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Real-Time Mapping Systems for Routine and Emergency Monitoring: Defining Boundaries between Fairy Tales and Reality

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Real-time analysis of data reported by environmental monitoring networks poses a number of challenges, one of which is the handling of point measurements of phenomena that display some spatial continuity. This is the case for many variables, such as atmospheric and aquatic pollutant levels, background radiation levels, rainfall fields, temperature and seismic activity, to name but a few.

What these variables have in common is that the observations are usually interpolated, a step that is necessary to obtain maps showing continuous information in time and space. These maps can then be used for modelling or decision making. Ideally, in order to allow real-time assessments and minimize human intervention in case of hazards and emergencies (e.g. extreme pollution levels, earthquakes, floods or nuclear accidents), these maps should be established quickly and thus automatically. In such extreme cases, one also would expect from the environmental monitoring system to trigger early-warnings.

A review of the scientific literature will show that only very little has been done in developing automatic mapping algorithms, probably because of the many obstacles in setting up systems that deal properly with the unpredictable.

It is the purpose of this paper to present the main challenges in developing an automatic mapping system for critical environmental variables as well as to discuss recent developments. It is believed that only an exhaustive analysis of the current challenges can contribute to delineate the current boundaries between possible tools and science-

fiction.

Keywords: *spatial interpolation, real-time mapping, environmental monitoring, error assessment*