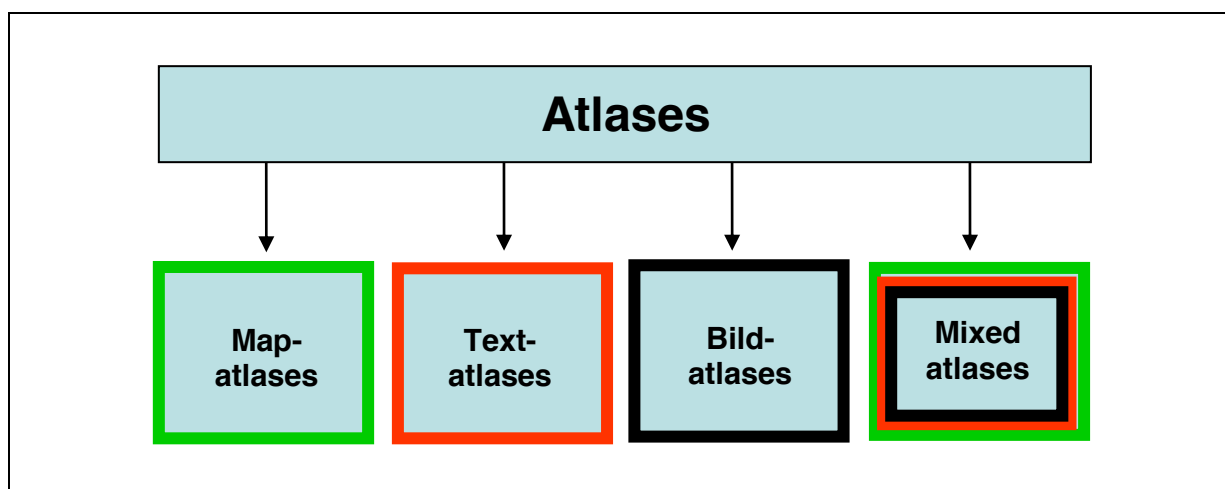
1.3. Ubiquitous atlases

We define ubiquitous atlases as semiotic knowledge models designed for mobile devices (e.g. smartphones or tablets), accessible anywhere and anytime. These atlases focus on operational and mobile search, visualization, structural analysis and interpretation of spatial and temporal information (map/map-like, textual and illustrative forms, or a combination thereof) and the acquisition of new spatio-semiotic knowledge.

2. Semiotic classification of atlases

From a user's perspective, one can subdivide the different types of atlases regarding purpose, content, structure, design, etc. Any atlas is a subject matter of atlas semiotics. Hence, these studies comprise atlases in both cartographic and non-cartographic terms.

For a semiotic classification we can subdivide all atlases in a fourfold manner, being the predominance of the semiotic meta-variables (map, text, image) the distinguishing feature (cf. fig. 1); additional, e.g. acoustic variables can be added when relevant:

- map-based atlases (> 50% maps)
- picture-based atlases (> 50% images)
- text-based atlases (> 50% text)
- mixed-atlases (each meta-variable <50%).

Fig. 1 Semiotic classification of atlases (after Wolodtschenko 2007)

3. Ubiqiutous atlases, atlassing and cloud-computing

3.1. Atlases within the semiotic coordinate system

From a cartographic point of view, the 20th century was the century of Bertin's graphic semiotics, based on visual cartographic applications and six graphic variables (cf. fig. 2a, left). After more than 50 years of development and principles of syntactic and logical rules for the use of map graphics, the graphic semiotics of the 20th century passed on to multimedia semiotics.

