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Abstract

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genome – A Personalised Programme Guide

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We have developed a prototype user interface, called genome, for developing ideas on content discovery in the TV environment. In this paper we concentrate on the personalisation and the user interface of the genome programme guide. We describe the user interface, the metadata, the personalisation and the results of our user testing. Finally we conclude with our ideas for incorporating personalisation in this and other similar user interfaces.

1 Background

Personal Video Recorders (PVRs), video-on-demand, peer-to-peer file sharing and other technologies are making more and more audio-visual content available to people at any time. The BBC has recently announced plans to make TV programmes available to download over broadband and to start to make the archive available online [1], in fact many radio programmes are already available using internet streaming [2].

Personal Video Recorders, essentially VCRs based on hard disks, are becoming more and more prevalent and can have a profound effect on peoples' consumption of TV and radio programmes. Our observation of peoples' behaviour with PVRs in the UK, such as TiVo and Sky+, has discovered a number of key points. People watch between 50% and 80% of their programmes from disk and they make heavy use of the recording facility. They engage in much more planning to determine what to record or watch. Adverts, trailers and channel idents tend to be missed and new programmes tend not to be noticed.

The broadcast television and radio world has previously relied on traditional methods such as schedules, trailers and other devices to publicise the available programmes but with these new distribution technologies and new behaviours affecting how people consume television and radio we must look at how they will discover content in the future.

2 genome

The genome programme guide[a] is our experimental PVR platform for developing ideas for programme navigation. It is written in Java and runs on Windows and Linux, making it suitable for demonstrations, real user interactions and longer term use. It is designed to be displayed on a typical TV screen and uses a simple remote control for all interactions.

The user interface provides a typical Electronic Programme Guide (EPG) grid display of the BBC TV and radio schedules (see Figure 1) together with several other ways of discovering programmes (see the section on Exploration below). There is comprehensive metadata for most programmes and some typical PVR functions such as easy-to-use programme and series recording are also implemented.

[a] So-called because of the shaded EPG grid's resemblance to the results of a PCR (polymerase chain reaction) test on DNA.

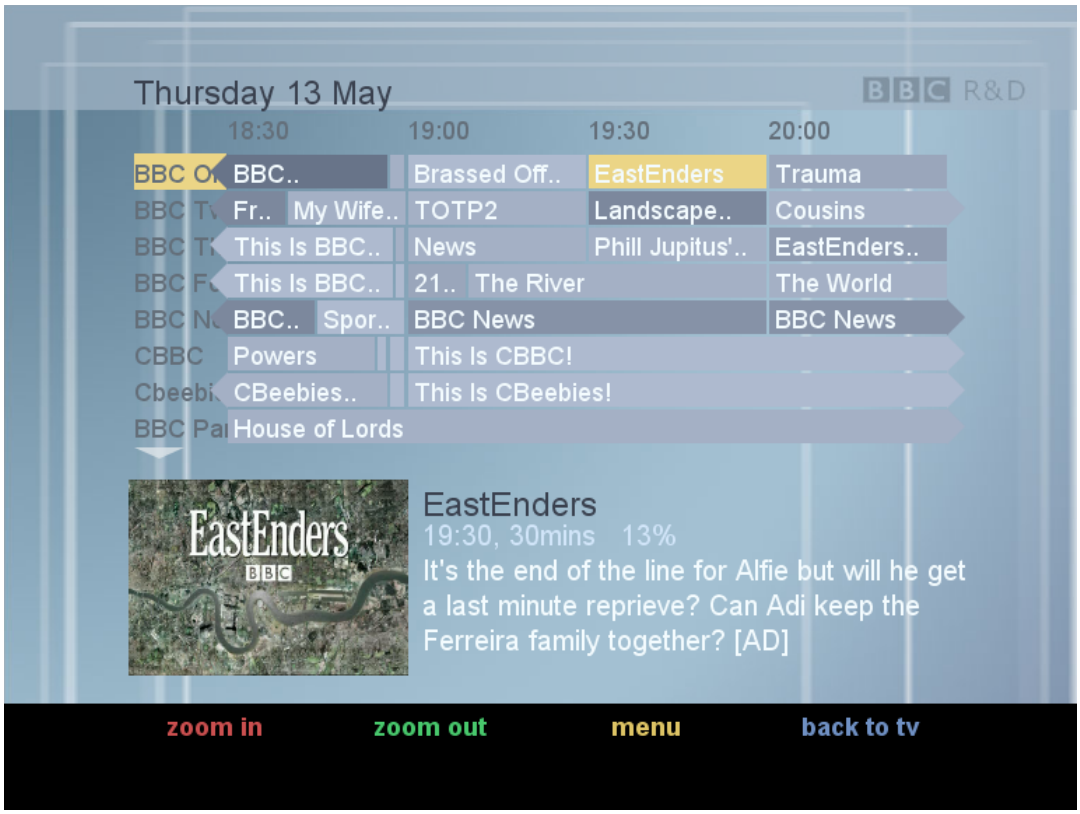

Figure 1. The genome programme guide

3 TV-Anytime Metadata

The metadata used in a programme guide is one of its most important aspects - all of our work in this area uses TV-Anytime metadata. The TV-Anytime Forum [3] is an association of organisations that seeks to develop open specifications to enable audio-visual services based on mass-storage in consumer platforms. The specification provides an XML representation of this metadata and work is also underway to develop methods to deliver this data via various mechanisms such as digital television and the internet.

