Problem statement:

Framework for integrating thematic uncertainty information into a Geovisual Analytics process

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Due to the increasing availability of Geodata and their integration into decision making processes there is also a growing demand to model and to communicate related information about the quality or uncertainty of those data or derived parameters. In many cases this also includes a spatial representation and analysis in order to detect local disparities, patterns or relationships for a follow-up reasoning step.

Considering Visual Analytics as a supporting methodology for this task, most of the presented work has dealt with problems of completeness and consistency of data. In contrary to that, this work focuses on thematic or attribute accuracies attached to locations (e.g., class membership probabilities in classified remotely sensed scenes).

In order to avoid typical ad hoc-analyses the general goal here is to develop a **task-oriented framework that integrates thematic uncertainty information into a Visual Analytics process.** It is envisaged to generate a **well structured compilation and connection of tasks in the course of considering uncertainty information by defining these tasks and recommending related and existing operations and visualization formats for a combined visual and computational processing**. In more detail:

- Selected, typical **tasks** considering uncertainty information can be: Get an impression of distribution of uncertainty values; get an impression of spatial disparities or patterns in uncertainty; detect outliers and special (spatial) characteristics of outliers; show/remove all locations (attributes) with "too low" uncertainty; detect correlations between uncertainties of different attributes; detect potential spatial autocorrelation.
- With respect to visual and computational **operations** mainly interactive filtering, either spatially or thematically (with the special case of filtering in histograms) are necessary in order to reduce the complexity of the overall process and to free cognitive resources for the reasoning step.
- To support the uncertainty analysis different **visualization** formats are needed which have to enable a tight connection between uncertainty and geo-thematic information. If it is not possible to integrate both types of information into one single map frame, at least linked formats (like linked choropleth maps, linked histograms, highlighting of selected areas and points) have to be provided.

Discussion issues related to this topic can include:

- Is the general framework consistent?
- Are there known approaches to group tasks related to uncertainty consideration in a meaningful manner (aiming at a kind of "taxonomy" which allows a more strict grouping, for example in navigation menus)?
- Are there detailed experiences or ideas for allocating operations (interactive filtering, or others) and visualization formats to specific tasks (for example: highlighting results of interactively selected percentiles in histograms in a choropleth map for showing spatial occurrence and patterns of outliers)?