

## THE INTERACTION BETWEEN STRUCTURE AND FUNCTION IN TACTILE CARTOGRAPHIC MEDIA

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### BACKGROUND AND OBJECTIVES

For many years there have been attempts made across the world to develop concepts for versatile tactile cartographic media. This is expected to lead to the further development of conventional maps for the blind and also to electronic, multimedia aids for the visually impaired (cf. Geiger 2008, Koch 2009). The theoretical basis for the conception, design and manufacture of modern tactile cartographic media has been relatively rudimentary. To date, there has been no specific in-depth research into either the structure or the function of these media. Knowledge regarding the interaction between structure and function (i.e. the relationship and the influence of the individual components of the structure through components of the function and analogously the concrete influence of the function through different structure components) has been completely lacking.

### APPROACH AND METHODS

In order to fill this gap in research, theoretical studies have been carried out and empirical research has begun. Following critical analysis, basic knowledge derived from the “visual world” has been carried over to the “tactile world”, in order to better characterise the theoretical foundations of tactile cartography. However, completely new avenues have also been pursued. Along the way, the scientific methodology of semiotic theory, together with communications and model theory have served as important resources.

### RESEARCH RESULTS

The newly developed complex structural model is based on three elements of media: hardware, software and system of symbols. The media element Software stands for “wherewith” and “whereon” tactile cartographic information is to be made representable and stored. The media element software describes “how” cartographic information will be forwarded to the user. The media element system of symbols designates the code “with which” the transferred information is coded. These media elements are described semiotically.

In comparison to the functions of visual cartographic media, tactile media have somewhat different principal functions, along with various sub-functions. There are two distinguishable invariant and three variant functions. To the invariant functions that are fulfilled by each tactile cartographic media, belong the information bearer function and the communication function. To the variant functions that can be fulfilled only by certain tactile cartographic media, belongs the realizations function, the orientation function and the socialization function, which is not among the main functions.

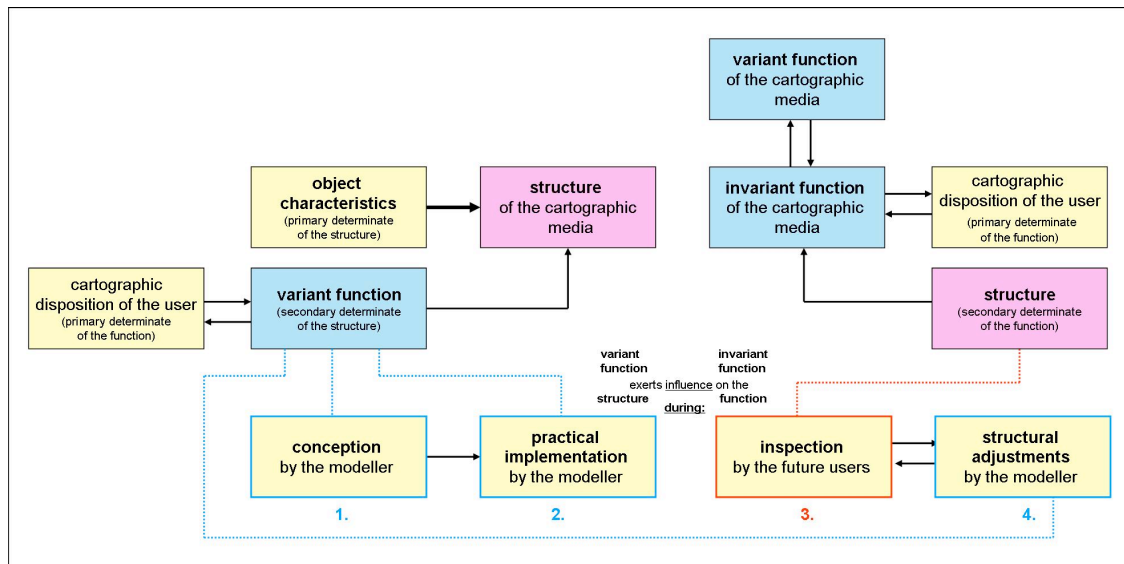
There is an interaction between structure and function in tactile cartographic media, occurring in the form of interdependence and reciprocal influence.

The tactile cartographic modelling process can be subdivided into four phases (working steps):

- The initial conception of the medium, taking into consideration any predetermined or known functions,
- The practical implementation of the conceived application by the modeller,
- The inspection of the newly manufactured media application by the future user(s) (it is essential that this be taken into account!),
- Structural adjustments to the predefined function (structural optimisation).

For this purpose, graphic structural models (schemes) were developed. In the first two phases, the variant functions determine structural development, and thereby establish the boundaries of the (media-) structure in advance.

In the third phase, a structure that already exists retroactively influences the targeted function. The finished structure of a tactile cartographic media application retrospectively determines the functionality and efficiency of the medium; it can even have an impact on the medium and set limits upon the pre-determined functionality.



During the phases of the conception and the practical implementation by the modeller in the tactile cartographic modelling process it is possible, that various and goal-oriented influences of individual structure components through the **variant functions** that are determined in advance, take place.

Some structure elements can develop themselves independently from variant functions, while others strongly depend on the functionality of the media application that is determined in advance.

In the tactile cartographic modelling process the **invariant functions** can generally not exert any influence on the structure development of a new developing tactile cartographic media application.