User's Behaivour Analysis Application for Open TV Platforms

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***Abstract* — The authors describe an application for Digital TV open platforms (like Android or MHP-OCAP). The application gives the instantaneous tip to watch one of available channels. The TV platform shall be provided with this recommendation right at the moment of turning on the TV without any specific actions or efforts from the TV viewer side. The application forms the tip based only on analysis of previous activities of the TV user.**

Usability of such application could be significantly improved if subject area's specific is taken into account. The authors discuss the assumptions based on industry experience.

A trivial approach to implementation of this application is suggested for the case when EPG and detailed info on user could not be accessed.

Key words: Android, MHP-OCAP

I. INTRODUCTION

Attempts to change the Set-Top Box (STB) functionality were started more than twenty years ago. Initially STB provided only access to TV channels, now Interactive TV has been implemented at least for vendor-specific TV platforms.

Another important trend observed last years is the transition to open TV platforms like MHP-OCAP or Android. Such STBs were shown, for example, on CES and IBC exhibitions in 2011 and 2012.

Despite significant support from some major hardware and software manufacturers (Google, Motorola, Cisco, etc.), open TV platforms are not so common solution. Operators do not invest significant efforts into their promotion, and the viewers do not have clear understanding of their advantages. In comparison with explosive spread of smartphones with open platforms, STBs with open platforms are still being field tested only.

One of the root causes of such problematic deployment is lack of available applications for open TV platforms. These applications could be considered as the major benefit of new STBs. And via versa the developers do not invest efforts to creation or adaptation of applications to TV platforms due to lack of potential users. The issue was not resolved even after recommendations for development of TV apps were created by Google in 2010.

The authors of this article describe a very simple but helpful application for open TV platforms that could be created by a little team. Special attention is paid to usability of such applications based on understanding of industry specifics (not only UI design is considered but also implied assumptions on viewer's experience and specifics of TV broadcasting are discussed). It allows analyzing of information on the user's behavior without direct requests on his/her preferences.

II. APPLICATION FUNCTIONALITY

This application shall provide recommendations on TV channel choice when the user turns on the TV set. The recommendations are based only on analysis of previous viewings. In other words, the viewer is not requested to choose channels from EPG (Electronic Program Guide) or answer any questions on preferences, etc.; he/she does not interact with this application explicitly.

It is expected that users could install such applications by themselves, and different algorithms could be implemented in frames of this application. So a user could choose the solution from different providers; the choice is based on the application's effectiveness and price. Permanent availability of such recommendation could be considered as an additional functionality (so the user could switch over to recommended channel any time).

This application is interesting for TV operator because it provides advertisement targeting by default (the user is directed to the channel he/she is interested in).

III. GENERAL APPROACH ON CONTENT NAVIAGTION

Before description of the suggested solution, the most general approach on content navigation and personal recommendations should be reviewed. It is necessary for understanding of difference with the suggested below approach. Moreover, this general approach is already common for the US or European operators; and it could be also implemented by their Russian counterparts in the nearest future.

In spite of some conservatism of TV industry, its future is impossible without improvement of content navigation. Majority of TV users in the Northern America, Europe, CIS has access to several tens of TV channels. At the same time the threat of migration to Internet forces TV operators to provides users with managed or unlimited access to the Web (for example, the TV viewer gets a Web browser or specific TV applications-"tubes" to the predefined Internet resources).

So convergence of TV and Internet leads to availability of huge number of TV channels and specially designed TV applications as well as infinity of content in WWW. Therefore a user faces the issue of search and choice of the necessary resources.

Since 2012 the companies developing software for open platforms suggest solutions based on new navigation principles. Instead of EPG and catalogues of the available content, the user gets a search engine (see, for example, Google TV description on http://www.google.com/tv/). For improvement of search results quality the following information could be used:

a) Explicitly expressed user profile or information gathered or submitted to TV operator by the user (age, location, sex, family info, preferences);

b) actions and viewings log analysis;

c) social networks related info;

d) general assumptions on behavior of TV viewing (for example, not so long programs are requested in the morning);

e) analysis of hardware characteristics (adaptation to display parameters, etc.);

f) collective knowledge, providing synergetic analysis of information gathered for all users of the same TV operator (for example, creation of recommendation for the users with the same profile).

