

Discovery Learning about Informatics Systems

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Themes

Learning aids in informatics, design patterns, Internet, Informatics Systems

Introduction

Informatics concepts are often abstract and thus hard to learn. The reason is that most of the details of an informatics system is hidden behind the graphical user interface. There are especially two reasons: 1. The basic units for data processing are bits which cannot be observed or manipulated by users. They have to be joint to a larger unit of meaning. 2. The behaviour is determined by the internal processes. But they cannot be observed because of their high performance. Learning aids are necessary to make visible what is normally hidden and to enhance hands-on exercises. They enable learners to discover informatics concepts at a lower level of abstraction.

We developed learning aids within the framework of two research projects. They were developed as a student project. The requirements were derived from the learning process. The first learning aid is called Pattern Park which aims toward understanding of informatics systems by means of design patterns. The second learning aid is called FILIUS and aims towards understanding the functionality of the Internet.

We will introduce these learning aids during the workshop and illustrate the possibility for using this software in learning processes at upper secondary level.

Learning Software Pattern Park

Based on fundamental ideas of informatics identified within software design patterns, the learning software Pattern Park has been developed to foster understanding of informatics systems. It is integrated into an education model for understanding of informatics systems (Stechert and Schubert, 2007). Therein, selected design patterns are used to represent networked fundamental concepts of informatics. They permit demystifying informatics systems. Pattern Park consists of different modules, each module describes at least one fundamental idea and consists of real-life representations within animations and exercises as well as more formal exercises using structural and behavioural diagrams of the Unified Modelling Language, e.g. class, sequence, and state diagrams. Such combination of real-life exercises and descriptions applying class and sequence diagrams within one consistent scenario seems to be very helpful for students. Beyond access control and states by Proxy and State design pattern as described by Stechert (2008), there are the fundamental ideas recursion by Composite and by Decorator, encapsulation by Facade, modularization by Template Method, iteration by Iterator, and separation of concerns by Observer design pattern.

Learning Software FILIUS

The aim was to develop educational software to overcome cognitive barriers and to enhance the learning process with exploratory student activities. FILIUS comprises two different modes: the design mode for the construction of computer networks and software and the simulation mode for simulation of Internet applications. The design

mode enables students to construct, extend or modify computer networks. Learners work with virtual networks. The simulation mode offers the view of the entire network. A virtual desktop can be opened for each host. The configuration of each host can be modified by installation or removing of applications. Data exchange can be observed within the network representation where connections were highlighted during data exchange and transferred messages were shown within a dialog window.

Outline of the Workshop Session

In the workshop we will present the learning software Pattern Park and FILIUS. We will explain how to integrate both into informatics courses at upper secondary level about informatics systems. We ask participants to be active during the workshop. Finally, there will be a discussion with the participants the value of these approaches and the way they can contribute to informatics courses.

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Biographies



Stefan Freischlad was born in 1978. He received his diploma in Technical Informatics (2005) from the University of Siegen. Currently, he teaches informatics at the University of Siegen where he is working towards his Ph.D. His research interests are media competences and informatics in secondary education focused on the Internet.



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