

Adding value to research and technology through integration of artists in projects and synergy creation between creative industries, entrepreneurs, researchers and arts

# STARTS Residency Public Report MUTED

## Muted, a fall through silence

Muted is a virtual reality installation that tackles the subject of abandonment through the sensation of weightlessness and sign language. Based on Fraunhofer HHI capturing technology, Muted poetically reveals the story of an abandoned girl who invent her own language. The visitor is invited to fall into a dedicated VR environment in which choreographed sign language is expressed through dancing avatar. The artistic challenge is to bring out emotions of movements in a sensitive way.

The residency happened in Brussels and Berlin, in four steps: Create VR world, study HHI avatar workflow, dancer capture in volumetric studio and Avatar creation and integration. Muted project and Conten4All project share a common goal: to transmit information using sign language through a 3D avatar. Fraunhofer HHI volumetric studio allowed me to obtain a precise and consistent 3D point cloud of a dancer. From this 3D point cloud I build a new way to visualize movements with particles. With the artist point of view, the relationship between the human being and its synthetic representation could be perceived in a poetic way.

Through Science and Art, we are trying to understand and describe the world, they together allow us to find new ways of looking at our reality. Muted experience falls within this framework.

Next step will be to show the project in digital art festivals, museums, contemporary art centre, cultural centres, etc...

## Index Terms— Virtual Reality, Sign language, 3D point cloud, particles, GLSL

#### I. INTRODUCTION

The research institute Fraunhofer HHI member of consortium Content4All aims to make more content accessible to the deaf community by developing a photorealistic 3D human avatar. Muted project addresses the notion of abandonment through the impossibility of the spoken word and use an invented sign language. Within the project, the HHI technology was used to create a new form of visualization in virtual reality.

#### II. ARTWORK

#### Muted, a fall through silence

Muted is a virtual reality installation that tackles the subject of abandonment through the sensation of weightlessness and sign language. Based on Fraunhofer HHI capturing technology, Muted poetically reveals the story of an abandoned girl who invent her own language. The visitor is invited to fall into a dedicated VR environment in which choreographed sign language is expressed through dancing avatar.

**Sensation**. The experience will take you to the depths, to the bottom of water, slowly, almost weightlessly along a thread as an apneist would do. The installation favours sensation as a journey in this story where violence is done through absence and silence. Muted is not a virtual reality film, but a six degrees of freedom interactive experience that allows you to be fully integrated into the universe.

**Speech impediment.** The main character in this story is a young girl who does not speak. The notion of abandonment is addressed through the impossibility of the spoken word. She refuses the words of the adult world, and to reclaim language, she invents a secret sign language. From the child's point of view, the body approach takes priority over the verb/word approach, she uses the physical gesture to try another world. Here the no-word constraint is a springboard to sublimate the act of expressing oneself.

**Augmented and poetic sign language challenge**. The artistic goals were to bring out emotions from movements in a sensitive way and succeed in the bet of a poetic augmented sign language. In this artwork, the focus was the emotion more than exact meaning. The form of the movement was inspired by existing sign languages, but is then part of a choreographic work.

**Hear with the eyes, see with the sound.** Part of the work was oriented on waves as a transfer of sensation between sight and hearing. The wave passes from one world to another by changing its frequency and length, like a channel for movement, sound, color. The particles composing the 3D character follow the fluctuations of waves that can resonate.



# III. METHODOLOGY

#### A 4 steps residency:

### 1st STEP: BRUSSELS / August 2019

The goal was to create the Virtual reality world in a real-time software before integration of the 3D avatar.

#### 2nd STEP: BERLIN / September 2019

Research & technical exploration of the 3D avatar creation in collaboration with the tech partner. Create and animate a 3D abstract avatar with data of our interpreters from volumetric studio.

#### 3rd STEP: BRUSSELS / November, 11<sup>a</sup> 2019

Volumetric capture of project dancer.

#### 4th STEP: BRUSSELS / October to December 2019

Integration of final animated avatar in the VR world. Optimization of the system to maintain a correct information flow with a fluid visualization.

**Scrum.** I used some tools of "Scrum framework" to organize the product development. The methodology is based on the division of a project into "sprints" as well as on the self-organization of the team (non-hierarchical). A sprint corresponds to a functionality of the project. For this particular purpose I used a one-week sprint duration as iteration cycle.



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#### IV. CO-CREATION PROCESS

The 3D signing avatar production was divided into two main parts: The capture of the model and the abstract/ poetic visualization of this one.

Fraunhofer HHI use a volumetric studio to capture a performer, this innovative capturing technology allow to reproduce fine details (e.g. finger, hands for sign language animation) with limited modeling effort. This kind of infrastructure allowed me to obtain a precise and consistent 3D point cloud of a dancer. From this 3D point cloud, I build a new way to visualize movements with particles.

**Volumetric capture of the dancer.** During September 2019, I researched how to "augment" an avatar movement based on the avatar capturing technology used at Fraunhofer HHI. The HHI team provided me capture tests in order to find interesting and realistic workflows. Once we were validated our workflow, we organized the capture session.

**Capture session**. The November, 11th 2019 the capture of the dancer was done. The HHI volumetric studio team organized and setup the system, and the performer and me prepared the choreography. Few weeks later, studio team provided me the point cloud of the dancer after data processing.

**Signing avatar abstract visualization**. During my research, it reveals that textures generate from capture was less interesting than the 3D points. I developed a way to generate particles from all the point cloud in real-time thanks to GLSL (openGL language). The abstract avatar is composed of 1 million interactive particles in VR 3K at 90 fps. I decided to use my own hardware and software to create this VR avatar, it allowed me to validate the new setup of the installation in the future. During the residency, I also used the real-time software Touch designer.



## V. IMPACT

## A. Research Impact

With the artist point of view, the relationship between the human being and its synthetic representation could be perceived in a poetic way. It provides a new way of 3D rendering avatar related to emotions as well as a new perception of the avatar in VR space. Ultimately it aims at increasing engaging of content4all end users.

It aims at also providing communication material to showcase the possibilities of the HHI technology

## B. Artistic Impact

Fraunhofer HHI volumetric studio allowed me to obtain a precise and consistent 3D point cloud of a dancer. From this 3D point cloud, I build an original way to visualize movements with particles.

# VI. ART-SCIENCE INTER-RELATIONSHIPS

Through Science and Art, we are trying to understand and describe the world, they together allow us to find new ways of looking at our reality. Muted experience falls within this framework.

The artistic project contributes to the innovative aspects of research by bringing new perspectives: Proposing an original augmented body language, a new way to visualize and spacialize feelings of the sign interpreter capture. The relationship between the human being and its virtual representation isn't necessarily mimetic: It was the bet of a poetic augmented sign language. In my practice, Science and Art are one entity. Science is not reduced to a tool, the way of doing things is part of creation.

## VII. FUTURE DIRECTION AND ACTIONS

Muted VR installation will be presented at the final event of the STARTS Residencies project, @Centquatre Paris from Friday, February 28, 2020 evening to Sunday March 1st.

Next step will be to show the project in digital art festivals, museums, contemporary art centre, cultural centres, etc...

## VIII. CONCLUSION

## A. Concluding Remarks

The STARTS Residency was a success for Muted project, the goal is achieved, and a very advanced prototype is already ready. Hope this research and work could be useful for all the partners. Also, the whole team hopes that the project will be shown to a wide audience.

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