Augmented Reality on HbbTV, an Hypervideo approach

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ABSTRACT
In this demo, an Augmented Reality system for the Connected TV is presented through a Hypervideo platform implementation. The Hypervideo platform consists of a back-office to manage audiovisual content and hot-spots, and an interactive video player based in HbbTV technology. The player lets the user get additional information of the points of interest which are displayed over the images. This project presents a useful platform to audiovisual production teams, letting them mix, in an easy way, these three technological concepts: interactive video, augmented reality and connected television.

Author Keywords
Augmented Reality; HbbTV; Hypervideo

ACM Classification Keywords
H.5.1 Information interfaces and presentation (e.g., HCI): Multimedia information systems—Artificial, augmented, and virtual realities.

H.5.4 Information interfaces and presentation (e.g., HCI): Hypertext/Hypermedia—Architectures, Navigation.

General terms: Design, Experimentation.

INTRODUCTION
A Hypervideo, or "interactive video", is an audiovisual stream with non-lineal navigation. The user is able to interact the media with hyperlinks, moving the spectator from a passive to an active state.

By using the hypervideo concept with real images, we are approaching Augmented Reality (AR) applications. AR defines a direct or indirect vision of the real world, whose elements are merged with virtual items to create a mixed reality.

In this demo, an interactive video platform development is presented, which is capable to deliver an Augmented Reality experience to the user, through the HbbTV specification, and all the tasks and tools needed to do so.

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THE HYPERVIDEO PLATFORM
The interactive video structure is formed by three data levels: 1) audiovisual content, displayed via streaming, 2) point of interest (PoI) information, viewed as Augmented Reality over the media, and 3) marker positions, that represent a PoI over the video images.

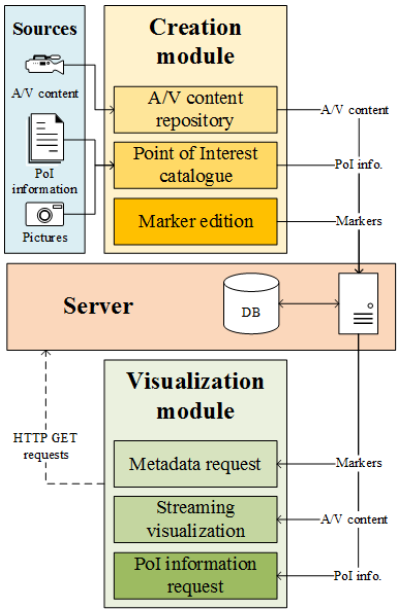

Figure 1. Hypervideo platform architecture

The hypervideo content creation, publishing and visualization platform architecture is shown in Figure 1 and described in this section. It is composed by the creation module and the visualization module.

Creation module
The creation module comprises the tools needed to manage the audiovisual repository, insert new data in the points of interest catalogue and generate the spatiotemporal metadata needed to connect the PoIs identified in the media with their markers position.

Audiovisual content repository
In order to guarantee compatibility with the HbbTV 1.1 specification, multimedia content uploaded must meet these requirements: video codec H264/AVC, audio codec HE-AAC and MP4 container.

Point of Interest catalogue

The catalogue organization is based on categories. For each PoI it is stored its category and descriptive information: text, images, URL and geographical position.

Marker edition

The markers purpose is to position the points of interest over the video images. In order to ease the marker edition, a tool inside the creation module is developed (Figure 2), letting the producer browse the media content, select the temporal intervals where a point of interest appears, and specify its position, pointing out as many key positions as needed.

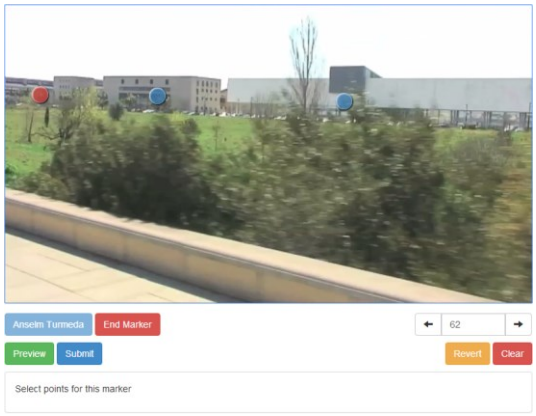

Figure 2. Hypervideo marker edition tool

Once the positions are defined, intermediate positions are generated through lineal interpolation, at a position per second frequency. If it is needed, the editor is able to correct these automatically generated positions.

VISUALIZATION MODULE

The visualization module is represented by a Hypervideo player developed according HbbTV 1.1 specification, making use of CE-HTML, CSS TV Profile 1.0 and Javascript.

The purpose of this module is reproduce the audiovisual content, providing information layer filtering, hot-spot selection and AR visualization.

When the visualization module starts, it asks for the metadata related to a hypervideo to the server through an HTTP GET request. According to this information, data structures are prepared and the video resource is linked to be played via streaming. Then, the user is able to start the video playback.

The player synchronizes the video streaming and the marker dynamic positioning over the video images, as it is shown in Figure 3. Hot-spot positions are refreshed ten times per second, interpolating the values generated in the previous module, in order to smoothen their movement.

Figure 3. Visualization module

The user is able to filter displayed PoIs according to their category and to pause the video playback and select a marker, getting the additional information from the server. That data is used to build an augmented reality window, displaying text, pictures and location.

Figure 4. Augmented Reality in visualization module

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