Evaluating Sketch Maps Qualitatively: A new software-supported method

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Challenges of Sketch Map Analysis

Although we know that human spatial knowledge is (mostly) qualitative, there are no suitable tools to support a comprehensive qualitative analysis of sketch maps. The most popular automated approach is the (quantitative) bidimensional regression which is affected by distortions typical to sketch maps. Qualitative approaches are either manual (lacking formalisation) or restricted to analysing a single type of spatial relation

Automating the Qualitative Analysis

We propose a new software-supported method to analyse sketch maps qualitatively. It automatically calculates the qualitative relations among all annotated features in the maps, providing a summary score for their completeness and correctness (recall and precision) that is not affected by the cognitive distortions typical to sketch maps.

Step 1: Annotate the area's reference map

Annotate the reference map and mark all relevant features (streets, landmarks, regions) that should be investigated. That means it is possible to limit the evaluation to only a few features, e.g. landmarks mentioned in your experimental materials.



Step 2: Annotate the sketch map

Analogously to Step 1, annotate the sketch map ensuring that each corresponding feature is annotated with the same label in the reference map and in the sketch map.





SPATIAL INTELLIGENCE ILABORATORY	Sketch Map Clas	sifier	WWU MÜNSTER
Overall Accuracy:			Sketch Map ID: 42
Precision		0.84	
Recall		0.55	
F-Score		0.67	
Completeness of Drawn Figures:	Features of Ref. Map	Drawn Features	Completeness (%)
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Step 3: Analyse the results

The software calculates the following variables:

Precision is the proportion of elements that are correct.
Recall is the proportion of information (correct or not) that was included in the sketch map.

The **F-Score** describes the relation between precision and recall (their relative weight can be adjusted).

Street segments	/		0	85.71				
Landmarks	4			4	4 100.0			
Regions	2		1	50.0				
Correctness of Drawn Features in Sketch Map:								
Qualitative Spatial Aspects	Relation in Ref. Map	Relations in Sketch Map	Correct Relations	Wrong Relations	Missing Relations	Accuracy Rate (%)		
Topological Relations between Landmarks and Regions	15	10	9	0	1	90.0		
Linear Ordering of Landmarks along Street-segments	15	6	5	1	9	83.33		
Left-Right Relations of Landmarks wrt. Street-segments	9	4	2	0	7	50.0		
Topological Relations between Street- segments and Regions/Landmarks	42	30	30	0	12	100.0		
Connectivity of Street-segments	21	15	11	1	9	79.35		
Relative Orientation of Connected Street-segments	40	9	5	0	5	55.56		

The completeness of sketch maps is provided separately for streets, landmarks, and regions. Elements that are missing are not included in the calculation of incorrect relations.

The results are also provided separately for each sketch aspect, i.e. for each set of qualitative relations that were evaluated by the software.





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