Against this background and in accordance with the aforementioned classification of atlases, the six graphic variables (cf. fig. 2a, right) can be extended both conceptually and methodologically by a triaxial coordinate system of semiotic meta-variables (Wolodtschenko 2007). This coordinate system defines all atlases, including ubiquitous atlases, as semiotic models built and set in the threeness of map, text and image (cf. fig. 2b).
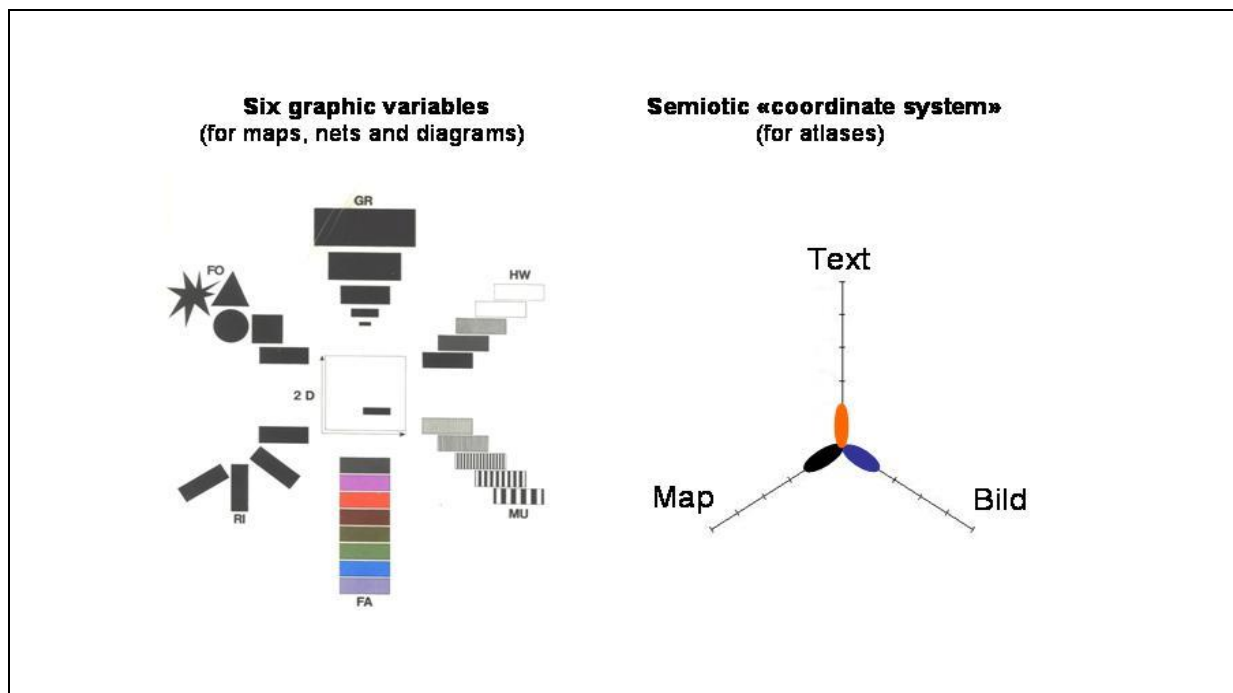
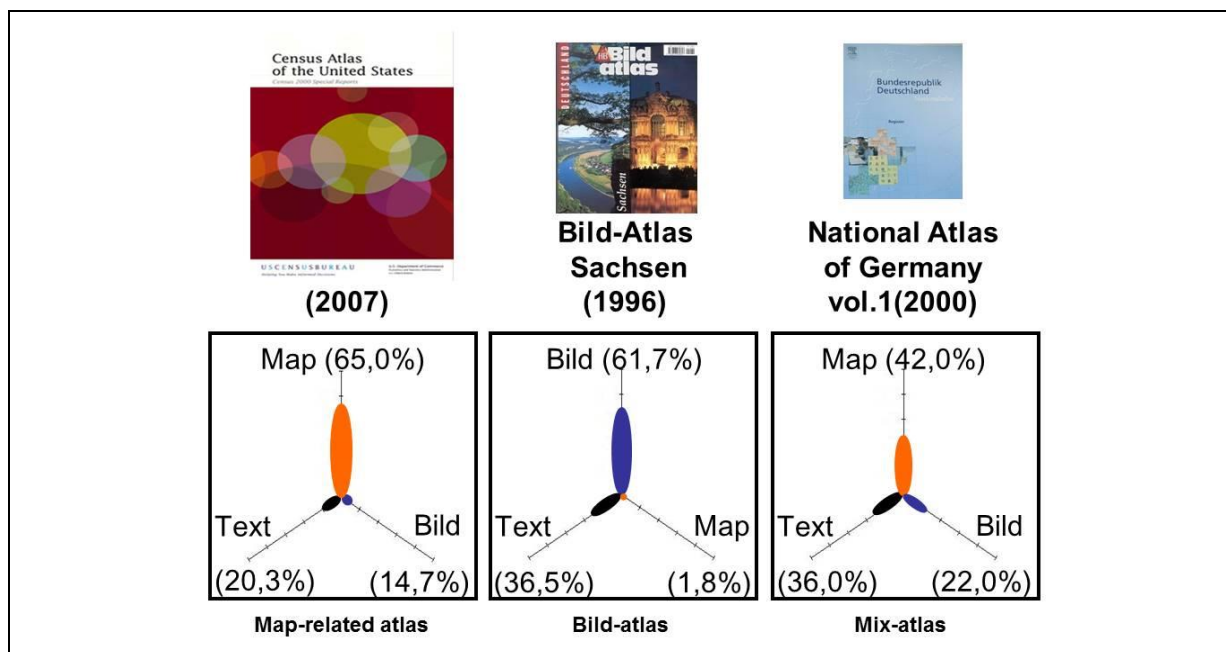**Fig. 2a** Graphic variables (for maps) and semiotic meta-variables (for atlases)

