

# Integrating social networks in an IPTV recommender system

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## ABSTRACT

The proliferation of multiple channels in the actual offer of cable and IPTV services is bringing challenges for users when selecting which program to see. Recommender systems are being introduced with the goal of facilitating the viewers' choices and promote TV content consumption. Different technical approaches to these systems are supported either on automatic algorithms or social data and activities analysis.

This paper reports on the first development phase of the Pétala system - a recommender system for an IPTV Telco - that aims to improve content recommendation by integrating social networks. Pétala provides the ability to use the system both in the Set-top box or as a web widget integrated in a social network like Facebook.

## Categories and Subject Descriptors

H5.2 [Information Interfaces and Presentation]: User Interfaces – Prototyping, Screen design, interaction styles.

## General Terms

Algorithms, Design, Experimentation.

## Keywords

Social networks, IPTV, recommendation, EPG, social TV.

## 1. INTRODUCTION

Social TV as a part of an interactive television distribution service may refer to the ability to communicate between two or more users at distance. For that different communication services may be used, like open audio channels, IM services (*instant messaging*) or other text based services complemented with information on channels/programs being viewed by each user.

However, even with this type of awareness, the wide variety of TV channels offered by IPTV or cable TV infrastructures opens a scenario where content recommendation based on the users' preferences is increasingly justified. Actually, this scenario contributes not only to the fragmentation of TV's audiences but

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also to a possible feeling of disorder since the user may get lost when he wants to choose a TV channel or program.

Content recommender systems may appear as a way to filter this wide TV offer allowing viewers to get recommendations on the programs related with their tastes and interests. Recommender Systems (RS) may base their information in the profile of the user along with the information retrieved by the activities in Web 2.0 social networks. These may act as triggers to perform content recommendation in a TV environment.

The Pétala system appears as a research prototype that aims to explore ways to integrate social networks (their features and information) in an IPTV environment.

## 2. RELATED WORK

A typical RS can provide recommendations to the user according to his profile, predicting his personal likes, typically according to his pattern of TV consumption or the ratings that he has assigned to similar content. In this way a RS will typically present items that have high rating levels [6].

RS are usually based in *Collaborative Filtering algorithms*, allowing, for example, that the system suggests an item through the matching of the user profile with the profiles of other users. In this kind of systems, data from a multiple-value rating (for example, in a 1 to 5 scale) is considered to evaluate items/contents [8]. Consequently, the system will be able to recommend similar items to the ones previously approved by the user or other users. Another strategy relies in *Content-Based* methods. These systems are based on semantic analyses, comparing the user items with a list of possible related ones. These strategies are typically applied in RS that are based in a complex method using algorithmic techniques that rely in several sources of data. Yet, content recommendation can be based in community (data) source [3], where socially networked users play an active role as content recommendation agents.

Content recommendation should be understood as a way to suggest content contributing for the minimization of the information overload typically associated with the EPG [7] [9]. Brokens [5] also argues that a recommendation should be trusted by the user along with the control over what is recommended. Several researchers and players, in the last years, have developed solutions of content recommendation for interactive TV, IPTV and CATV applications. Some relevant examples are the case of TiVO<sup>1</sup> or the ConnecTV project [4].

<sup>1</sup> <http://www.tivo.com/> (December 2009)

Recently, in the latest Microsoft's MediaRoom Application Contest<sup>2</sup>, the Accedo BroadBand<sup>3</sup> introduced an application based in a community where users can see *tweets* and Wikipedia information related with TV programs. Along with this enhanced information, users can also vote on content/programs.

Most of the research projects focus on user's preferences and their ranking of movies and TV programs as the main source of information. This method can be in some way disadvantageous because it requires user time, will and effort [10]. Most of the research projects are applied to a one-to-one scenario in an individual use of the RS. Providing content recommendations for multi-user environments is also a concern. The work developed in the project "unobtrusive context-aware recommender system" [10] presents interesting results because it relies in a multi-user environment and the used methods do not force users to provide pre-information such as preferences or interests. In the *WeOnTV* project [1], users can know what others are viewing and they can offer direct recommendations to other in a buddy list. However, this is a social approach to content recommendation rather than an automatic RS.

*Collabora TV* [9] a research project that explores social activities supported by asynchronous communication, allows viewers to communicate through text annotations superimposed on programs. The viewers can access a list of shows that their buddies have been watching or track a list of *Popular Shows*. This is a different method of recommendation.

Another important related project is the *Television Meets Facebook* [2]. This project aims to improve the experience of TV consumption through the convergence between TV and an interactive social network. This application relies in connecting the STBs to the *Facebook* API to suggest TV content that friends like (based on their ratings). It also allows automatic content recording.

