

Report on the exchange in the context of the PROMISE project

Requirements and Specifications of the iPad Prototype Application for the Visual Comparison of Ranked Result Cumulated Gains

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1 Introduction

The purpose of the visit conducted from April 13 to April 15, 2011, was to discuss the requirements and the technology specifications for the design of a user interface on the Apple iPad device in order to enhance the user experience with the PROMISE Evaluation Infrastructure. This activity was carried out in the context of the PROMISE¹ network of excellence, specifically in WP3 (*Evaluation Infrastructure*) and WP5 (*Collaboration and Knowledge Sharing*).

WP5 is responsible for designing, developing and delivering the user interfaces and the annotation service needed to promote the collaboration among the stakeholders of the evaluation infrastructure and foster the knowledge sharing and reuse. Moreover, it is responsible for exploring how to exploit information visualization and visual analytics techniques to information retrieval experimental data in order to improve their understanding and allow researchers to effectively cope with huge amount of data.

2 Planned Work

The specific objective of the activity was to outline a common ground for the design and implementation over the iPad device of the software prototype described in [1] which aims at providing an intuitive graphical representation of documents misplaced with respect to the optimal ranking.

In particular, the objectives of the activity were:

- to discuss the development strategies focusing on the toolset Xcode² IDE for building iOS applications;
- to delineate the user/interface requirements for a first prototype iPad application of the tool proposed in [1] which will exploit information visualization and visual analytics techniques using the iOS native APIs.

¹<http://www.promise-noe.eu>

²<http://developer.apple.com/xcode/>

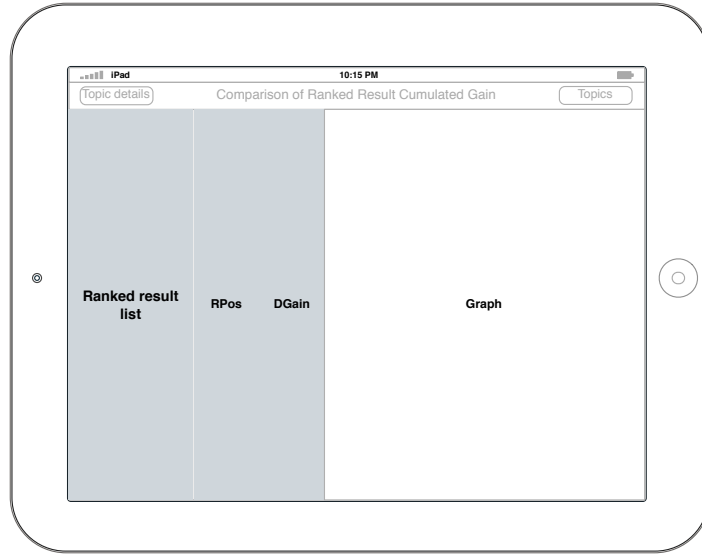


Figure 1: The proposed prototype interface.

3 Conducted Work

The work carried out during the visit was mainly focused on three aspects:

- the main characteristics of the iPad device and the Xcode IDE, focusing on the available software libraries for the visualization of data and charts;
- the main requirements for the prototype interface;
- possible venue for a future publication.

3.1 Development strategies

The first part of the activity consisted in a brief discussion on Xcode which is a suite for developing software for iOS devices. For the visualization of data and graphs we have chosen the Core Plot³ library which is an open-source plotting framework for Mac OS X and iOS. It provides 2D visualization of data, and is tightly integrated with Apple technologies like Core Animation, Core Data, and Cocoa Bindings.

3.2 Prototype requirements

The second part of the activity was focused on the prototype described in [1] and how it could be implemented on the iPad device, focusing on the multi-touch features that this kind of interface offers.

Figure 1 shows the overall design of the main interface, based on the specifications which have been outlined during a general discussion. The user has to be able to visualize a scrolled list (named **Ranked result list** in figure 1) of the top $n = 200$ ranked results for a given experiment/topic. Each row of the ranked list corresponds to a document ID, a short snippet of the content is included in the subtitle of each cell and more information on a specific result (i.e.

³<http://code.google.com/p/core-plot/>

relevance score, DCG , R_Pos , Δ_Gain) can be viewed by touching the row. On the right side there are two coloured vectors (in figure 1 they are called **RPos** and **DGain**) which show the R_Pos and Δ_Gain functions. The R_Pos vector presents the results using different color shadings: light green, light red and light blue respectively for documents that are within, below and above the optimal interval. It allows for locating misplaced documents and, thanks to the shading, understanding how they are far from the optimal position. Similarly, the Δ_Gain vector codes the function using colors: light blue refers to positive values, light red codes negative values, and green 0 values. Moreover, if the user touches a specific area of the R_Pos vector, the main results list automatically scrolls back, providing the end user with a detailed view on the corresponding documents. The rightmost part of the screen (**Graph** in figure 1) shows the DCG graphs of the observed, the optimal and the ideal vector, i.e. the ranking curves for the $n = 200$ results. More specifically:

- *observed curve*: the rank-gain graph that displays the interpolated curve based on the gain values obtained from the experiment, i.e. the ranked result list returned by the IR system;
- *optimal curve*: the rank-gain graph that displays the interpolated curve based on the gain values of the optimal ranked list obtained by an optimal permutation of the observed ranked result list;
- *ideal curve*: the rank-gain graph that displays the interpolated curve based on the gain values obtained from the pool, i.e. documents in the *qrels* ranked in descending order of gain.

The navigation bar includes a **Topics** button on the right which let the user visualize the results for different topics on the same experiment, together with a **Topic details** button which presents the user with some details on the current topic.

Possible *to-dos* that should be made in order to improve the effectiveness of the current proposal are:

- provide some interaction on the graph (i.e. the user will be able to visualize some detailed information on data by touching a specific point on the curves);
- pointing out the DCG values for each curve on the graph when the user touches a document in the **Ranked result list**;
- support the zoom of the curves by pinching-out the graph area;
- support data load through the web-service paradigm.

3.3 Possible venues

The last activity concerned with possible venues to document the work on this prototype interface. The EuroHCIR 2011 workshop⁴ has been identified as a possible venue. The publication will focus on visual analytics with the description of the new prototype and its main functionalities.

⁴<http://fitlab.eu/euroHCIR2011/index.php>



Figure 2: The current status of prototype interface.

3.4 Current status of the work

At the time of writing, the outcomes of this work have been published in [2]. The paper proposes a methodology based on discounted cumulated gain measures and visual analytics techniques which is geared to favour a natural and effective interaction of the researchers and developers with the experimental data and it is demonstrated by developing the iPad application described in this report (see figure 2).

References

- [1] N. Ferro, A. Sabetta, G. Santucci, G. Tino, and F. Veltri. Visual Comparison of Ranked Result Cumulated Gains. Submitted to the *International Workshop on Visual Analytics*, 2011.
- [2] E. Di Buccio, M. Dussin, N. Ferro, I. Masiero, G. Santucci and G. Tino. Interactive Analysis and Exploration of Experimental Evaluation Results. *1st European Workshop on Human-Computer Interaction and Information Retrieval*, 2011.