

# Grounding Spatial Named Entities and Generating Visual Document Surrogates

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**Abstract:** Two parts of the Named entity (NE) annotation task have recently been automated with near-human performance [5]: identifying the scope of each text span and its class (e.g. place name). The third part, grounding the result with respect to its denotation in the world or a model, is the focus of this project. We ground (geo-)spatial named entities using geographic coordinates, suggest a minimality-based place name resolution algorithm, and show the results can be visualized using off-the-shelf software. Using this, visual surrogates—geographic maps communicating the “spatial aboutness” of a story—can be generated from Web newspaper stories [4].

## Background

Gazetteers are lists of names of geographic entities, usually enriched by information regarding class (town, river, dam, ...), size, and location (with respect to some coordinate system, e.g. longitude/latitude) [1]. To date, NE tagging has used gazetteers only as evidence that a text span could be some kind of place name. In contrast, we show how they can be used for spatial grounding, i.e. relating NEs to their real-world referents, and demonstrate how grounding can be used to resolve referential ambiguity.

## Method

Many places share the same name (Berlin, Germany/Berlin, Wisconsin). Humans resolve ambiguous place names in a discourse easily. We propose two minimality heuristics [3], the first modified from [2], is “one referent per discourse”, the other assumes that, in cases where there is more than one place name in a discourse, the smallest region that is able to ground the set of place names is the one that is intended:

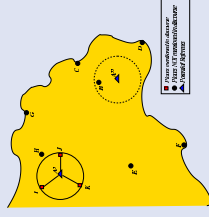


Figure 1. Spatial Minimality Heuristic.

**Example:** Which “Berlin” is it?

- { Berlin; Potsdam } → Berlin, Germany
- { Fairburn; Berlin } → Berlin, WI, USA
- { Copperville; Berlin; Gorham } → Berlin, NH, USA



## System Architecture

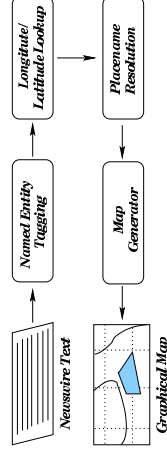
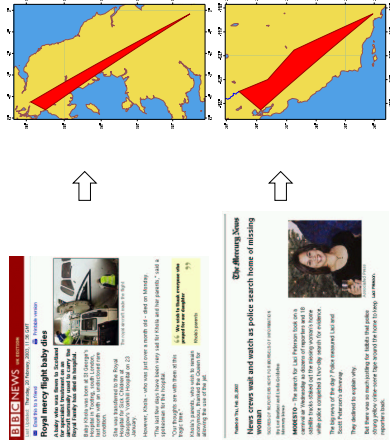


Figure 2. Software Architecture.

## Visualization

We generate Mercator projections from the coordinates mentioned in News stories from the Web using GMT, a map drawing toolkit. Such a visual surrogates are superior with respect to comprehension time:



## Summary and Conclusion

We have described how NEs can be unambiguously grounded using coordinates, resolving ambiguous place names using a minimality heuristic, and have applied this to automatic map generation.

We do not know of previous attempts to create geographical maps automatically from unconstrained text.

Such maps can be used to produce animations from multiple topic-related documents with different time stamps, which could aid analysts in the timely identification of regions of crisis. □

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## References

1. Frew *et al.* (1998). The Alexandria Digital Library architecture. In: *LNAI* 1513.
2. Gale/Church/Yarowsky (1992). One sense per discourse. *Proc. 4th DARPA Speech & Language Workshop*.
3. Gardent/Webber (2001). Towards the use of automated reasoning in discourse disambiguation. *J. Logic, Lang. and Inform.* **10**(4).
4. Leidner/Sinclair/Webber (2003). Grounding spatial named entities for information extraction and question answering. *Proc. Workshop on the Analysis of Geographic References held at HLT-NAACL 2003*.
5. Zheng/Su (2002). Named entity tagging using an HMM-based chunk tagger. *Proc. of the 40th Meeting of the ACL*.