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Enhancing TV programmes with additional contents using MPEG-7 segmentation information ☆

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ABSTRACT

Interactive Digital TV offers a large amount of TV channels, as well as new contents that come along with the TV programmes. To take advantage of these additional contents and make them easily available to viewers, this paper proposes to offer additional contents linked to the segments of TV programmes by means of semantic relations obtained using MPEG-7 segmentation information. As a practical use of this work, we propose two different application fields: t-learning, with the aim of using TV programmes to engage viewers in education; and personalised advertising, whose goal is offering viewers products of their interest, maximising its effectiveness.

1. Introduction

The arrival of Interactive Digital TV (IDTV) permits viewers to access a huge amount of interactive contents, in addition to the traditional TV programmes: games, web pages, learning contents, new types of advertisements, etc. However, a problem arises due to the difficulty in preventing the viewer from feeling lost in that mess of contents and offering him/her only the interesting ones. In this direction, some research efforts focus on designing audiovisual contents recommenders (Björkman et al., 2006; Blanco Fernández, Pazos Arias, López Nores, Gil Solla, & Ramos Cabrer, 2006), according to the viewer's preferences. However, for the success of these recommendations, selecting the suitable ones is as important as offering these contents when the user is more likely to watch them.

The recommendation systems used in many Internet web sites – e.g. the on-line store Amazon (http://www.amazon.com) (Linden, Smith, & York, 2003) – address this issue by offering the user some items related to the one he/she is browsing. On the contrary, TV recommenders usually suggest the viewer isolated contents, although the techniques used are appropriate for the aforementioned type of *contextual* recommendations. Taking advantage of these strategies, the programmes can be grouped together according to two different criteria: the similarity in their contents (content-based filtering) and the resemblance between the profiles of the viewers that have watched them (collaborative filtering). In this manner, we could be able to offer related contents when the viewer finishes watching a programme, as shown in Figs. 1 and 2. *Contextual* recommendations take into account the fact that the user is likely to watch related contents when a programme has finished. However, the granularity of these approaches is quite coarse, since they deal with entire contents.

The main idea of this paper is studying how to identify which characteristics of the programmes can arouse the viewer's curiosity and at which point of these programmes this curiosity comes up, as well as finding mechanisms to offer the appropriate additional contents to satisfy it. Our approach requires a finer granularity than the *contextual* recommendation ones mentioned above, since it looks for establishing relationships not only with entire contents but also with some parts of them – such as segments of videos, some pages of a web site or some learning objects instead of an entire course. Specifically, we are interested in using this approach in two areas of IDTV. On the one hand, to provide the user with educational contents related to the programme he/she is watching, in order to use the characteristics of this programme as a bait to engage viewers in education. On the other hand, to offer the viewer personalised advertisements related to the contents of the programme, in order for him/her to feel the need to buy these products.

Our approach takes into account the fact that the user is more likely to get involved in new contents if they are related to the context of the situation he/she is living; in this case, as he/she is

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Fig. 1. *Contextual* recommendations similar in content.

Fig. 2. *Contextual* recommendations watched by similar users.

playing the role of a viewer, the context is constituted by the contents of the programme he/she is watching. As an example, no matter how interested is the user in oriental cultures, if we offer him/her to watch a documentary of the history of kimonos or to buy one of them when he/she turns on TV – like current TV programmes recommenders do –, he/she would probably decide not to do it. On the contrary, if the same elements are offered while watching the film 'Memoirs of a Geisha', it will arouse the viewer's curiosity and the probabilities will increase. In order for these *contextual* recommendations to be offered, we need appropriate labelling mechanisms for the content as well as semantic reasoning algorithms to find the relationships between the contents.

In this paper, the next section explains the mechanism of enhancing TV programmes with additional contents, taking into account the agents and phases of the process. This proposal is based on the correct description of the contents, so that relations can be established between them. Section 3 discusses the different mechanisms to create the descriptions, as well as the different standards used to share them. Section 4 exposes the architecture of the system, as well as an example for a better understanding. Then, we introduce some application scenarios, focusing on our fields of research: t-learning (TV-based interactive learning) and personalised advertising. Finally, we draw some conclusions about the proposal and motivate our future work.

2. The agents that enhance TV programmes

We have already mentioned that we want to enhance TV programmes with additional contents that are related to some of their characteristics: subject matter, cast, place, etc. Three different agents take part in this process: content creators, content providers and IDTV receivers.

Content creators are the agents that know the content best, that is why they can anticipate to the user's needs by providing additional contents and applications: removed scenes, videos of the filming, biographies of the participants, etc. Besides, these interactive contents can also be useful for the content creators themselves since they can provide feedback from the users.

For example, in the reality show 'Survivor', the content creators could add an application to allow viewers to vote for the contestant to maintain in the island, as shown in Fig. 3.

Content providers do not have as much knowledge about the programme as content creators, but they are the ones that best know about the audience and they are informed about the contents that they transmit in the same time interval as well as which contents they are interested in transmitting on purpose to complement the target programme, with the aim of publicising them, engaging users in new services, etc. For example, the content providers can enhance different scenes of an episode of the series