ImAc Player: Enabling a Personalized Consumption of Accessible Immersive Contents

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Abstract
Accessibility is a fundamental requirement for every (multimedia) service. Although immersive media services are on the rise, they still lack of accessibility features. This paper presents a web-based player that enables the presentation of immersive 360º contents augmented by a set of access services, like subtitles, (spatial) audio description and sign language. The paper initially provides an overview of the end-to-end broadcast platform in which the player is integrated. Then, the key components that make up the player and its appearance are briefly introduced. Finally, the different accessibility, personalization and interaction features implemented in the player are described. The player is being tested in a series of pilot actions involving users with accessibility needs, is being used as a proof of concept in different standardization activities, and is envisioned to be integrated into the services provided by European broadcasters.

Author Keywords
Accessibility, Immersive Media, 360º Video, Spatial Audio, Subtitles, Virtual Reality.

ACM Classification Keywords
H.5. Information interfaces and presentation (e.g. HCI)

ImAc (Immersive Accessibility) Project

Goal: Seamless integration between accessibility services and immersive media, by enabling **personalization** and keeping compatibility with current technologies and standards.

Immersive Contents: 360º Video and Spatial Audio.

Accessibility Contents: (text and audio) subtitling, audio description, and sign language interpreting.

Interaction Modalities: Adapted User Interfaces (UI), voice control and guiding methods.

Use Cases: Single- and Multi-Screen Scenarios, combining traditional and VR consumption devices.

Figure 1: ImAc logo.

Introduction

Research on TV-related content consumption is being intense in the last years. As proof of evidence, previous works have targeted at integrating accessibility features (e.g. [1]), companion devices (e.g. [2]), and immersive contents (e.g. [3]) in interactive TV scenarios. However, there enhancement features have not been investigated in a jointly manner yet. To that end, ImAc (www.imac-project.eu) is a European H2020 project that explores how accessibility services can be efficiently integrated with immersive media, while keeping compatibility with current technologies [4].

This paper presents the web-based player developed within the umbrella of ImAc to enable the consumption of immersive 360º contents in a personalized and accessible manner. First, an overview of the end-to-end ImAc platform is provided. This will give an idea of the broadcast environments in which the player can be integrated. Then, the different components and modules making up the player, together with its appearance, are presented. Finally, the different accessibility and personalization features provided by the player are briefly described. The audience will be able to experience with the features provided by the player, by selecting different 360º videos augmented with accessibility content, including subtitling, (spatial) audio description and sign language interpreting. The demo setup will consist of at least one Head Mounted Display (HMD), one tablet and one laptop to be able to test the player in different traditional and Virtual Reality (VR) consumption devices (Figure 2). Headphones will be also available to let the audience to experience with the supported spatial audio features for both the immersive and accessibility contents. Demo videos can be watched at: https://bit.ly/2Wqd336

Related Work

As far as authors know, the existing players enabling a personalized consumption of accessibility contents have mostly focused on subtitling for traditional media (i.e. 2D video). Relevant examples can be found in [1, 2, 5]. In addition, subtitling solutions for 360º video have been proposed and assessed in [6, 7], leaving the door open to further research in this topic. The presented player includes further presentation options for subtitles than the ones in [6, 7], being all of them derived from user-centric activities [4]. In addition, it provides innovative solutions for other access services. All these features are described later on in this paper.

End-to-End ImAc platform

ImAc is developing an end-to-end platform comprised of different components handling key processes from media production to consumption (more details in [8]):

- An Accessibility Content Manager (ACM) through which the immersive contents are uploaded, the creation of accessibility content is managed, and the preparation of contents (see below) is triggered.
- Web-based tools for the production and edition of access services and their integration with immersive content.
- Tools and components for preparing the contents for their appropriate processing, signaling and delivery.
- Web-based player for the consumption of the immersive and accessibility contents.

ImAc Player

The player is a core component of the ImAc platform, as it is the interface through which end-users consume the available immersive and accessibility contents.

Figure 1: Scenario in which traditional and VR devices are running the ImAc player.

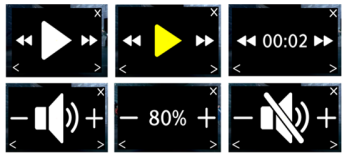

Figure 6: Visual feedback when interacting with controls.

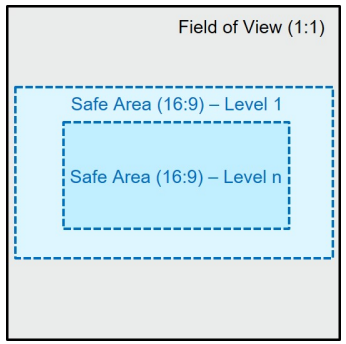

Figure 7: Safe area levels.

