

9 ATLAS FUNCTIONALITY: INTERACTIVE FUNCTIONS AND TOOLS

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9.1 INTRODUCTION

Basically, *atlas functionality* is used to answer the four main user's questions: "What?", "Where?", "When?", and "Why?". "What?" refers to the thematic issues and maps of an atlas, "Where?" treats the geographic-topographic context, "When?" sets the temporal frame of the theme, and the question "Why?" is answered by the informative-didactic components of the atlas. *Atlas tools* enable the user to manipulate and visualize maps and data. In general, their functionality enables interactions with the geographic and thematic content of an atlas.

When *users* were asked about tools or functions they would like to find and apply in digital atlases, the request will certainly end up with a full bunch of features. Interestingly, the same effect can be observed with atlas authors: pushed by the (supposed) feature request of the users and also driven by their own ideas, they implement a lot of functionality in their atlas application.

But if we take a closer look at the real utilization of *atlas functions* we can state that less is more: Users apply only a few functions very often, while most of the functions were rarely or even never used, although they were rated as useful (Pucher 2011).

Why does this gap between wishful thinking, theory and reality exist? Generally, users are "map consumers", not "power users", and most of them are just occasional atlas users. The majority of the atlas users – of any atlas type – use only 20% of all functions available. The user activities mainly focus on looking at maps, exploring them visually, picking some map-related information, and on using some map distribution functions, e.g., *Print and Export*. These findings are documented in several surveys on interactive atlases (Kramers 2007; Pucher 2011; Sieber et al. 2010; Schnürer et al. 2015).

Concerning the occurrence and effective frequency of interactive functions offered in several digital atlases, another remarkable fact is revealing: only a few functions (less than ten!) are available in more than 50% of the atlases (Ortner 2011). Of course, an atlas has to offer more than ten functions, but they should be carefully selected according to the target audience. Thus, the statement "*You have to know your user*" (Cooper et al. 2003) is an imperative in order to design atlas functions and tools. In addition, not only the number of functions but also the importance of every function has to be considered to build up a user-focused, tailor-made atlas.

This chapter will give an overview on the atlas functions available, classify them into functionality and interactivity categories, and finally add some advice how they can be best applied as atlas tools.

9.2 CATEGORIZING INTERACTIVE ATLAS FUNCTIONALITY

Interactive functionality is one of the core elements of a digital atlas. To determine the required functionality, an atlas editor firstly needs to understand what functionality means. Functionality can be defined as: “The quality or state of being functional; *especially*: the set of functions or capabilities associated with computer software or hardware or an electronic device.” (<http://www.merriam-webster.com>). The definition shows two important functionality aspects: *Quality and State*. *Quality* includes the terms *interactivity and usability* (see chapter 3), while *State* means the *set of functions* of a digital atlas. Therefore, interactivity and the functional set of an atlas are crucial factors for effective atlas presentation and have to be discussed in more detail.

Levels of Interactivity

Interactivity in atlases allows the user to manipulate geo-related information and maps in order to get tailor-made visualizations and also knowledge gain. From a user-centered perspective, interactivity depends strongly on the tasks and activities users want to achieve. For the use of maps, van Elzakker (2004) distinguishes between: search activities, selection activities, reading activities, analytical activities, adjustment activities and construction activities (see chapter 3). In practice, some of the activities with maps and

atlases are used in different contexts and some more often than others. Thus, two levels of functional interactivity are proposed: *Basic* and *Advanced*.

- *Basic interactivity* is dealing with activities like: Looking at maps and compare them visually (time, space), get some information about the topic, move around, search and locate places, export the visualization result.
- *Advanced interactivity* covers more high-level activities as e.g., detect and compare map patterns and processes (Andrienko and Andrienko 2007), import and recalculate data sets.

Based on these two interactivity levels, a dedicated set of atlas functions can be defined and applied to digital atlas tools. As it is outlined in chapter 7 *Atlas GUI Design*, the tools were implemented by means of *Input and Output Controls, Selection and Action Controls*.

Set of Functions, Functional Groups

To reveal the full capability of digital atlases a set of useful functions must be offered to the user. In the mid-nineties, Van Leeuwen (1996) listed about 40 desirable functions arranged into nine groups: general functions, navigational functions, map functions, database functions, atlas functions,

POSSIBLE FUNCTIONS IN INTERACTIVE ATLASES

educational functions, cartographic functions, map use and analysis functions, and miscellaneous functions. Subsequently, rather divergent approaches for the classification of functions in interactive atlases were presented, e.g. by Ormeling (1997) and Bär and Sieber (1997). This might be an indication of the complexity to set up a comprehensive, well-founded classification.

Considering the structure of modern digital atlases and their functional segmentation of the GUI, an adjusted grouping schema seems appropriate. Based on additional work of Cron (2006a), the functions can be arranged in five functional groups:

- General Atlas Functions
- Navigation Functions
- Cartographic and Visualization Functions
- Analytic Functions
- Information and Didactic Functions.

As a result of an analysis of some of the most popular and comprehensive atlas products currently available, Table 9-1 shows possible functions in interactive atlases. The table gives an overview and can be expanded in the future. There is no strict separation between basic and advanced interactivity level, and it is not recommended to integrate every function labeled as “basic” in an atlas.

In the following subchapters, a characterization for a selection of *representative atlas functions* is provided, always considering the three paragraphs: Definition, Implementation/Tools, and Interactivity. To give a graphical impression of the functions, exemplary sketches are added. A full description of all functions can be found in Cron (2006b).

