

Servicing Environmental E-Learning (E²-Learning): using Geographic Information and Remote Sensing Web Services to support E²-Learning

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Abstract

E-learning efforts, that use or support environmental information, have been around for quite some time now. In the recent years these efforts have been grown to rich information portals that extend and complement the learning experience taking place in the classroom. These efforts tend to provide learners with a rich information space that nowadays is usually coupled with rich semantic descriptions trying to catch also the meaning along with the presentation of data, algorithms and procedures. In the environmental information arena various efforts have used e-learning as means of information dissemination and awareness of environmental issues. Semantic descriptions enable the use of the same learning objects within different environments and tools. In that sense, sharing has been made easier.

One of the major shortcomings in the environmental e-learning efforts is the ability to allow users not only use algorithms, procedures and data developed elsewhere but to actually enable them to build their own applications, tools and create value added information on top of the provided data. In this paper we present an effort to achieve such a goal by using Geographic Information and Remote Sensing Web Services. Web services are programmable software components that can either be used as is or called through other pieces of software in order to perform a specific task. In the environmental e-learning case this can be an algorithm that showcases a specific task and then can be combined with a tool that can present the end results. The important point to be stressed here is that the two services need not to be in the same server or area or even catalogue. Web services are semantically described components that can be registered in global directories that anybody can query in order to find the desired service. That way e-learning portals can combine services from different sources and in a way that is transparent to the end users.

In this paper we combine advancements in the computer science arena, like portlets that allow wrapping of web services as components in portals. So we describe the development of web services that:

- retrieve satellite images from large databases in real-time making them available to anybody who will use the corresponding web service.
- calculate the Vegetation Index (NDVI) on the retrieved images
- support user retrieval of the produced result.

Web services have the advantage of being platform and programming language neutral, so they can be used by learners using any operating environment, depending in their specific needs and choices. In the

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paper we demonstrate such feasibility by providing different clients with different look and feel and capabilities. We also demonstrate the ability to integrate the web services in a portal in order to support a complete e-learning environment.

Concluding, in this paper we propose, describe and implement a new way to support environmental e-learning by using web services as the building block of the learning material. Building on the rich customization capabilities and the flexibility of web services we provide a framework that can be used in order to support the e-learning process that can take place along with the work that happens in the classroom and can be customized to facilitate any educational level.