"Innovating forest ecosystem management with advanced multi-criteria decision-making methods"

Forestry Engineering and Natural Resources

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keywords

Forestry decision support systems; Mathematical programming models; Simulation; Biometric Models; Risk.

Summary

Abstract

Objectives

List of submitted publications

Work in progress

Abstract

My working programme is focused on

- Development of **user-friendly wGui**, forms and **computer tools** to **Simulation** and **Decision Making** processes. Improve **models of risk analysis and management**, **wildfires**, **ecosystems sustainability** and **biodiversity** (task 1).

- Development of **spatial optimization** integrating **integer programing** techniques and **heuristics** as well as **multicriteria decision making** (task 2).

- Implementation of relational databases to be used by the **geographic information system** and in all modules of the **web-based decision support system SADfLOR** (task 3).

Objectives (1/4)

- The **ForChange** group has been involved in several projects in **forest decision support systems** with **multi-criteria decision methodologies**. The **SADfLOR DSS** has evolved to meet **a wide range of forest ecosystem management planning problems** (Borges et al 2003, Reynolds et al 2008)

- It's an almost completely **freeware** and **modular** system with the wGUI development in web programming languages: HTML, CSS, PHP, JavaScript and the DBMS with PostgreSQL.

- "the research **will focus on multi-criteria spatial DSS and on a web-based architecture** of this functionality to support participatory backcasting analysis", Garcia-Gonzalo et al 2014.

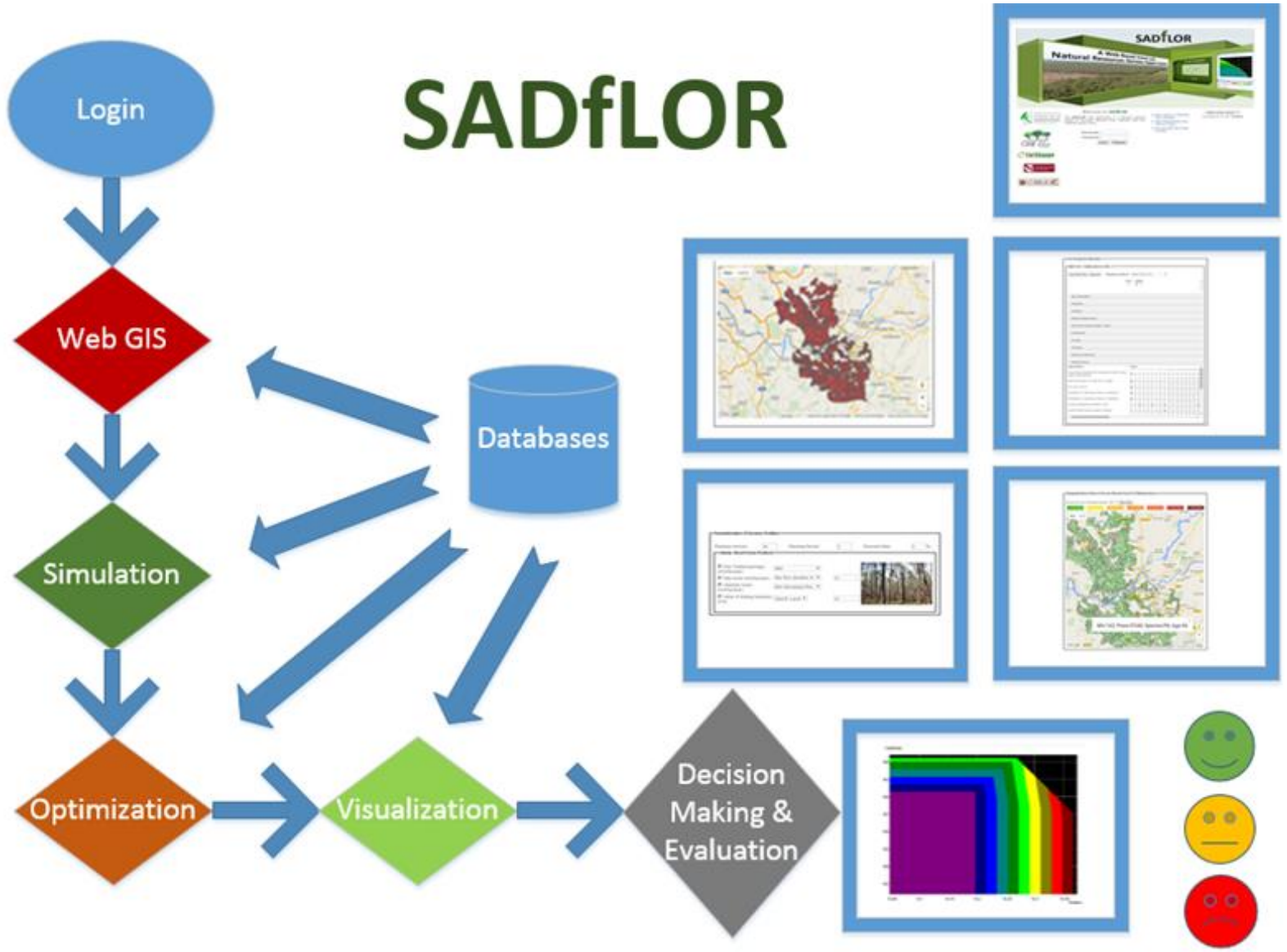
Objectives (2/4)