Key features of TV-Anytime include a location referencing method allowing accurate recordings that deal with last minute schedule changes, user profiles and behaviours, a rich set of descriptive metadata (including titles, synopses, cast lists, keywords and a detailed genre structure) and the ability to express relationships, links and groupings of and between programmes, series and other content (see Figure 2).

Authoring this metadata is a challenge in itself and it is important that accurate and comprehensive metadata is available for the process of content discovery. For our current work we semi-automatically generate live TV-Anytime data based on a feed from the BBC's schedule information database.

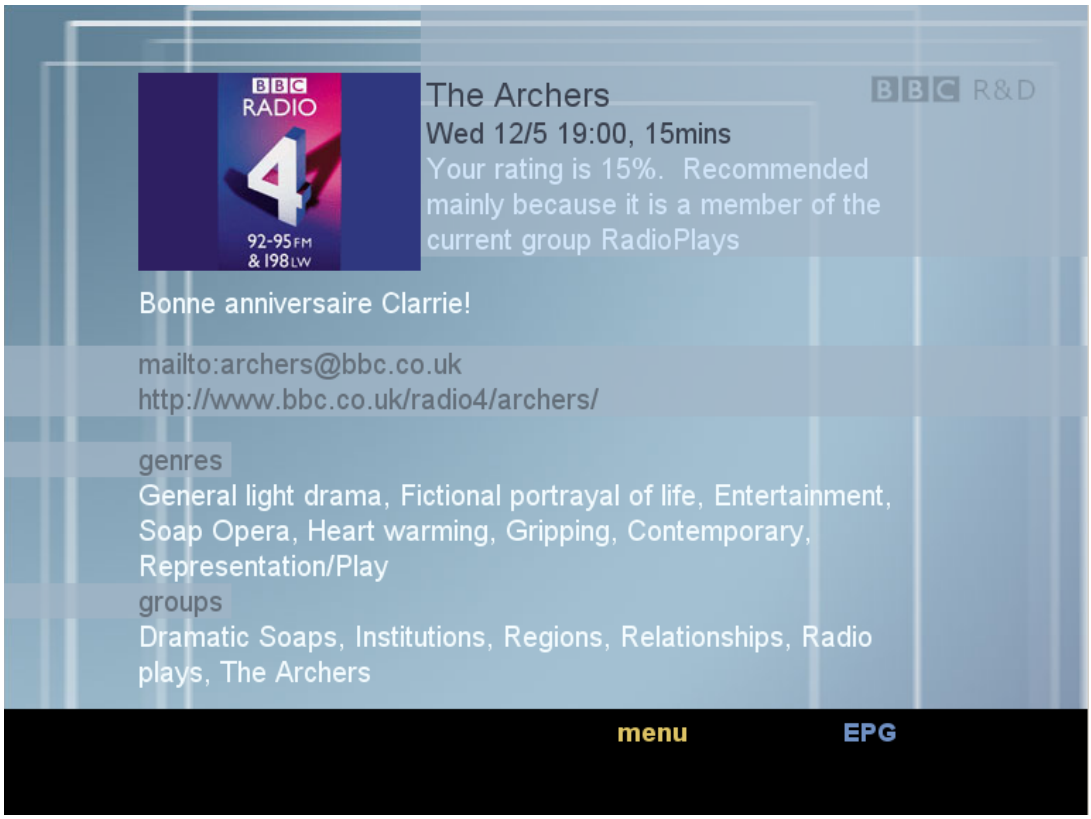

Figure 2. The programme information screen

4 Personalisation

Personalisation and intelligent agents have been a significant topic of research for some time and have been used in many fields from e-commerce [4] to music recommendations [12]. Indeed there is a significant field of research specialising in personalisation and recommender systems for TV (e.g. [6][7]).

We are interested in personalising a user's viewing and listening experience and recommending TV and radio programmes. The BBC, as a public broadcaster, has a responsibility to educate, entertain and inform and one of our challenges is to make sure that any automated systems will broaden, not narrow, users' horizons. We therefore seek to understand what positions we could fill in personalisation whether it is as a trusted provider of a personalisation service or as a provider of high quality metadata that assists third-party personalisation systems.

The system we have developed is relatively simple at present and is there as a basis for our work, particularly our user interface research. A user profile is generated from user-rated programmes and then a simple content-filtering algorithm is used to generate personalised programme ratings.

The programme ratings currently come from explicit rating of daily schedules, there is obviously resistance to this from users and we would expect that most ratings would be gathered implicitly from PVR and EPG usage statistics (i.e. what programmes were watched or recorded) [8] or from a combination of implicit and explicit ratings.

