Hybrid Matroids

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We are currently looking at how we can use qualitative spatial relations in the formal description of geographic space. Qualitative information is an important part of the way people describe their environments - in describing locations or directions to one another, we invariably use qualitative rather than quantitative descriptions, and the quantitative information we do give tends to be fairly imprecise. This is a good indication of the ease with which we can compute qualitative information compared with qualitative measures for which we need specialized tools. Current spatial systems of course tend to have the opposite characteristic, computing easily with quantitative information, but having a very poor understanding of qualitative information.

The aim of the current work is to look at how computers may analyse qualitative information that we may provide in order to give probable locations on a digital map. The structure we propose to use is a structure based on the matroid (see [von75][Wel76]) with the addition of some axioms governing a counterclockwise relation (see [Knu92]). This gives us tools to describe a range of useful qualitative descriptions. The combinatorial nature of the matroid structure ensures robust calculation on the data, free from any rounding errors. On top of this foundation layer, we place a description language, enabling a variety of interfaces to be able to give a qualitative description of a landscape without the use of specialized tools.

We aim to provide a sample architecture and algorithms in order to use the language to query a spatial database. Such a system might be used in a variety of ways, and routefinding on mobile devices give a good example. Mobile devices only allow a relatively small part of a digital map to be displayed to the user. A system such as the one proposed above would help to make such maps more useful, by taking qualitative input from a user, and working with that input to display the users most probable location on the screen.

References

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