The general approach might include also elements of self-education of the system (analysis of success of previous recommendations, etc.) Usually it also means interaction between STB and servers. Detailed description of each program is available via EPG (the TV program could be classified on several tens of parameters) that is used for recommendations improvement.

Powerful algorithms [1] could be implemented for high correspondence of recommendations and real user's preferences. However it requires much more efforts for development and more hardware resources for operation. At the same time very simple algorithms might be implemented for several working days and provide good enough effectiveness.

IV. Limitations

Simple algorithms implementation is partly invoked by technical reasons (Russian specific limitations are listed below). For example, calculation of recommendation should be done quickly to satisfy usability requirements. So lack of hardware resources available to applications could be the first limitation.

Secondly, interaction with server could be also limited (cheap STBs does not have the return channel). It excludes collective knowledge support as well as some indirect information on the user's preferences (such as VOD – Video on Demand – requests). In such case the user's profile could not be submitted to operator.

Thirdly, some states limit usage of the viewer's activities log (the USA, etc.)

In the forth, EPG information is usually absent in Russian practice.

Finally, several users (members of one family, etc.) could view TV via one STB, and identification is not usually maintained.

So the minimal information the STB could gather is the following:

a) the log of the user's activities on TV viewing (start and duration of viewing of specific channel, number of channel;

b) all the limitations listed above take place.

V. Assumptions

Of course, it is very hard to get good recommendations in such case. However we may consider some powerful assumptions based on TV broadcasting knowledge. List the most important ones:

a) Strong regular programming approach for majority of channels. The programs are started at the same time and repeated on regular (daily or weekly) basis;

b) Correlation between already seen program and the intention to watch the program again is higher if the time interval in days between them is less. In other words, if yesterday the users watched TV 1 channel at 7 PM and the new episode of series was shown, the probability to watch the same channel at the same time is higher in several days than in several months;

c) Duration of watching the program could be considered as quantitative and qualitative estimation of the viewer's preferences.

These assumptions allow wording of trivial but effective enough algorithm generally described below.

VI. Trivial Effective Algorithm

So the STB supports the database of the TV channels viewings for a long time (for a quarter, etc.)

When the user "turns on" the TV set (for example, at 18-53), the STB defines what channels (and how long) the viewer watched at the same time last days.

For example, yesterday the viewer watched Channel 11 for half an hour. The day before yesterday the TV set was turned off at 18-53. A week ago the 15th Channel was watched less than for a minute – and so on.

In the second step, the rating is calculated for each of the chosen programs. The rating consists of two components. The first depends from the viewing duration (for example, 0.001 for the programs watched less than for a minute; 0.01 for duration from 1 minute to 5 minutes, 0.1 for duration from 5 minutes to 15 minutes, 1 for duration more than 0.5 hour).

Another component depends from the time interval from the day of the viewing till the current day. For example, a program watched yesterday and a week ago, this coefficient is equal to 1; for the programs watched a quarter ago, it is equal to 0.1.

Finally, the ratings for the same channels are summarized, and random choice of the recommended channel is done taking into account these ratings (for example, if the summarized rating of Channel 11 is equal to 2, and the summarized rating of Channel 15 is equal to 3, the other channels has zero ratings, the probability of Channel 15 recommendation is about 0.6).

At the first glance, this trivial and fast algorithm completely ignores information on the specific TV programs. It shows only relationships to the viewed channels. However strong regular programming policy of majority TV broadcasters provides some implied correlation between the time of viewing and the specific TV program, so it allows to level lack of EPG information.

VII. CONCLUSIONS

The authors describe an application for Digital TV open platforms that gives the instantaneous tip to watch one of available channels. The approach allows improving usability of the application by using the industry specifics (appropriate assumptions are listed). No actions from the user are required.

Finally the trivial algorithm for recommendations definition is discussed. It could be applied even in case of lack of any additional information on the user's preferences or TV programs description. It does not require significant hardware resources for operation and might be supported on cheap STBs.

Development of so simple applications may give good experience for further creation of commercial applications for open TV platforms [2].

The SECR presentation will include the application demo.

LITERATURE

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