In the Portuguese commercial scenario, Telcos are offering different IPTV products and solutions. The most popular is MEO<sup>4</sup> from Portugal Telecom. *Sonaecom*, a player in the telecommunication market, offers the *Clix* TV solution. Besides VOD, DVR and Restart TV<sup>5</sup> services, *Clix* also offers Digital TV with a content recommendation service. The application suggests movies and TV shows based on the user preferences (however these need to be manually introduced).

Like the *Collabora TV* and *WeOnTV* projects, the **Pétala System** uses social methods to provide recommendations, but instead of having a specific buddy list, the **Pétala System** uses a social network like Facebook, to retrieve recommendations from the user's friends. In the **Pétala System** the recommendations can be retrieved directly from the friends (like a direct message) or, in a social approach, can be displayed as an average rating in the EPG. Since the RS services offer in the Portuguese Telcos is almost insignificant, it would be interesting to explore content

recommendation based on social networks and realize how to implement a project like the **Pétala System** in a commercial IPTV solution.

### 3. THE PÉTALA SYSTEM

#### 3.1 Goals

The main goal of the project is the research and development of strategies for the integration of Web 2.0 social paradigms and networks to achieve a content recommendation system over an IPTV environment.

It was defined as a primary goal the development of a RS based not only on inference algorithms but mainly in information from social networks, namely the users' friends activity (votes and recommendations) in these social networks.

This **Pétala System** includes two main client applications: i) an application in the STB; ii) a widget type application integrated in social networks like Facebook or Hi-5. For both modules a special EPG was prepared enriched with the ability to recommend/vote a program while watching it (if in TV) or while using Facebook or Hi-5.

#### 3.2 Application Modules

The system is organized in three interconnected modules.

The Web Widget module consists of an application integrated into Facebook and Hi-5. It includes an enhanced EPG containing the programming grid from MEO<sup>4</sup> including a representation of reckoning rates applied to each program. This module includes a rating functionality where users can classify TV programs. It also allows users to send direct recommendations to other users (in a format of a pre-set text message). On the other hand it allows reading direct recommendations from others, to see how a program is rated or to view tops of the most rated programs.

The TV-STB module is a prototype developed in the MediaRoom – Presentation Framework Middleware. Like the Web Widget module, it also relies in an EPG with information of the reckoning rates associated to each program, the possibility to rate a program and to send direct recommendation to friends. The top of most rated programs is also available.

Finally, a Server-Side module supports both client applications. It consists of a layer of web-services informed by the system's database. These web-services act as a (normalized) bridge between the Web Widget and the TV-STB application.

### 4. THE DEVELOPMENT PROCESS

#### 4.1 System Architecture

For supporting both client applications, Web and TV, a set of web services implemented in a cloud computing paradigm is used. Figure 1 represents all the components involved: a *Database Server* hosts the main SQL database that stores all the users' interaction activity (ratings and direct recommendations); the *Web Server* is responsible for all ASP.NET modules (TV-STB APP, Web Widget and Pétala Web Service) relying in Microsoft Internet Information Services 6.0; the *Social Data* server, hosting the *Facebook API Platform*<sup>6</sup>, is accessed to retrieve information

<sup>2</sup> <http://www.microsoft.com/Mediaroom/ContestWinners.aspx> (December 2009)

<sup>3</sup> <http://acedobroadband.com> (December 2009)

<sup>4</sup> <http://meo.pt> (April 2010)

<sup>5</sup> Feature that lets you go back to the beginning of a program that has already started

<sup>6</sup> <http://developers.facebook.com> (April 2010)

from that social network; and the SAPO EPG API<sup>7</sup> is the source of information for the (MEO) EPG. This API is used to populate the enhanced EPG in the TV-STB and Web Widget applications.

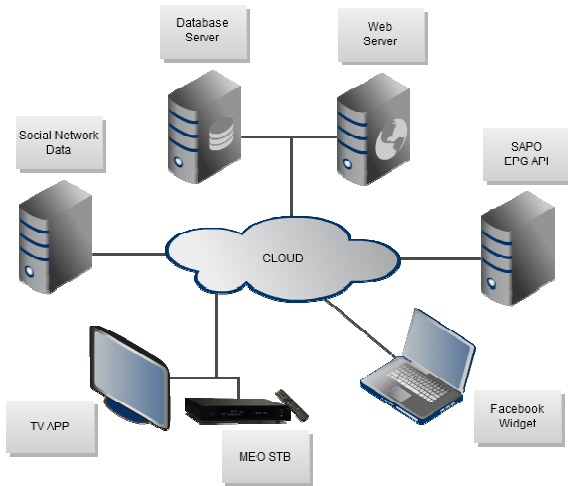


Figure 1. System Architecture

## 4.2 Server-Side Module

The Web Service Pétala, relying on a XML model developed in ASP.NET – C#, assures the communication with the server and its database. Using this module the client application does not directly operates with the server or the database, minimizing data inconsistency and bugs. It also adds an extra level of safety in the access to the system.