Function Groups	Function Subgroups	Functions Basic Level of Interactivity	Advanced Level of Interactivity
General Atlas Functions	System-related Functions	Language Selection; Print; System Status; Help; Imprint; Home; Exit	
	Content-related Functions	Forward/Backward (Map History); Tooltips; Bookmarks	2D/3D Modus Selection; Export/Import: Maps and Data; Hot Spots; Preferences
Navigation Functions	Spatial Navigation	Region Selection; Scale Selection; Zooming; Panning; Reference Map; Location/Georeference; Geographic Index/Gazetteer; Geographic Search	2D Map Rotation; Viewing Direction in a 3D Map; 3D Moving and Flying around; Tracking; Pins, Localizer; Magnifier; Snapping
	Temporal Navigation	Time Point/Period Selection; Temporal Search and Temporal Index	Temporal Animation/Time Change/Time Line
	Thematic Navigation	Theme Selection; Theme Change/Switch; Thematic Index; Thematic Search	
Cartographic Visualization Functions	Map Manipulation	Layer Display/Layer Overlay (on/off); Layer Transparency; Legend Display (on/off)	2D Symbolization/Appearance Modification; 3D Symbolization/Appearance Modification; Projection Change
	Redlining	Labelling: Static	Labelling: Interactive; Additional Map Elements
Analytic Functions	Spatial Queries	Positional Query; Distance and Area Measuring	
	Thematic Queries	Attribute Query	Attribute Selection
	Thematic Analysis	Map Comparison	Classification Modification; Classification (Legend Category) Selection; Map Feature Comparison; Map Feature Selection; Buffering; Intersection; Aggregation
	Terrain Analysis		Hypsography; Slope; Aspect; Visibility; Terrain Profile
Information and Didactic Functions	Commentary Functions	Multimedia: Text, Graphics, Tables, Pictures/Images, Sound, Movies; Preview	Guided Tours
	Self-Control Functions		Didactic Tasks; Quizzes; Games

FIGURE 9-1:

SYSTEM STATUS FUNCTION

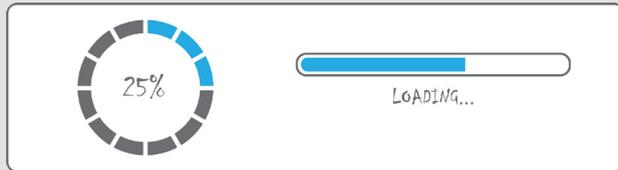
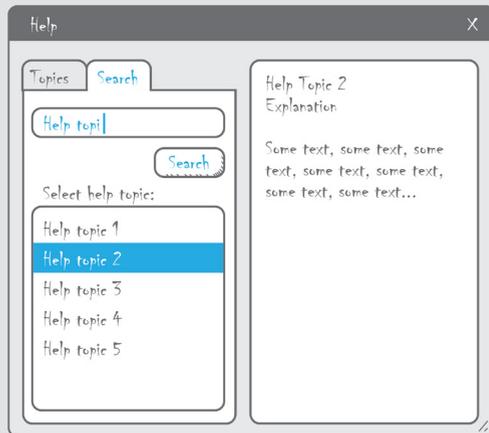


FIGURE 9-2:

HELP FUNCTION



9.3 GENERAL ATLAS FUNCTIONS

The General Atlas Functions are not atlas-specific. They are well-known from other applications, permanently available/applicable and have the same functionality in all programs. Distinctions are made between *System-related Functions* and *Content-related Functions*.

System-related Functions

Language Selection [Basic]

Definition: The function enables the user to choose the preferred language of the user interface.

Implementation/Tools: Language Selection is realized by means of an Icon or a Push Button. Either tools containing a symbol of the country's flag or are labelled with the name of the selectable language. A Drop-Down List can be used as an alternative if more than 4 languages are selectable or the user interface has not enough space for showing all selectable languages at once.

Interaction: By clicking on the language Icon or Button or by selecting the language from a Drop-Down List, the user interface and atlas content is translated into the chosen language.

Print [Basic]

Definition: The Print function allows the output of a chosen map or map excerpt on a printer connected to the computer. Settings for printing, such as quality, paper size or format may be made individually before printing.

Implementation/Tools: Print is usually done by means of an Icon with a printer symbol – just as the users know from other programs. As an alternative, the function can be called up from the atlas menu using a List Box or a Drop-Down List. The

assignment of the Print function with a Function Key (Keyboard Shortcut) is also very common.

Interaction: Pressing the Print Icon opens the Print setup window, where the user can view and edit the print settings.

System Status [Basic]

Definition: On the one hand, the function can inform the user about the current status of the application, e.g. loading time or running processes. On the other hand, the function can show information that increases the atlas usability, e.g. name and usage of the chosen tool.

Implementation/Tools: The System Status function is implemented using the Status Bar tool for displaying a progress. An animated clock symbol Icon is often used as well. Information shown in text form like name and usage of a tool is presented in a Display Field.

Interaction: Status Bar, Display Field or animated Icons cannot be manipulated by the user directly. As soon as an action of a UI element is triggered on the user interface of the atlas application, the user gets informed about the System Status.

Help [Basic]

Definition: The Help contains information about the atlas content and functionality to improve the usability of the atlas and supports the user in atlas handling.

Implementation/Tools: The Help function is a combination of Entry Field, Action Button, Display Field and List Box, arranged in a Help Panel. The Help Panel can be accessed via an Icon, a Drop-Down List or an Action Button labelled 'Help'. start page)