Towards a Spatial Decission Support System for Emergency Management - A Case Study of the Croatian Island of Rava

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The identification of the issue (introduction)
The problem of fire protection represents an outstanding challenge for all Mediterranean countries, including Croatia. Understanding behavioral characteristics of wildfires and how they spread through various terrains and vegetation types, as well as the lack of information about the current state and dynamic spreading of fire, play an important role in developing effective fire fighting strategies.
In fire management spatial information is the key factor of decision making process. Better analyses of the situation, phases of planning, preparedness, training, response, rehabilitation and reconstruction of a disaster situation are demanding for a useful combination of topographic and thematic data.

Motives (objectives)
The main goal of this research project is establishment of a system for operational prediction of wildfire propagation in space and time, which could serve:
 as decision support to a fire management in critical phases – from receiving information on fire ignition to reaching the fire site
 for prediction of dangerous situations which pose a threat to public and firefighter safety, natural and man made objects
 for more effective actions in fire suppression
 as a tool for firefighter training and for developing an operational fire suppression plan before the fire season starts
 for firefighter awareness of dangerous situations
Since the cartographic visualization plays an important role in decision making process of a fire management, our goal is to visualize simulated raw propagation data in a dynamic 3D interactive environment. Such visualization could provide a more realistic and easy to interpret view of fire propagation and give the user a very good intuition about the terrain. Thereby, the way of approaching the fire could be quickly decided.

Focus (methodology)
In our paper an overview of current situation of cartographic support for emergency management in the Republic of Croatia will be presented. On the example of the small island of Rava, situated in the Adriatic Sea, all preliminary works needed for the response in the case of emergency will be described.

Data Requirements
In order for the fire propagation model to be efficient, we need to collect various spatial data. First, we need fuel model, in which the fuel characteristics are represented by certain average values. The fuel model suitable for describing the vegetation in Croatia does not exist yet, but systematic measurements of the fuel moistures in various meteorological conditions for characteristic Croatian vegetation are in progress by Faculty of Forestry. Another way of defining fuel models is by using data form past fires. Using iterative optimization techniques, the fuel parameters can be estimated

by comparing the real fire perimeters from historical fires with the simulation results. Using this method, researches from Institute for Physics determined parameters for three typical types of Croatian vegetation. Second, we need vegetation map. Inland Habitat Maps of the Republic of Croatia (i.e. cartographic representation and GIS database of the habitat types of the certain area) can be obtained from State Institute for Nature and Protection of the Republic of Croatia. Topography is third important parameter for propagation simulation. Elevation, aspect and slope can be derived from digital terrain model which can be obtained from State Geodetic Administration of the Republic of Croatia. Since the DTM data are still not created for the some areas in the country, we might be forced to identify other sources for collecting this data, like SRTM data, or to produce our own DTM from vectorizing the contour lines. Fourthly, environmental parameters (like humidity, temperature, cloudiness, rainfall, wind speed and direction) for several days before and on the day of fire occurrence can be obtained from Meteorological and Hydrological Service. Additionally, there are also some ancillary layers we would like to include in fire simulation like data about roads, settlements, hydrological data, fire roads, objects of the special interest, etc. which could be obtained from official topographic map at scale 1:25 000. and from the Fire Protection Study. We can also include field data and measurements, which could be provided from fire fighters during the fire emergency.
To simulate the occurrence of the fire emergency on the Island of Rava we will use free fire propagation simulation software FARSITE. To visualize this raw propagation data and additional ancillary layers (data about settlements, roads, hydrological data, etc.) in dynamic environment, we will use open source software VTP Enviro.

Results

We expect that results accomplished in this research will meet setted goals.
However, we tend to accomplish the final result: a creation of a standard digital cartographic infrastructure for dynamic visualization of geospatial data for emergency fire management in the case study of the Croatian island of Rava, that will finally result in lowering the amount of time necessary for actual decision making and selecting a solution.