Fig. 2b Application of semiotic meta-variables for the analyses of atlases

3.2. Atlassing

Atlassing is a relative new term in the realm of atlas semiotics and cartography. Including semiotic analysis and portraying of atlases, atlassing also describes the transition of atlas *products* to atlas *processes*: "an atlas no longer needs to be understood as a *product* consisting of a combination of already existing maps, but rather as a *process* including data acquisition and mapmaking as well." (Hruby et al., 2015) As a new methodical-semiotic approach, atlassing is open for both cartographic and non-cartographic concepts.
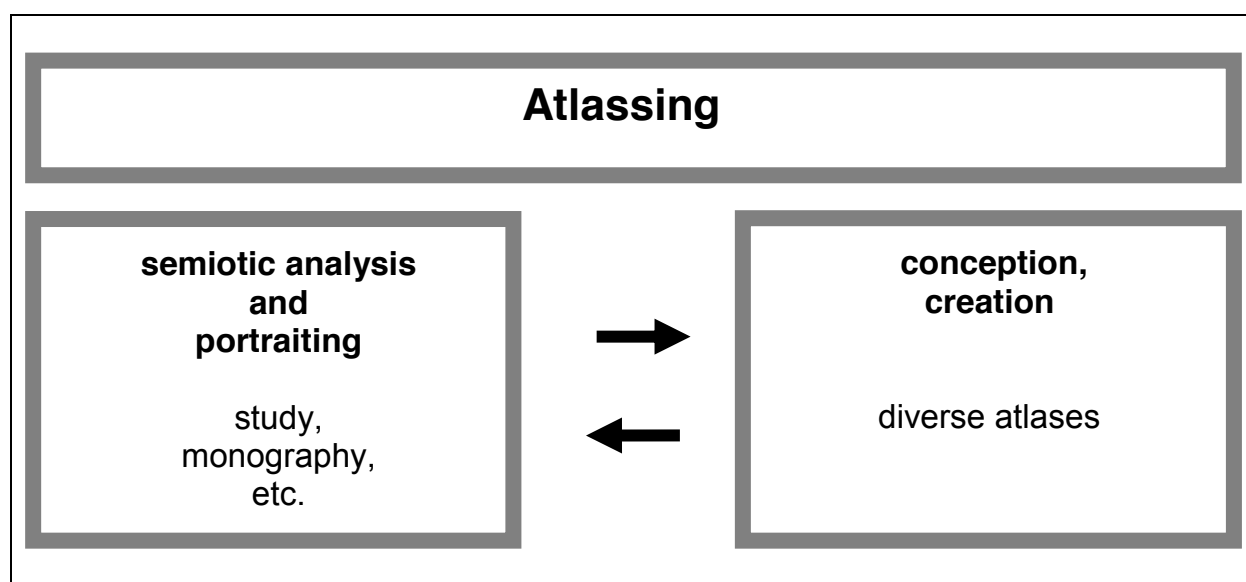
**Fig. 3** Structural model of atlassing (after Wolodtschenko 2012)

3.3. Cloud-based atlassing

The Internet has evolved into a powerful tool for cartographic and non-cartographic users. Cloud computing is taking these benefits even a step further.

In recent papers, Hruby (2015) and Hruby et al. (2015) proposed and discussed methodological usage of atlassing and cloud technologies for map-related atlases. Cloud technology is now one of the most popular topics in the IT-sphere; concerning atlas cartography, cloud computing is still at an early stage.

Cloud-based atlassing can bring, on the one hand, economic benefits for its users: They don´t need to afford hard- or software, nor care about maintenance issues. Rather they can lease necessary capacities on a pay-per-use basis, or even make usage of free (incl. open source) solutions. Moreover, cloud-based depositories allow ubiquitous access to a wide range of data – both as producer and user of data.

