

GLASS: A Learning Analytics Visualization Tool

Derick Leony, Abelardo Pardo, Luis de la Fuente Valentín,
David Sánchez de Castro, Carlos Delgado Kloos
University Carlos III of Madrid
Avenida Universidad 30
28911 Leganés (Madrid) Spain
dleony@it.uc3m.es, abel@it.uc3m.es, lfuentes@it.uc3m.es,
dscastro@inv.it.uc3m.es, cdk@it.uc3m.es

ABSTRACT

The use of technology in every day tasks enables the possibility to collect large amounts of observations of events taking place in different environments. Most tools are capable of storing a detailed account of the operations executed by users in certain files commonly known as logs. These files can be further analyzed to infer information that is not directly visible such as the most popular applications, times of the day with highest activity, calories burnt after a running session, etc. Graphic visualizations of this data can be used to support this type of analysis as shown in [1]. Visualization can also be applied in the domain of learning experiences to track and analyse the data obtained from both learners and instructors. There are several tools that have been proposed in specific environments such as, for example, in personal learning environments [5], to foster self-reflection and awareness [2], and to support instructors in web-based distance learning [3]. These visualizations need to take into account aspects such as how to access and protect personal data, filter management, multi-user support and availability. In this paper, the web-based visualization platform GLASS (Gradient's Learning Analytics System) is presented. The architecture of the tool has been conceived to support a large number of modular visualizations derived from a common dataset containing a large number of recorded events. The tool was developed following a bottom-up methodology to provide a set of basic operations required by any visualization. The design goal is to provide a highly versatile, modular platform that simplifies the implementation of new visualizations.

The main functionality elements considered in GLASS are database access, module management, visualization parameters, and the web interface. The platform uses datasets stored using the CAM schema (Contextualized Attention Metadata) [6]. This schema allows to capture events occurring during the use of various computer applications which, in our case, are the tools used by students when working in a learning environment. The process to obtain events from

learning environments has been described in [4]. GLASS is able to connect to more than one CAM database, thus allowing access to events obtained in different contexts.

The tool is extensible through the installation of *modules*. A module is a structured set of scripts and resources that, given a dataset of events and a set of filters, generates at least one visualization. In order to simplify the development of new modules, the platform provides an API to manage common visualizations settings such as the date range and other typical filters. A visualization may include a simpler version suitable to be displayed in the user's Dashboard, which is the entry page of the application. Figure 1 shows an example of dashboard in GLASS. Additionally, visualizations can be exported as HTML code to be embedded in another website.

The GLASS architecture consists of four layers: data layer, code base, modules and visualizations, as depicted in Figure 2. The data layer is composed of a set of CAM databases and a database to store the platform parameters. The code base is in charge of the main functionalities of GLASS regarding module and user management and interfaces. Modules must comply with the platform specifications to generate visualizations and the settings that can affect their appearance. Currently, the tool includes a default module that provides two visualizations as shown in Figure 1): a frequency time line of activity events and a bar-chart with grouped bars of events generated by different user groups (e.g. events from students individually, or groups). The default module also serves as an example of how to develop a additional modules.

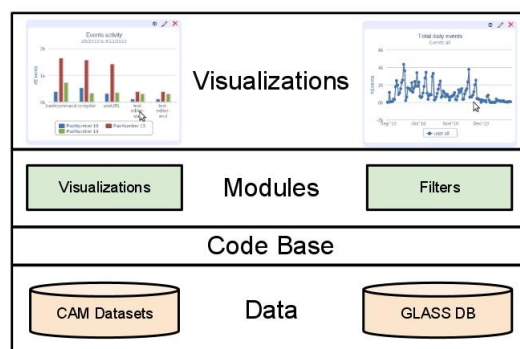


Figure 2: The four layers of GLASS architecture.

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Currently, GLASS is able to support new visualizations

GLASS (Gradient's Learning Analytics SyStem)



Figure 1: GLASS Dashboard. Four visualizations provided by one module.

and is undergoing additional testing in different learning scenarios. Preliminary results obtained from user tests indicate that visualizations need to be very intuitive for both instructors and learners. The current development effort is focused on providing visualizations that show the most-common learners events and the most active learners in a given context. To encourage its use in other institutions, the tool has been released with an open source license and can be obtained from <http://glass.mozart.gast.it.uc3m.es>. A video demonstrating the tool is available at <http://bit.ly/glass-lak12>.

Keywords

Learning analytics, visualization system, visualization framework

Categories and Subject Descriptors

J.1 [Administrative Data Processing]: Education; K.3.1 [Computers Uses in Education]: Collaborative learning, Computer-assisted instruction (CAI), Computer-managed instruction (CMI), Distance learning

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