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GIS Measures Impact of New Munich II Airport

Geographical Information and GIS: Keys to Coastal Zone Management

European Science Foundation Initiates GIS Research Programme

GIS Monitors Household Waste Management





Error: Ignoring It Could Be The Biggest Mistake of All

Error is one of those words that most "GIS people" are becoming increasingly aware of and yet, to be honest, would prefer to turn a bit of a blind eye to. Why?

Our apparent fear of anything to do with error seems to stem from a feeling that it is too difficult a subject to grasp. Therefore, error analysis often is perceived to be out of reach of anyone except the GIS "boffin." The truth of the matter is that far too few of us really have the in-depth knowledge and understanding of error required to do the task — what error is, what it means and how to deal with it in practice. In other words, we haven't learned the language of error yet!

There are many different sources and types of error in a GIS. The potential for error begins with the data. Error also can be propagated during data conversion, processing and analysis. In fact, it can accumulate all the way through the GIS operations performed and, worst of all, end up in the final map product. Error can even arise through the process of communication.

As the number of GIS applications increases, and GIS becomes more widely used as the basis for decision making and planning, both system and end users will need to become better equipped to deal with error, data accuracy and levels of confidence. Amongst other things, they will need to have a far better theoretical understanding of error and knowledge of all possible sources, and be able to monitor, check and assess the magnitude of error. Standardised and easily accessible means for reporting error will be a necessity. Guidance on good map design also will become important.

Without the means to estimate and assess error within a commercial GIS, many end products, that is to say maps, may be of little use ultimately. Without any indication of the level of confidence one can place in data or in the information presented on a map, the trusting end

user will know no better. After all, high-quality, colourful output from "high-tech" systems can be very persuasive visually and, as a result, go largely unquestioned!

In recent years, there have been quite a number of academic papers on different aspects of error in GIS and remote sensing systems. Perhaps this is to be viewed as a sign that error is at last being taken seriously. If nothing else, this literature has at least raised awareness, albeit amongst a rather limited audience.

However, awareness and theoretical knowledge of error are only a partial solution to the problem. What about the GIS software developer and the user? How often do you hear the word error mentioned on the exhibition stand? What about the practical element of error? How often do you see demonstrations of error checking and analysis, or error modules as part of commercial GIS software? How many GISs offer guidance on the principles of good map design?

While we do need to know more about the theory of error, equally important is the need to examine the possibilities for introducing error assessment modules into commercially available GISs. The treatment of error should be rigorous, flexible and accessible via a user interface. Error analysis must be in a form that the "average GIS Joe" can handle. Standards for data capture, conversion, accuracy and reliability also need to be established to allow users to decide upon specifications for acceptable and unacceptable error. There is perhaps scope here for the use of expert systems.

What progress is currently being made toward implementing error assessment algorithms into commercial GISs? Until recently, progress was quite slow and, for the most part, an academic exercise. Apparently "built-in" error analysis in GIS is still limited and difficult to implement. However, at least it has

reached the stage where it is being considered.

As our capability to acquire more accurate data increases, such as through the use of global positioning systems (GPS), our awareness about error and data accuracy will increase. As part of our education about error, we need to know when error is significant and when it is not. A balance must be struck between knowing about error and becoming overwhelmed by it. Knowledge of error should have a positive effect and encourage users to be more inquiring and critical of GIS data and information. People must be made to think about error and routinely incorporate error analysis into their work.

As someone recently said, "Error — isn't that a mistake we all make?" That could well turn out to be true if we continue to ignore the question of error much longer! Our awareness, knowledge and understanding of error will only become more impor-

tant in the future. We need to educate more people about error and, in turn, that will lead to greater demand for more information on

error. For the time being though, error analysis is easier to talk about than it is to implement. However, with growing use of GIS, how much longer can we afford to let users get away with this? In the end, a solution may be vital if people are to have confidence in GIS!

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