Components and Modules

The player has been developed by exclusively relying on standard(-complaint) web-based technologies and components. It is made up of following key layers:

- *Immersive Layer*: it handles the presentation of both traditional and immersive content.
- *Accessibility Layer*: it handles the presentation of accessibility content.
- *Assistive Layer*: it assists in a more effective usage of the player, by enabling e.g. voice control, preview and zooming features.
- *Synchronization Layer*: it ensures a synchronized consumption of contents, both within each device and across devices in multi-screen scenarios.

Further details about these layers, their interactions, and their software components can be found in [8].

Interfaces and Interaction Modalities

The player is accessed via a URL and through the ImAc portal, which is the initial screen that enables the selection of contents and initial settings (see Figure 3). The following general settings are highlighted:

- *Voice Control*: it includes voice recognition and spoken feedback for / when executing commands.
- Menu type: it includes a traditional User Interface (UI) – Figure 4 - and an Enhanced-Accessibility UI – Figure 5 -, which occupies most part of the screen. Both UIs provide visual feedback to the execution of commands – Figure 6-.
- Safe Area: Size of the Field of View in which visual elements are presented on screen – Figure 7 -.
- Indicator: graphical element (arrow, radar) to indicate where the target speaker is in the 360º area. An auto-positioning mode is also available [8].

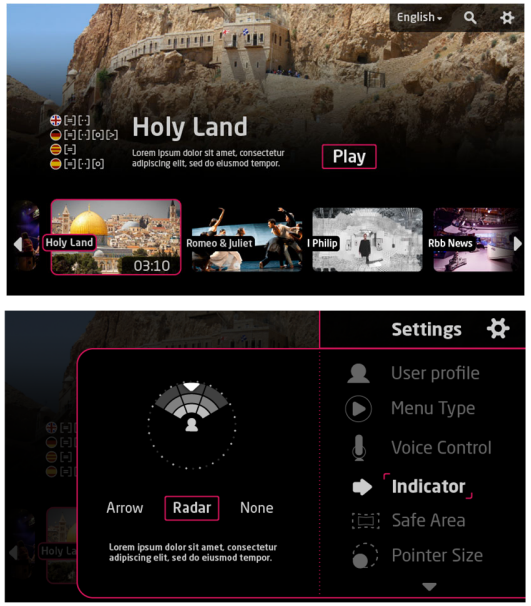

Figure 2: ImAc portal.

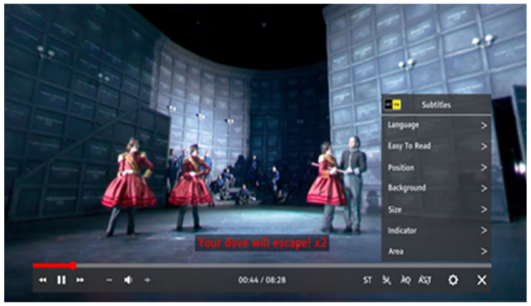

Figure 4: Traditional UI.

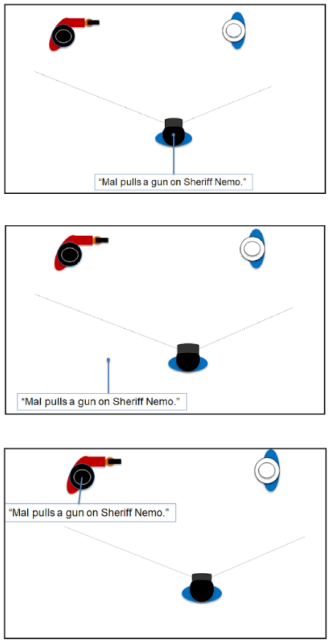

Figure 8: AD Presentation modes.

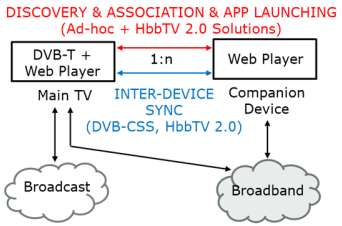

Figure 9: Envisioned multi-screen scenarios in ImAc.

Figure 5: Enhanced-Accessibility UI.

Once clicking on "Play", the player shows up. During media consumption, the UI can be opened by using the keyboard/controller/touchscreen, by looking down for a period of time, or via voice control.

Presentation of Accessibility Contents

Subtitling

It includes different settings, like language, three font sizes, position (top, bottom), subtitle type (traditional, easy-to-read), and background (outline, semi-transparent box). It also includes different colors and fonts for a better speakers' representation, and the inclusion of emojis or text for representing sound effects. In addition, different rendering modes are being tested, using the video sphere, the field of view or the target speaker/object as the reference [8].

Audio Description

It includes settings, like the language, three different spatial audio presentation modes and narratives (Voice of Good, Friend on Sofa, and Placed on Action, see Figure 8), and three gain levels of the audio description track compared to the main audio track.

Sign Language

It includes settings like the language, position and size of the window, and speaker's identification methods.

Multi-Screen Scenarios

The player is being prepared for its integration in web-based and HbbTV-compliant multi-screen scenarios (Figures 2 and 9) [3].

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