On the other hand, cloud computing profits by the multiplied processing power of data centers, facilitating compute-extensive tasks, e.g. mobile real-time applications (e.g. Yang et al., 2011).
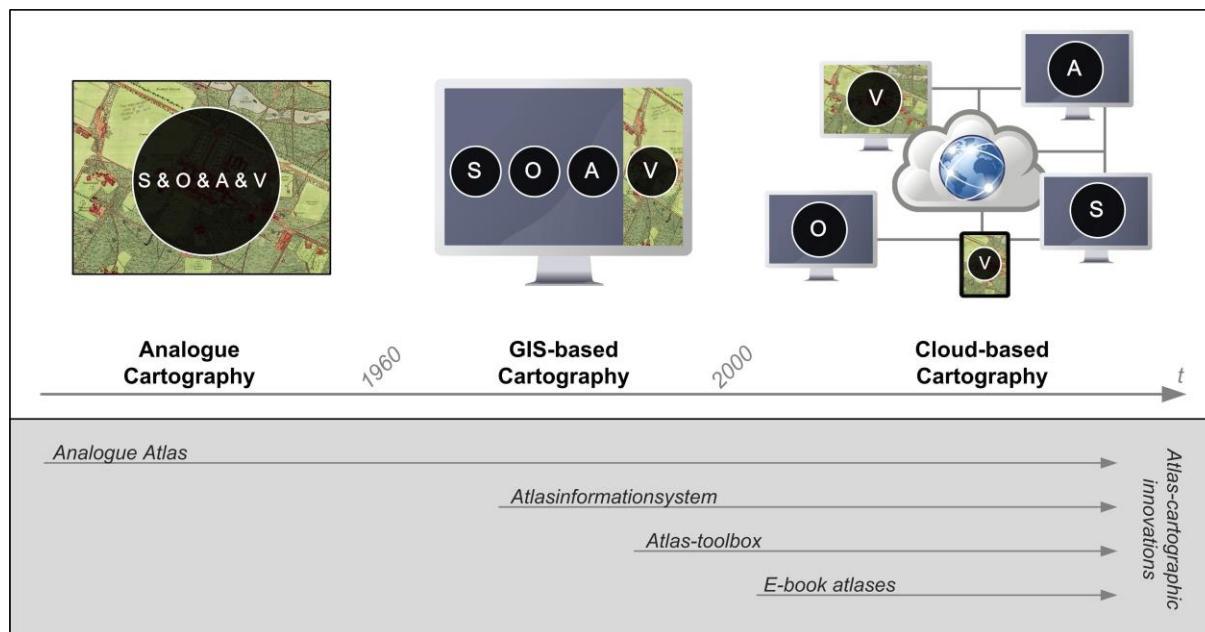
Fig. 4 From analogue to cloud-based cartography –basic tasks of analogue maps [(store (S), organize (O), analyse (A) and visualize (V)], and their transformation into the cloud; paralleled with selected atlas-cartographic innovations (modified after Hruby et al., 2015)

4. Conclusion

In this paper, we tried to show how the atlas as a semiotic knowledge model evolved from a paper print product to a cloud-based process; the term atlassing has been proposed to label this transition. As we have outlined, this development can be approached from a both cartographic and non-cartographic viewpoint. In either case, atlassing can take advantage of cloud computing technology, which implies more processing and communicational power at lower costs.

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Summary

Atlases are the object of study and research of many disciplines, not just cartography. Ubiquitous atlases, in terms of semiotic knowledge models designed for mobile devices (e.g. smartphones or tablets), are accessible anywhere and anytime. Representing a new methodical-semiotic approach, atlassing is open for both cartographic and non-cartographic concepts and includes the transition from atlases-as-products to atlases-as-processes (e.g. cloud-based processes).

Zusammenfassung

Atlanten sind Forschungsgegenstand vieler Disziplinen, nicht nur der Kartographie. Ubiquitäre Atlanten als semiotische Wissensmodelle für mobile Geräte (z.B. Smartphones oder Tablets) sind jederzeit zugänglich und überall verwendbar. Als neuer methodisch-semiotischer Ansatz ist Atlassing für kartographische und nicht-kartographische Konzepte offen und beschreibt den Übergang von Atlas-Produkten zu Atlas-Verfahren (z. B. zu Rahmen eines cloud-basierten Prozesses).

Резюме

Атласы являются объектом изучения и исследования многих дисциплин, а не только картографии. Юбиквитные атласы как модели семиотических знаний, предназначены для мобильных устройств (например, смартфоны или планшеты), доступны везде и в любое время. Как новый методико-семиотический подход, атлассинг открыт для картографических и не картографических концепций, и включает переход от атлас-продукта к атлас-процессу (например, на основе «облачных технологий»).