Doctoral Thesis Title: Big data visualization for Cyber-hybrid situational awareness improvements in emergency management and critical infrastructures protection.

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Abstract:

This thesis aims to propose new approaches in natural or human-induced disaster management, that can affect critical infrastructures, in the preventive phase: for the technical services that carry out risk analysis and prevention studies; As well as in the operational phase: oriented to the action response and coordinational tasks between the main actors in real time. A massive data visualization architecture will be proposed and validated in order to increase perception, share the situation among the different levels of command, improve situational awareness and projecting future impacts for better decision making.

The innovative and experimental challenge from this thesis lies on enriching the main controller perception of the situation with a tailor-made Human Machine Interface (HMI) in which data collected from the physical domain (e.g. deployed teams with GPS) and logic domain (e.g. network equipment, firewalls, etc.) will be represented in real time in a unique space, compact and intuitive.

Spatial Data Infrastructures (IDE) technologies will allow us to build a virtual structure in a data and services network, to dispose and integrate them, guaranteeing a bast variety of updated spatial data available in any place, condition and circumstance that allow interoperability with their emergency response information systems, based on international standards ISO 19100 and therefore the legal framework of the European Directive (2007/2/CE INSPIRE) and its transposition to Spanish legislation (Law 14/2010 LISIGE).

On the other hand, the solution will be distributed in real time and will provide a kind of transparency equivalent to physical proximity, allowing the capture, management and visualization of the emergency (e.g. fire perimeter through data from airborne sensors, cyber attack a dam, etc.). The communication system will be able to satisfy with equity and priority the different types of traffic: critical and noncritical real time; with predictability, reliability and failure tolerance.

The methodology to follow will be the following: definition of the system architecture, design of a prototype to validate the proposed architecture and the evaluation of the solution implemented in a final scenario, thus validating the concept from the technical and operational (functional) point of view.

Available Means:

The development will take place in the Distributed Real Time Systems and Applications Laboratory (SATRD) at the UPV Communications Department, through an H2020 European research project funding.
Within the available means, the software as well as the instrumentation from both the Cartographic Engineering Department and the SATRD group.
Requesting:

- Access to computer search engines and virtual libraries. (e.g. IEEE explorer)
- Opensource programming for the design and development of prototypes.
- Geographic Information Systems.
- LUCIAD geospatial visualization technology.
- Databases.

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