The main objectives are:

- **Develop SADfLOR** and **computer tools** (in Visual basic, Matlab, etc) focused on help **decision makers** to make better decisions with the aid of maps, graphics, KPI's, tables and **multiple-criteria decision methods**. Various tools are available in the SADfLOR system which consider the **spatial analysis, risk criteria, wildfire, resistance criteria, ecosystem sustainability and biodiversity**

Objectives (3/4)

SADfLOR as a modular system.



Objectives (4/4)

Research Hypothesis:

The development of SADfLOR has the main aim to improve and add new web-based tools in simulation and optimization, giving answers to the question:

is it possible to develop a Web-based Decision Support System which improve decision processes with the help of user friendly interfaces and multi-criteria decision methods and tools that allows Decision Makers to be more comfortable and confident with their decisions?

List of submitted publications (1/2)

Proposed article 1: Marto, M., Reynolds, K. M., Borges, J. G., Bushenkov, V., Marques, S., Botequim, B., Marques, M., Barreiro, S. and Tomé, M. A Web-based Forest and Natural Resources Decision Support System: SADfLOR.

This line of study is focused on the development of **web-based decision support systems to be integrated in SADfLOR**. It includes various **multi-criteria decision techniques and web programming of interfaces (wGUI), geographical information**, graphics, tables and **analytical tools**.

This work (abstract) was presented in the ICDSST:

Marto, M., Marques, M., Borges, J. G. & Tomé, M. (2016). A Web-based Forest and Natural Resources Decision Support System: SADfLOR. ICDSST 2016 on Decision Support Systems Addressing Sustainability & Societal Challenges, Plymouth, U.K

List of submitted publications (2/2)

Proposed article 2: Marto, M, Reynolds, K. M., Borges, J. G., Bushenkov, V. and Marques, S. Combining decision support approaches for optimizing the selection of bundles of ecosystem services

Six alternative solutions (A to F) were selected in **an Interactive Decision Map generated by a multiple criteria method within a decision support system (SADfLOR)** for subsequent analysis;

An aspatial strategic multi-criteria decision analysis (MCDA) analysis was performed with the **Criterium DecisionPlus (CDP)** component of another decision support system (**EMDS**) to assess the aggregate performance of solutions A to F;

A spatial logic-based assessment of solutions A to F for individual stands of the study area was performed with the **NetWeaver component of EMDS**.

Work in progress

I. Improve web-based Interactive Decision Maps for representing Pareto frontiers.

II. Develop Heuristic algorithms to solve Forest Spatial Integer Programming Problems.

III. Use EMDS DSS to predict the productivity of Forest species.

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