The user profile used is then simply a capped summation of the metadata items for each programme rated, with each item having a weight assigned depending on the user's rating of that programme. The metadata items used are genres, keywords (including keywords automatically generated using a TF-IDF (Term Frequency Inverse Document Frequency) based algorithm [9]), groups and linked programmes, the approximate time slot and the channel. The latter two may seem redundant in a world of time-shifted viewing but at the moment they still encode a significant amount of

information as channel schedulers place particular types of programmes on particular channels at particular times of day. For example, programmes on a mainstream TV channel (i.e. BBC1) on Friday evenings will appeal to a different audience than programmes on a speech-based radio channel (i.e. BBC Radio 4) on weekday mornings.

A simple content-filtering algorithm is then used to rate each programme in the forthcoming days for the user. This algorithm looks for matches between the programme and the user profile within each area of metadata (keywords, genres, groups and time/channel) and rates the programme accordingly. We have also experimented with an alternative algorithm based on a contextual network graph (CNG) [10] that provides comparable results but is faster at the expense of a long start-up time.

Collaborative filtering approaches [11][12] for recommendation of TV and radio programmes are also attractive. The dataset would seem to be a far less sparse environment, there are fewer items and more users consume similar items, than something like an online bookstore. However at the moment we do not have access to a sufficient amount of user data to carry out experiments.

The personalisation is incorporated into the genome user interface in several ways. Each programme has a percentage preference and a reason for the recommendation, for example "*Because it is a member of the RadioPlays group*" (see Figure 2). Our research has shown a reason for the recommendation is important – Sinha et al [13] also found that users were more likely to purchase a so-called transparent recommendation. The EPG grid screen is also colour-coded; darker shaded grid elements (i.e. programmes) have higher preference scores for that user (see Figure 1). Finally there is a simple list-based recommendations screen showing the programmes in order of preference.

5 Exploration

Other screens in the genome interface allow the user to explore the set of programmes in other ways. At the moment these are relatively simple implementations but the intention is to create more novel displays in the future. Currently the interface provides navigation of a genre tree using a list metaphor, navigation of a complex interconnected structure of programme groupings, selection of programmes based on their mood or atmosphere and a simple free text search.

6 User testing

We have carried out user testing on the genome programme guide to discover people's reactions in two key areas. Firstly the reaction to the concepts and services implemented in genome and secondly, to determine the usability of the interface. The 12 participants in the test covered a broad profile of age and social status and all participants owned digital/multi-channel TV. Participants were given a walkthrough of some of the features and then given a list of tasks to complete.

Five tasks were given including finding a programme the user liked, finding a particular programme, finding a highly recommended programme, finding detailed programme information and recording a series. The overall success rates are shown in Table 1.

Table 1. Success rates across all tasks

Success	Difficulty	Failure
53.7%	21%	25.3%

Most participants were fairly happy with the basic EPG screen and found it and general navigation to be simple to use, however they tended not to explore further in the interface. Personalisation was seen as a potentially useful feature but it was hard to test realistically as we did not have time in the

user testing to create a user profile for the individual participant, instead we had to use a generic stereotypical profile based on popular programmes. The prompts we gave for the personalisation, the shading and percentage ratings, were also not clear enough for most users.

All participants were also asked to complete a rating scales based on the work of Hassenzahl [14]. This attempts to measure the user's view of the visual and general attractiveness (hedonic quality), the ease of use (usability) and the general response (acceptability). The results are shown in Table 2, the scores are on a 7-point scale and are all generally positive.

Table 2. Mean post-task questionnaire ratings

Measure	Mean rating
Hedonic quality	4.7
Usability	5.0
Acceptability	5.1

To test the system more thoroughly we intend to carry out some long-term testing. We believe that lab-based testing is too constrained for this kind of application as it depends on a level of familiarity with a new concept in TV viewing (i.e. the effects of PVRs) and the personalisation generally requires a modest amount of time before it becomes effective for a particular user.

7 Further work

The next stages of this work will involve developing a fully working Linux-based PVR based on the genome user interface – this will enable some of the longer term user testing mentioned in the previous section. The personalisation algorithms obviously need improvement, particularly the user profile generation, and we need to tackle the cold start problem of the bad initial performance of personalisation systems [15]. We also wish to look at some more innovative and alternative user interfaces for navigating content and visualising the data. Another obvious deficiency is the issue of multiple users [9] which is a frequent occurrence in television viewing – how do you identify who is watching and what if several people are watching simultaneously, a very common occurrence.

8 Conclusion

It has been argued that personalisation can be counter to a good user interface [16], making it less consistent and less predictable. Our testing has shown that users will be amenable to the idea of personalisation, but with some caveats. The system should provide support for the user's decisions about what to view – it shouldn't make decisions for the user. Similarly it shouldn't be presented as "intelligent" and fully autonomous, with all the expectations and threats that may imply; instead it should be seen as under the control of the user. When used, the personalised information should be presented clearly in several alternative ways, such as text, graphics or icons, and be transparent to the user (i.e. provide information on why the recommendation was made). There should also be different modes of accessing the personalised information; built-in integrated prompts (i.e. in the EPG screen) or specific interfaces that the user seeks out if they wish to.

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