It offers several reading and writing methods like returning buddy lists, reckoning rates or direct messages and input operations like rating and sending direct messages.

One of the methods returns a list of the “TOP” ranked programs. In this list every program has a representation of its arithmetic average, based on all rates. It is also possible to set a social filter on this ranking, returning the most rated programs (and its average) from one specific social network. The user may also decide to retrieve the ranking based on all users’ data or only on his friends’ data. Despite some limitations, these filters introduce some level of personalization to Pétala.

## 4.3 Web Widget

This module includes three informative panels: EPG, TOP and INBOX (see Figure 2).

The EPG Panel shows the program guide for the next two hours but can retrieve information for a week period. The TV programs are identified by its name and the rating information is overlaid in the same area.



Figure 2. EPG Panel

By clicking in a program a floating panel presents two options: rate the program or recommend it to a buddy. When rating the user can choose between a 1 to 5 scale (which will then contribute to the reckoning of that program). If he chooses to recommend he can select a buddy from his contact list and the recommendation will go as a direct message to the buddy’s INBOX.



Figure 3. TOP Panel

The Top Panel shows the scores, represented by stars, of all rated programs in the EPG, being possible to the user access its schedule information. The user can also filter the results according to his preferences: the first option toggles the reckoning of the TOP values taking in consideration inputs from the entire set of users of the recommendation system or only from his buddies; it is also possible to split the ratings from different social networks; finally the user can also choose the TV programs of one TV channel by selecting his favorite channel in the filter. These filters are cumulative and produce changes in the final calculation of the "rating" of each program since the sample collection will change every time the user changes the filtering options.

The INBOX panel is a small mailbox of direct recommendations from other users, displaying the sender's name, the recommended program and the sending date. For further information about the transmission of the TV program there is a button that triggers a floating panel with the schedule information.

## 4.4 TV-STB APP

This application was originally developed in a simulator environment - ADK (Application Development Kit) - Version 2.1

<sup>7</sup> <http://services.telecom.pt/> (April 2010)

(June 2009), followed with the deployment in a STB equipped with a MPF build: Model Cisco KMM3010.

The TV-STB prototype comprises three modules:

*Pétala EPG* – Enhanced EPG where it is possible to rate and recommend content;

Received Recommendations – an area where the user can access recommendations sent from other users.

Rating Tops – an area displaying the most high rated programs.

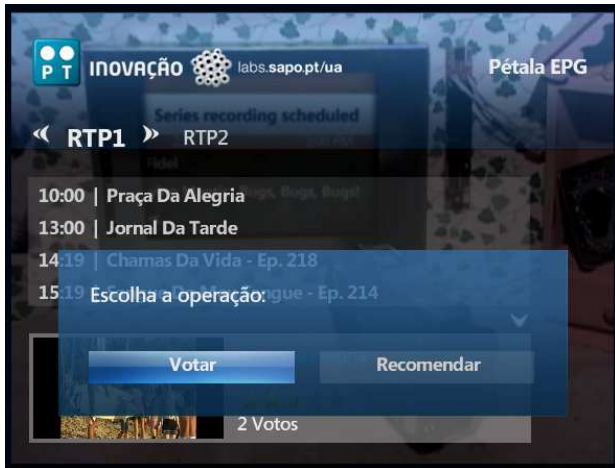


Figure 4. Rate or Recommend options

The Pétala EPG (Figure 4) consists of a program guide in its minimal style, identical to the existing commercial MEO solution. By consulting a program's information the viewer can: i) see information about the rating average retrieved from social networks (the users' friends' votes) and other Pétala users; ii) rate the selected program (figure 5). The viewer can assign a value (from 1 to 5 stars), see how many people rated that program and its reckoning;



Figure 5. Rating area

iii) recommend it to a friend through a direct message – the viewer just needs to select the friend from his contact list.

In the STB the user can also read program recommendations sent by his friends (either from the Web Widget or from TV-STB APP). These recommendations are complemented with information on when the program will be broadcasted again.

## 5. REMARKS AND FUTURE WORK

Although in an early development phase the work done so far has allowed the team to start exploring means of integrating social networks data in a recommender system. Despite some positive feedback from users in informal public demonstrations, further and more structured evaluation is needed and will be done in near future.

As a prototype, the Pétala system only supports a part of the features that the research team expects to deliver in a future version of the RS. Considering future developments an improved integration in the middleware is aimed. One way to achieve it could be by means of integrating these features in a more complete social TV application like WeOnTV.

Another planned feature includes the ability to provide emotional mood as a parameter for the recommendation.

Another possible feature relates with the ability to have a visual representation of which content is being/was consumed based on different parameters like: geographical area, age or genre.

## 6. ACKNOWLEDGMENTS

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