Objects and Fields (Again)

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Fields and objects have fundamental importance to ontology in GIS. Coming out of the implementation debate between vector and raster, fields and objects have been shown to be more than an implementation issue, and parallels have been drawn between them, and distinctions in physics, philosophy, and linguistics. There have been calls for a common framework that integrates the two approaches, but as yet no effort has achieved a satisfactory result. For instance, much of the recent work from the DBMS community is still fundamentally object (or vector) based; it may acknowledge the existence of fields in that object attributes can have field-like qualities, but there is no room for treating fields as first-order, and you cannot, for instance, derive objects from the underlying field-based information.

This subservience of fields to objects is quite surprising, especially when we consider that most geographical data are derived from spatially-referenced measurements. One could view these measurements as a functional mapping from locations in space to elements of an associated value-range. As such, they can be said to have a 'field-like' quality. The notion of a field, therefore, is fundamental to GIS, and we should not restrict ourselves to systems that are fundamentally object-based. What we need is a common framework that has equal support for both objects and fields, as well as the inter-connections that exist between them. My PhD project seeks to develop such a framework.

At present, I am treating the object/field distinction as an abstract, ontological distinction that can be applied to not just space, but time, space-and-time (3+1 dimensions), and space-time (4 dimensions). Treating the distinction as abstract, I am looking at the various kinds of field-from-object (FFO) and object-from-field (OFF) operations. The latter are of particular interest as they generally involve working with areas of the field-space that exhibit some observational significance, or *salience*. I term these areas 'features'. An example of a feature could be points of local maxima in a land-elevation field, where the field is a mapping from locations in space to points on the real number line representing heights. If the domain of this field were to include the area of some mountainous region, then the local maxima would represent the peaks of the individual mountains. A common OFF operation would be to identity these peaks as first-class objects. To identify the entire mountain as an object (which raises the problems associated with vague boundaries) other features would need to be used — e.g., areas close to a local minimum that start to increase quite suddenly may signify the base of a mountain, a plateau, or a ridge. Features can be used to 'anchor' an object's location, that is, they may provide marker points that outline the object's boundary.