DIGITAL BROADCAST ENVIRONMENT USING WEB SERVICE TECHNOLOGY – NEW APPROACHES FOR FUZZY CONTENT DETECTION AND SERVICE DISTRIBUTION

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ABSTRACT

The main objective of this paper is to introduce the software environmental approach for semantic television. The main idea is to combine WEB 2.0 characteristics with Semantic Web as well as AI features to achieve a flexible application independent media platform. In this paper the main realization aspects concerning the used web service technology, the AI methods as well as the environmental structure is described.

INTRODUCTION

Digital TV (IPTV, DVB, DVB-C, DVB-S) is one of the biggest challenges of the broadcasting market. IPTV denotes delivering of TV over the IP protocol. Internet as a platform for distributing TV services implies the possibility of customized transmission and facilitates new forms of interactivity and personalization of services. The concept WEB TV is used both when transmitting TV over the WEB and WEB services over TV networks. Because of interactivity on the Internet, it is possible to add other values to these services. The most successful Internet TV business models are likely to involve syndication to or from other media. On the user side (Video on demand, for example), all services are provided through the network.

Most of the features and functionalities of digital Television are depending on external market conditions. In spite of that several governments including Europe have determined an analog terrestrial broadcast cutoff date. Accordingly in many geographical regions, analog reception, or free TV, is the most prevalent television access technology. The analog broadcast cut-off date will yield in several activities on the provider side as well as the industrial vendors. The end of the analog television area implies also the development of new broadcast structures as well as the creation of new tools for digital object (especially moving pictures) handling.

DIGITAL BROADCAST REALIST AS CONVERGENT MEDIA-PLATFORM

Within the last few years the area of television is in a phase of change – several concepts related to Digital Television are discussed and meanwhile brought to realization. One of the main approaches in this context is the concept of "**convergent media-platforms**". Although a clear and distinguished definition is missing – and the term convergent media-platform is used within different contexts, the authors try to give a definition related to the introduced media platform approach. As illustrated in Figure 1 the term convergent is used in the sense that several digital media streams are converged to a pool of digital objects. Furthermore different distribution streams are bundled within one platform – also somekind of converging – bundling = converging. Although the distribution process itself is not focused on one distribution channel but several: within convergent media platforms the digital content (AV-objects, "moving pictures") is distributed and broadcasted via several streams (channels) like IPTV, DVB-S, DVB-C, DVB-H etc). It depends on the structure of the media platform itself, which broadcast and distribution channels are used – possible are a lot due to the digital feature of the objects.

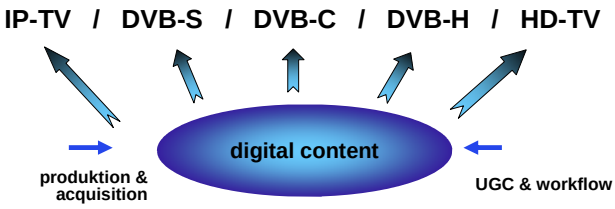

Figure 1: Convergent Media-Platform with different distribution channels

CLASSICAL VIEW:
BACKEND – MIDDLEWARE - FRONTEND

The proposed type of media-platform is designed as a classical three-fold structure (illustrated in Figure 2): Backend, Middleware, and Frontend. The input for the backend is delivered by

1) edutainment partners, who post their edutainment objects and products and
2) by the TV editing team, processing the AV-objects (mainly moving pictures) and
3) further partner and clients

The backend module itself is related to several processes, like

1) semantic indexing of the AV-objects and edutainment products and
2) the adequate assignment of annotated AV- as well as edutainment objects based on the given annotation
3) a CMS system for organizing the objects
4) as well as special tools for handling user generated content (UGC)

The middleware is mainly devoted to streaming, encoding and web server applications. In a fully expanded media platform the server applications also include the satellite cable TV uplink resp. provision of the broadcast signals to the uplinking provider.

The user gets access to the platform via the frontend module and is provided with streaming products (WebTV / IPTV streams), Video on Demand (VoD) and further communication services as well as - in the expanded version - with DVB-C and/or DVB-S program broadcast.

As described in /Nern-2008/ the described media platform is realized in the first step in the edutainment sector.

The threefold architecture structure is already mentioned in /Rothe-2008/.

