Design of a component-based integrated environmental modeling framework

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Abstract

Integrated environmental modeling (IEM) includes interdependent science-based components that comprise an appropriate software modeling system and are responsible for consuming and producing information as part of the system, but moving information from one component to another (i.e., interoperability) is the responsibility of the IEM software system. We describe and discuss the Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES), a component-based IEM system, from the standpoint of software design requirements which define system functionalities. Design requirements were identified in a series of workshops, attended by IEM practitioners, and reported in the development of a number of IEM software systems. The requirements cover issues associated with standards, component connectivity, linkage protocols, system architecture and functionality, and web-based access, all of which facilitate the creation of plug & play components from stand-alone models through a series of software support tools and standards.

1. Introduction

Many complex environmental problems can benefit from a multi-disciplinary analysis provided by integrated modeling, and only by implementing systems thinking and integrative approaches that complement traditional single-discipline approaches will we be better able to solve challenging environmental problems (Babendreier et al., 2007; Gaber et al., 2008). Laniak et al. (2013) and Whelan and Laniak (1998) chronicle the evolution of integrated technologies that view the environment from a holistic, systematic viewpoint. A number of researchers (e.g., Gaber et al., 2008; Jakeman and Letcher, 2003; Laniak et al., 2013; MEA, 2005; Parker et al., 2002) have articulated the need to create cost-effective, harmonious, higher-order systems thinking and holistic, equitable solutions that reflect the inherent complexity of environmental systems. To develop and organize multidisciplinary knowledge through a science-based structure that explains, explores, and predicts.

Software/Data availability

FRAMES-2
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First available 2005
Hardware requirements 700 Mhz CPU 512 MB RAM
Software requirements Windows 95 Or Newer
Availability Open source (no license, source code available upon request)
Cost Free
Program language Visual Basic and C++
Program size 700 MB on disk after installation
Software Access (download FRAMES) http://iemhub.org/resources/133/