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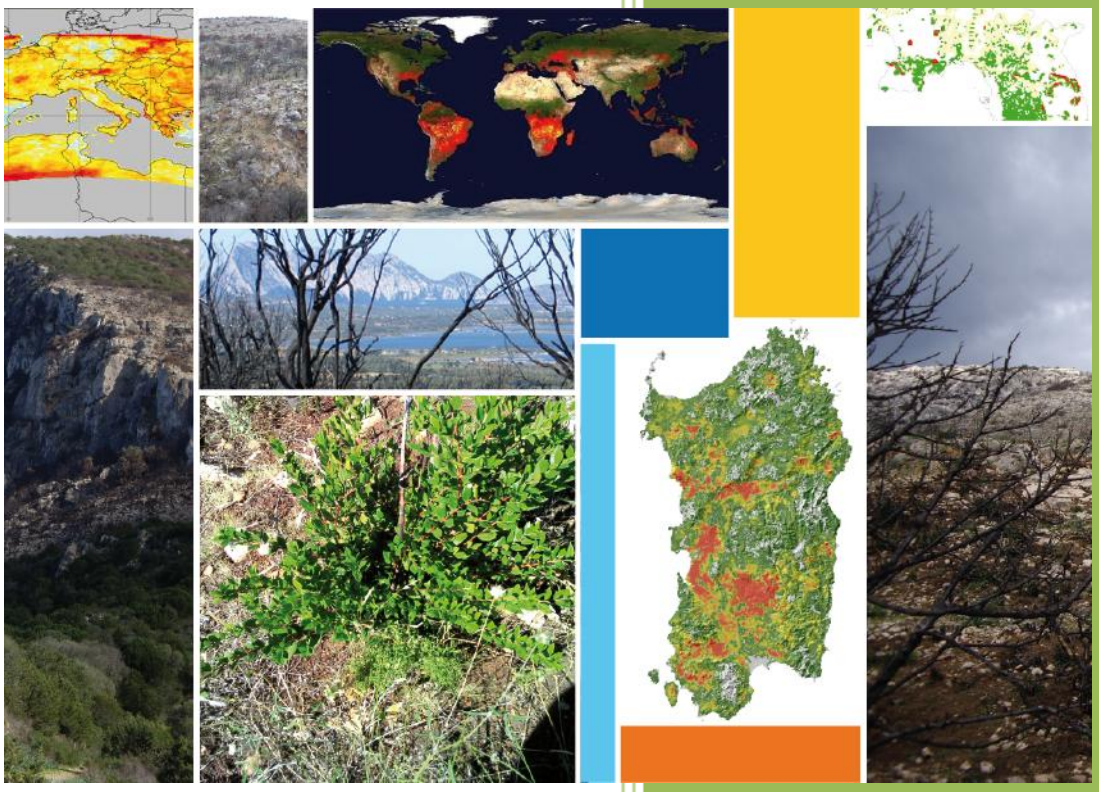

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FRM.03 - AEGIS - WILDFIRE PREVENTION AND MANAGEMENT INFORMATION SYSTEM

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A web-GIS wildfire prevention and management information system (AEGIS) has been developed, aiming at reducing potential socioeconomic and environmental losses (http://aegis.aegean.gr). AEGIS is a state-of-the-art, cost-effective and easy-to-use forest fire management system designed for civil protection. The AEGIS platform assists on early fire warning, fire control and coordination of firefighting forces by providing access to fire prediction data (risk and behavior), as well as to additional information such as socioeconomic activities, roads, land uses, water tanks, patrol routes, satellite images, detection cameras, vegetation types, terrain and weather data. All functionalities provided by AEGIS are accessible to local fire agencies and civil protection authorities through a modern graphical user interface. Main research outcomes were a fire danger rating system and a fire behavior modeling scheme. Structure of the algorithms relied on parallel processing techniques (high performance and Cloud computing), to ensure both scalability and promptness of the calculations. The proposed system was developed and applied in 7 different study areas from north to south of Greece with high-hazard, high-value and high-use forests and other multi-purpose sites. Artificial neural networks and innovative geo-spatial tools were utilized for fire danger estimation based on various parameters (i.e. latitude, longitude, altitude, month, day of week, distance from urban areas, distance from power lines, distance from main and secondary roads, distance from landfills, distance from agricultural areas, wind, rain, relative humidity and temperature). More specifically, for each study area various training methods, activation functions, pre-processing methods and network structures were evaluated to create the most suitable neural networks. The proposed methodologies were the Backpropagation Neural Networks (BPN), the Kohonen Networks (Self Organizing Maps) and 2 types of the Radial Basis Function (RBF) Networks. Outcomes revealed that the BPN networks achieved better performance compared to the other methodologies; and the BPNs were trained based on different training parameters for each study area. In all but one (due to the smaller training dataset) of the study areas, the Mean Square Error of the validation datasets was less than 12.1%, while the correct classification rate of ignition points was more than 80.3%. Sensitivity analysis of the trained BPNs proved that the initial choice of the study areas was justified because of the different wildfire ignition patterns that they were finally identified. Results showed that the distance from urban areas is mostly a critical parameter for the wildfire ignition, while temperature seemed to have the smallest influence compared to the rest of the parameters for all the study areas.

Keywords: forest fire risk, Web-GIS, artificial neural networks, parallel processing