



The ISTIMES project: a new integrated system for monitoring critical transport infrastructures interested by natural hazards

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The research project "Integrated System for Transport Infrastructure surveillance and Monitoring by Electromagnetic Sensing" (ISTIMES), was approved in the 7th Framework Programme, in the Joint Call ICT and Security and started on 1st July 2009. The purpose of ISTIMES project is to design, assess and promote an ICT-based system, exploiting distributed and local sensors, for non-destructive electromagnetic monitoring in order to achieve the critical transport infrastructures more reliable and safe.

The transportation sector's components are susceptible to the consequences of natural disasters and can also be attractive as terrorist targets. The sector's size, its physically dispersed and decentralized nature, the many public and private entities involved in its operations, the critical importance of cost considerations, and the inherent requirement of convenient accessibility to its services by all users - make the transportation particularly vulnerable to security and safety threats. As well known, the surface transportation system consists of interconnected infrastructures including highways, transit systems, railroads, airports, waterways, pipelines and ports, and the vehicles, aircraft, and vessels that operate along these networks. Thus, interdependencies exist between transportation and nearly every other sector of the economy and the effective operation of this system is essential to the European economic productivity; therefore, transportation sector protection is of paramount importance since threats to it may impact other industries that rely on it.

The system exploits an open network architecture that can accommodate a wide range of sensors, static and mobile, and can be easily scaled up to allow the integration of additional sensors and interfacing with other networks. It relies on heterogeneous state-of-the-art electromagnetic sensors, enabling a self-organizing, self-healing, ad-hoc networking of terrestrial sensors, supported by specific satellite measurements. The integration of electromagnetic technologies with new ICT information and telecommunications systems enables remotely controlled monitoring and surveillance and real time data imaging of the critical transport infrastructures. Thus, the proposal will concern also with the development of tools for handling, analysing and processing large data volume (Information Fusion) and then providing information and performing behaviour prediction in a quick, easy and intuitive way (Situation Awareness).

The proposal is based on several independent non-invasive imaging technologies based on electromagnetic sensing. Sensor cross validation, synergy and new data fusion and correlation schemes will permit a multi-method, multi-resolution and multi-scale electromagnetic detection and monitoring of surface and subsurface changes of the infrastructure.

According to GMES and European Spatial Data Infrastructure (ESDI) initiatives, the system will adopt open architectures and will make efforts to achieve full interoperability. The system will be tested on two very challenging test beds such as: a highway-bridge and a railway tunnel. The system will be based on clear end-user requirements, coming from representative end-users and technological choices will be based on a long term cost-benefit analysis.

Then, a dissemination plan was included into the project to encourage a wide range of public institutions and private companies to evaluate and adopt our approach for real-time control and distributed monitoring also in the more general framework of critical and civil infrastructure management and protection. Finally, an exploitation plan will develop for the commercialization of any derived technology, software, or monitoring concepts.

ISTIMES project is carried out by an international partnership formed by nine partners coming from seven countries: Tecnologie per le Osservazioni della Terra (TeRN), Elsag Datamat (ED) and Dipartimento della

Protezione Civile (DPC) from Italy, Eidgenoessische Materialpruefungs-und Forschungsanstalt (EMPA) from Switzerland, Laboratoire Central des Ponts et Chaussées (LCPC) from France, Lund University (ULUND) from Sweden, Tel Aviv University (TAU) from Israel, Territorial Data Elaboration (TDE) from Romania and Norsk Elektro Optikk (NEO) from Norway.