

Extended Abstract

On the Use of Semantic Web Technologies for Forest Fire Emergencies in Resilient Societies

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Abstract. This short paper presents work in progress for the semantic representation and integration of information in the SAFERS framework. More specifically, SAFERS is an H2020 project that aims to support intelligent decision-making of wildfire scenarios, intervening at critical points in the emergency management cycle. Semantic Web technologies, such as OWL 2, are extensively employed in the framework to semantically represent the available information and best practices in crisis management, fostering advanced linking and interpretation mechanisms for decision-making solutions to support human operators and authorities.

Keywords: forest fires, semantic web, ontologies, knowledge representation, reasoning

Introduction

Climate change and extreme weather conditions exacerbate the factors that create forest fire conditions. Therefore, SAFERS provides an integrated solution featuring a forest fire Decision Support System, by using different sources: earth observations from Copernicus and GEOSS, fire sensors in forests, topographic data, weather forecasts and even crowdsourced data from social media. The aggregation of information from complementary sources is addressed by SAFERS with advanced knowledge representation and ontology-based semantic interpretation methodologies. On top of that, the SAFERS Decision Support System suggests best practices according to the emergency phase (prevention and preparedness, detection and response, restoration and adaptation), facilitating an auxiliary tool to support both human operators and authorities.

Ontology representation and semantic integration

The main aim of SAFERS ontology is to provide an effective conceptualization of existing knowledge by building new knowledge on top of existing best practices on emergency management situations in wildfires. For this reason, best practices are captured through this ontology in all the emergency management phases.

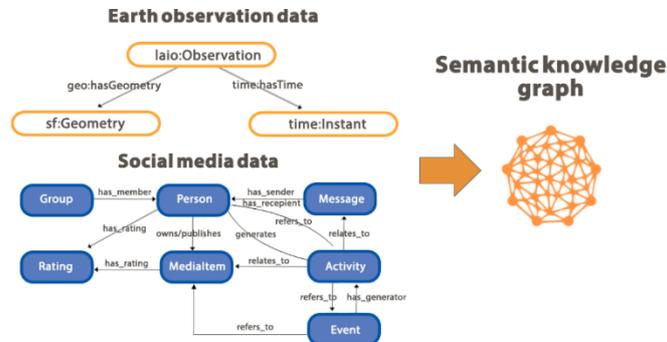


Fig. 1. Data representation of earth observation and social media sources

Data representation from different sources, as Fig. 1 depicts, help develop a wildfire and forest resilience action plan, in order to improve the fire safety of our communities, organize better the emergency management operation and restore the health and resilience of forests, grasslands and natural places.

The ontology is conceived in order to capture the results of the SAFERS analysis modules in a reusable and interoperable way and to accomplish the following practical development issue of the SAFERS project to:

- Represent and organize all collected data from the end-users and in-field skilled agents.
- Ensure the semantic consistency and deliver the framework to support further enrichment of captured information through context-aware reasoning and fusion.
- Provide a common conceptualization of all the processes and best practices in all emergency phases.
- Be utilized as an auxiliary tool that will help to check and to validate the final outcomes of the project.

The reasoning module for Decision Support performs a semantic reasoning scheme running on top of the knowledge base that will perform data analysis and will recommend solutions. This module implements a hybrid inference engine, consisting of a set of mechanisms, such as reinforcement learning (RL) algorithms, description logics (DL) and reasoning rules. In addition, this module is responsible for transforming and defining incoming data for the crowdsourcing components into semantic structures as well as for the emergency management best practices in order to make them standardized and interoperable. Furthermore, this module provides recommendations and execute actions, such as communicate to citizens' advices, according to user-defined parameters and along the disaster risk management cycle.

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