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CHARITY
Cloud for Holography and Augmented RealITY

The next step towards immersive communication

New EU project CHARITY develops framework for enabling holographic applications and immersive virtual training

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Heidelberg – Advanced media technologies for business and leisure, such as augmented reality (AR), virtual reality (VR), and holographic communications, are on the rise. However, the current user experience is not yet fully immersive. This is, among others, due to the high-interactivity nature of the associated services and its requirements in terms of intensive bandwidth and extremely low latency. The new EU project CHARITY – "Cloud for Holography and Cross Reality" – will tackle these challenges by developing an open source framework and tools for the intelligent use of network resources.

CHARITY will develop a cloud architecture that will be based on edge computing solutions, autonomous orchestration of computing and network resources, application-driven interfacing, mechanisms for smart, adaptive and efficient resource management, strong community involvement, and compatibility with infrastructure vendors.

In this way, CHARITY will enable novel media applications to deliver an immersive and highly interactive user experience. The project will prove the feasibility of its solutions via three use cases.

Real-time holographic applications

Holographic concerts with remote musicians playing together in real-time pose huge technical challenges. This is why the CHARITY consortium chose it as a use case. It requires extremely high bandwidth, ultra-low delay, high-precision synchronisation, and the ability to support coordinated service levels across massive bundles of interrelated streams. CHARITY will tackle this challenge with intelligent network and end-user schemes for encoding/transcoding, compression, caching and synchronization. This in-space 2D projection solution allows very large form factors and large audiences. A holographic meeting use case is based on the same technical principle.

CHARITY also targets a holographic assistant use case, adopting the physical principles "diffraction and interference of light" to enable real 3D holography, based on very sophisticated custom optical components and algorithms. This lays the foundation for showing a butler-like avatar in 3D space on a holographic 3D display with true depth and true eye focus - for your eyes it is like natural viewing. The butler shall react to natural language and assists by providing information gathered from the cloud or the internet. Beside the 3D holographic presentation,

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this use case enables a lot of sophisticated and challenging services and new technology to be developed and implemented in the CHARITY cloud - streaming 3D point cloud generation, handling and transcoding; speech recognition, synthesis and interpretation; access to and merging of different information sources and services - just to name some.

Immersive virtual training

CHARITY will explore several real-time immersive virtual training scenarios, including a VR-based schooling use case. It consists of multiple students connected to a virtual classroom, in which the teacher can provide virtual objects for the students to interact with, like, for example, a virtual 3D model of a DNA helix in a biology class. The challenge is to simulate the interaction in the virtual environment close to real life to provide a full immersion experience. Furthermore, a VR medical training use case will provide experiential simulation for medical training and assessment with cutting edge Virtual Reality (VR). The realistic surgical training modules will allow a large number of concurrent medical personnel-users to collaborate within a virtual environment interacting with 3D soft bodies of tissues, muscles, and more. This physics-based simulation requires a lot of processing power for mathematical calculations and an optimised network for minimal-latency synchronisation across all clients.

Mixed reality interactive applications

CHARITY will explore two mixed reality (MR) interactive applications, which combine AR and VR. The first is a highly immersive multiplayer AR game. In order to provide players with sufficient immersion, CHARITY will develop a dedicated multiplayer engine which will be able to synchronise all dynamic game objects along with the user states. The second is an operations trainer for helicopter flights in a search-and-rescue scenario with multiple collaborating manned and unmanned vehicles. Participants can virtually collaborate in a coordinated search within a largely synthetic environment including a free viewpoint and real equipment. This application will contribute significant advantages for future training and simulation systems by enabling the merging of synthetic and real imagery into the video stream as well as collaboration across multiple locations.

"A major step towards immersive communication"

Project coordinator Uwe Herzog from Eurescom GmbH in Germany said:
"The CHARITY project will make a major step towards bringing immersive communication into people's daily lives. CHARITY will enable novel applications based on augmented reality, virtual reality, and holographic communication in areas like cultural events, business meetings, training, and gaming."

Tarik Taleb, CHARITY's technical manager from ICTFICIAL Oy in Finland, said:
"The CHARITY framework will bridge the gap between the capabilities of 5G networks and the huge resource demands of advanced applications for advanced media technologies. Tackling this challenge is positioning Europe at the cutting edge of immersive communication solutions and will open up new business opportunities for European industry."

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About the CHARITY project

Horizon 2020 project CHARITY develops an open source framework and tools for enabling immersive communication through the intelligent use of network resources. The project started in January 2021 and will end in December 2023. It is performed by a consortium of 15 European partners from industry and academia.
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Acknowledgment