Frank, A. U. "A Question of Semantics." *GIS Europe*, no. October 1996 (1996): 26.

A question of semantics

BY ANDREW FRANK

Spatial information is unique. While it has all the properties of information in general, it also has semantic, technical, administrative, organisational and legal aspects that differentiate it from other information. I want to concentrate here on the semantic aspects of spatial information—what we actually mean by 'spatial', and how its meaning makes it distinctive.

In simple terms, 'spatial' means 'of or relating to space, or existing or happening in space'. Human beings are therefore spatial. From this fact, we can hypothesise that spatial elements form the foundation of human thought: spatial relations are learned in earliest childhood, and all other relations are patterned after them. The linguistic theories of George Lakoff and Mark Johnson are built on these premises. Mark Johnson argued that spatial metaphors are essential to understanding abstract concepts, as for example, the political hierarchy (in terms of up/down for power). Johnson also demonstrated the importance of spatial imagination in (for example) the understanding of ethical principles. Ethical principles depend largely on our spatial imagination of the human brain, soul, mind and body.

In everyday life, human beings behave as if there were only a single spatial reality, and all spatial information referred to the same physical reality. This 'single reality' is fundamental for human interaction, and clearly evident in the common-sense reasoning we use. Because it can be observed with multiple sensors (visual, acoustic, olfactory etc), it appears extremely real. In court cases, for instance, the justice system relies on a shared understanding of a single reality by the defence, prosecution, judge and jury.

Reality checkpoint

Social science, however, points out that very different observations of this single reality are possible. Different activities use space differently, react to different properties of space and observe these properties differently. A surveyor sees a building plot as 'meets and bounds', where a natural resource manager sees biotopes. However, such observations can be integrated in principle, because they refer to the same unique physical space.

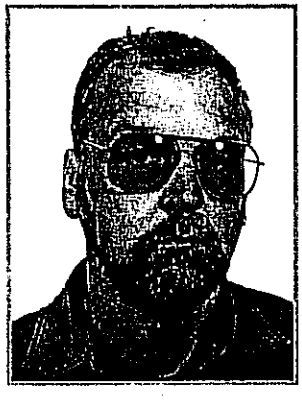
Physical reality can be observed, for most aspects, by anybody. While objective measurements are often possible, there is no final authoritative source. For the text of a law, the publication in the 'official journal' provides the definitive value. No similar source exists for the average daily temperature of London in June. For some applications, there may exist a convention to use the values published by the weather service, but nobody assumes that this is the true value.

Spatial reality, for its part, can be observed and information collected at different levels of resolution, or 'scales', and with different focuses on content theme. It has no ultimate, finest resolution, as does, say, a financial database. With spatial data, fuzziness is intrinsic and unavoidable.

But the 'single reality' of space allows us to integrate datasets from different sources as long as they can be related to space in some way. We have extremely flexible methods for combining data that is related to space directly in different ways (coordinate frames) or indirectly, using 'spatial reference objects' (spatial units).

When we collect descriptive data, we subdivide space into named and bounded containers, or territories. These are especially important in the gathering of socio-economic data, but are crucial for the spatial integration of such data. Space provides a concept of neighbourhood and of distance. Even if observed facts are not related to the same object, they may relate to interacting phenomena at nearby locations. The integration of observation with relation to space is important, because activities in space influence each other.

ANDREW FRANK is professor of Geoinformation at the Technical University of Vienna. He may be contacted on Tel: +43 1 58801 3786; Fax: +43 1 504 3535; Email: frank@geoinfo.tuwien.ac.at



GIS by Larry