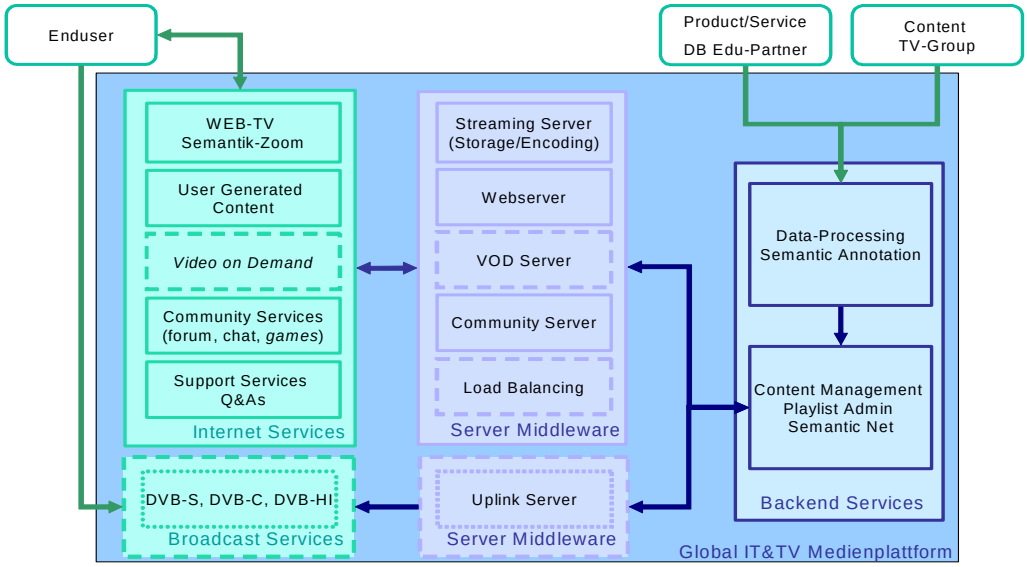

Figure 2: Detailed view of the three fold realization structure

FRONTEND – FUZZY CONTENT DETECTION AND PROCESSING

Data Processing & Semantic Annotation

The data handling procedure benefits from the fact that the AV-objects are given in known digital formats (mpg2, mpg4, avi, swf, rm,etc). This allows a (quasi-) automated preprocessing and detection resp. classification of known as well as unknown objects. The main idea here is to treat the object – especially the UGS objects - as services /Atanasova-2007/ and to build up net structures consisting of coupled objects and object fragments (illustrated in Figure 3). For enabling an optimized creation process the AV content objects are described as semantic web services resulting in a net of coupled objects and subnets of coupled objects. As illustrated in Figure 3 the advantage of the net structure is the feasibility to extract sub-nets and to create out of the nested objects and fragments new merged objects /Nern-2007/.

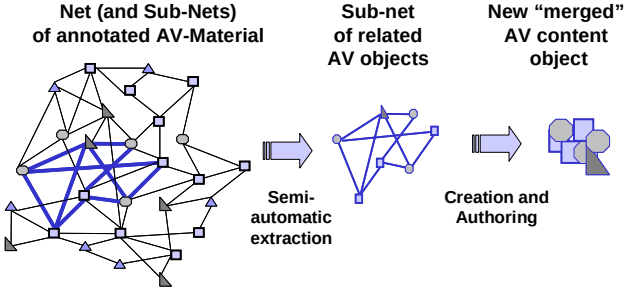

Figure 3: Net and sub-nets of objects and object fragments

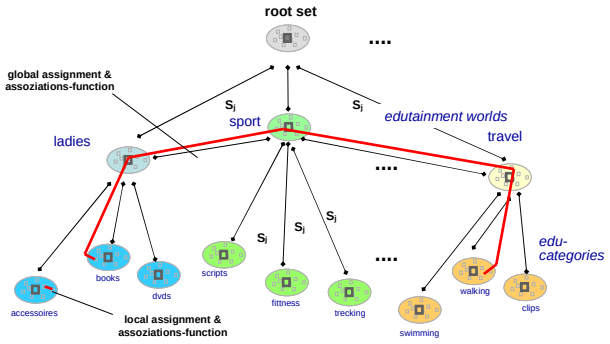

Figure 4: Flexible three layered classification structure

The algorithms for the fuzzy set based classification of the AV-objects is given in /Andonova 2006/. The result of the extraction and classification process is illustrated in Figure 4: a flexible three layered classification tree. The assignment functions for a special layer are illustrated in Figure 6.

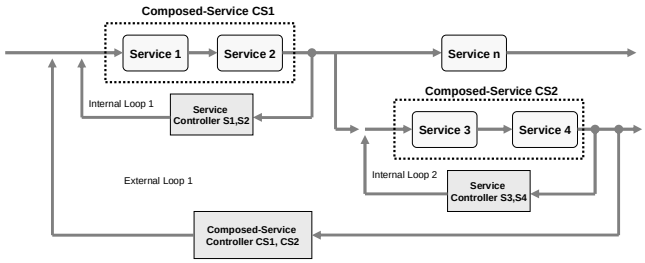

Figure 5: The service (AV-object) compsing process realized as a closed loop cycle

Application of the SWS paradigm to AV-objects

For representing the AV-objects as SWS the WSMO /WSMO-2008/ specification is applied, especially the choreography and orchestration feature. To optimize the orchestration procedure of AV-objects to be merged a controller structure in case of serialization and composition of services (representing the AV-objects) is used. As depicted in Figure 5 the composing process is designed as a closed loop process ensuring quite stable self regulating features. The details about the composing process is given in /Atanasova-2005/.

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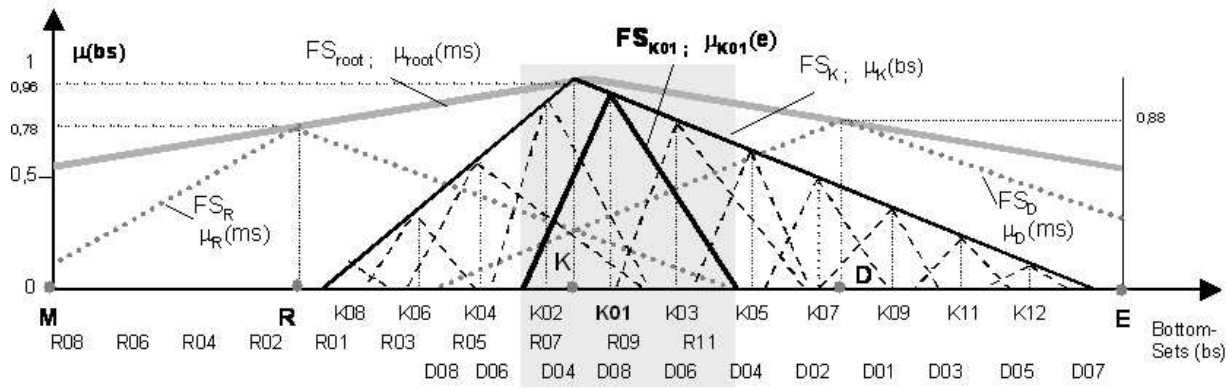

Figure 6: Example of assignment functions after a fuzzy set classification for a pseudo three layered classification tree