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Linked Data Driven Visual Analytics for Tracking Learners in a PLE

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Abstract: In this work we introduce necessary steps and planned actions for implementation of analytical application with purpose on analyzing and visualizing information gathered by tracking user behavior and actions in our educational system called Personal Learning Environment (PLE)[5]. Furthermore we present a novel Semantic Web driven approach, for modeling of learning and activity based context using eligible domain specific ontologies, as well as for retrieving modeled data depending on the value of interests demonstrated by learner himself. We intend on closing the learning analytic cycle [Clo12] for PLE and for that purpose we are defining the requirements and implementation steps of analytic dashboard which shall give us necessary knowledge for improvement.

Keywords: PLE, Linked Data, Visual Analytics

1 Introduction and Motivation

After the launch of Personal Learning Environment (PLE) at TU Graz University of Technology the number of users and widgets has increased rapidly. First step towards improving the learning process in PLE was already done in 2011 [TSE11] by introducing the tracking module with the goal to track user behavior, widget usage and user activities. Next logical and most important step is to learn from tracked data. In this step the semantic modeling of the data from tracking module will be used in order to gain meaningful information. Semantically modeled information will be visualized by widget for analytics in PLE Dashboard. Our goal is to show most relevant users, widgets or actions, but also to reveal hidden information like user interests or similarities in general.

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2 Related Work

The main idea of PLE at Graz University of Technology is to integrate existing university services and resources with services and resources from the World Wide Web in one platform and in a personalized way [ET10]. The TU Graz PLE contains Widgets [TES09, ET10] that represent the resources and services integrated from the World Wide Web. According to [TC05, WT04] the term "Visual analytics" is defined as "the science of analytical reasoning facilitated by interactive visual interfaces". It is considered as combination of fields of information visualization and scientific visualization. The Semantic Web standards like RDF[6] and SPARQL[7] enable data for standardized interchange and to be queried as graphs. IntelLEO Project[8] delivered an ontology framework where Activities Ontology[9] is used to model learning activities and events related to them.

3 Methodology

The visualization pipeline for gathering and preparing data for knowledge extraction and visualization can be seen on Figure 1. In our case provided text logs which include information when and how user used a certain widget will be used as input for application. This data is pre-processed using the tracking module into JSON format by splitting the information about user, environment and event into separate blocks. As next step in mining pipeline is the transformation which requires data modeling. This step produces then instanced data which is dynamically processed in order to generate responsive visualizations needed for tracking of learners within PLE. And the final step is visualization of processed and selected data.

Fig. 1: Implemented vizualisation pipeline

4 Preliminary Results

Presented approach allows us tracking of PLE learner activity trends over time periods, user wise or like presented in Figure 2 widget wise.

[6] http://www.w3.org/RDF
[7] http://www.w3.org/TR/rdf-sparql-query/
[8] http://intelleo.eu
[9] http://www.intelleo.eu/ontologies/activities/spec/

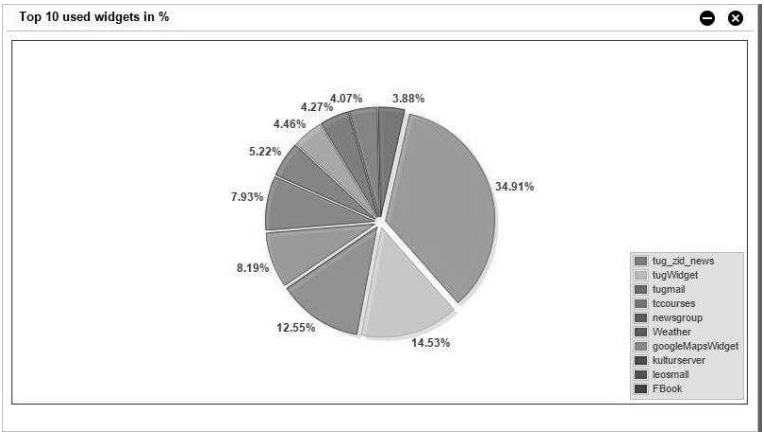

Fig. 2: Top 10 used widgets by PLE

The overview over distribution of widget usage can reflect the overall interest of the users within PLE for different periods of time or based on type of actions they perform. Such outputs implicitly support the improvement of the quality of services for students and teachers. Future efforts will focus on user wise statistics of learning widgets, since PLE can also provide this information.

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