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Natural risk management for industrial plants and infrastructures: the DaBo system

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Natural risk management on complex critical infrastructures often requires integration of data coming out from a huge number of sensors. Solutions are sometimes derived by classical supervisory control and data acquisition systems (SCADAs), usually employed in manufacturing and industrial plants environment. This “control room” approach often proves to be ineffective when the system to be monitored goes beyond the limits of the single plant and it is extended to the surrounding environment including buildings and public infrastructures in a strong interaction with local communities. The paper presents the case study of a hydroelectric plant extended over a territory of a few tens of square kilometers and subject to hydrogeological problems of various kinds, with interactions with buildings and infrastructures. The huge number of sensors installed for production control proved to be far to monitor the safety of the plant in its environmental context. We present here the risk assessment procedure and the proposed actions, also in terms of sensor installation. DaBo platform work as a data integrator. The structural and hydraulic “ordinary state” is continuously generated by means of numerical modeling basing upon real time observed boundary conditions. This state, via a suitable set of state variables, is compared with sensor data allowing a clear synthesis of the safety of the infrastructure and its natural and anthropic context. DaBo poses itself as a systems integrator both from a conceptual and an operational point of view, able to activate direct measures to reduce the risk in case of emergency, involving also local civil protection authorities.
The platform integrates information from a wide range of sensors (viz. temperature, water level, strain, water content), weather alerts, weather forecast from high resolution limited area models. The main innovation of DaBo consists in the dashboard designed to provide communication of risk to the end user and to link the warnings to action procedures. It is technically a responsive single page web application that is based on an information storage and management layer by a high capacity relational database, a powerful scalable business logic tier for decision support and early warning system, and a multi profiled responsive user interface. The goal is to ensure the operation of the entire supply chain that connects the various sources of information to the entire user range.