# IO3 video of the use case of virtual reality for geosciences training

Outline

During the International week for VR in geosciences from 11/29/2021 to 12/3/2021 in the form of a virtual event, 3 days of collaborative immersive course sessions were organized by VR2Planets in order to demonstrate the potential of virtual reality tools for geosciences pedagogy. From this demonstration, videos were extracted by filming the students and professors physically present on the Nantes site. Videos were also extracted directly from the virtual reality software to present the immersive experience. This deliverable presents the different aspects of the virtual reality tool and the functionalities implemented to create relevant pedagogical activities for geosciences teaching on planetary bodies.

The immersive experience

A development tool has been made to synchronize the position of an external tracker attached to a real camera, to the position of a virtual camera. This development allows to capture the movements of a real camera and to synchronize them with the movements of a virtual camera positioned in the virtual world.
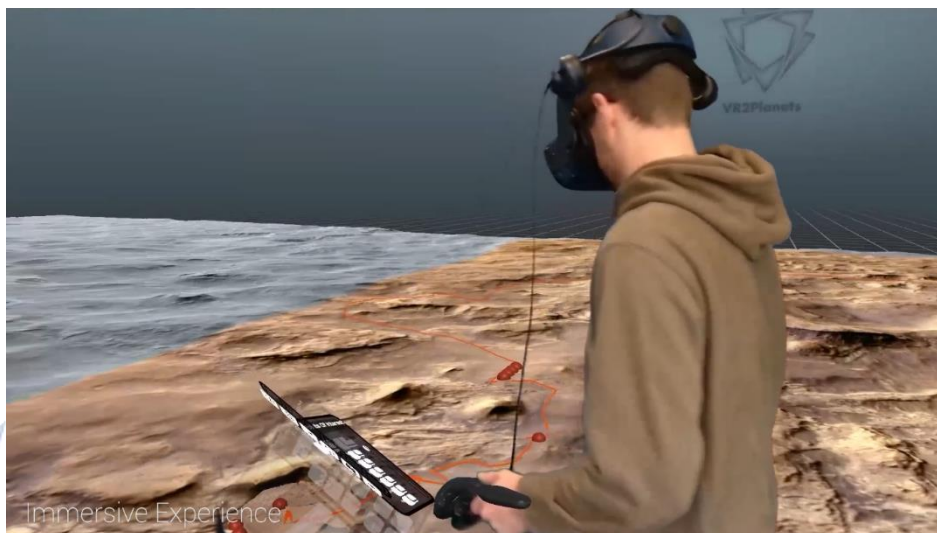
The second step consisted in filming a user in front of a green background during his experience with his virtual reality helmet. The movements of the real camera were thus reproduced in the virtual world to present a coherent field of view between the two video acquisitions.

VR2Planets
Virtual reality for geosciences and education
contact@vr2planets.com

The video acquisitions were carried out with standard equipment and an effort of adaptation was made to create the necessary tools for this video acquisition: adaptation of the support of the external tracker on the digital camera, acquisition of specific software allowing to mix in real time various video flows, adaptation of the green background to the field of view of the camera.
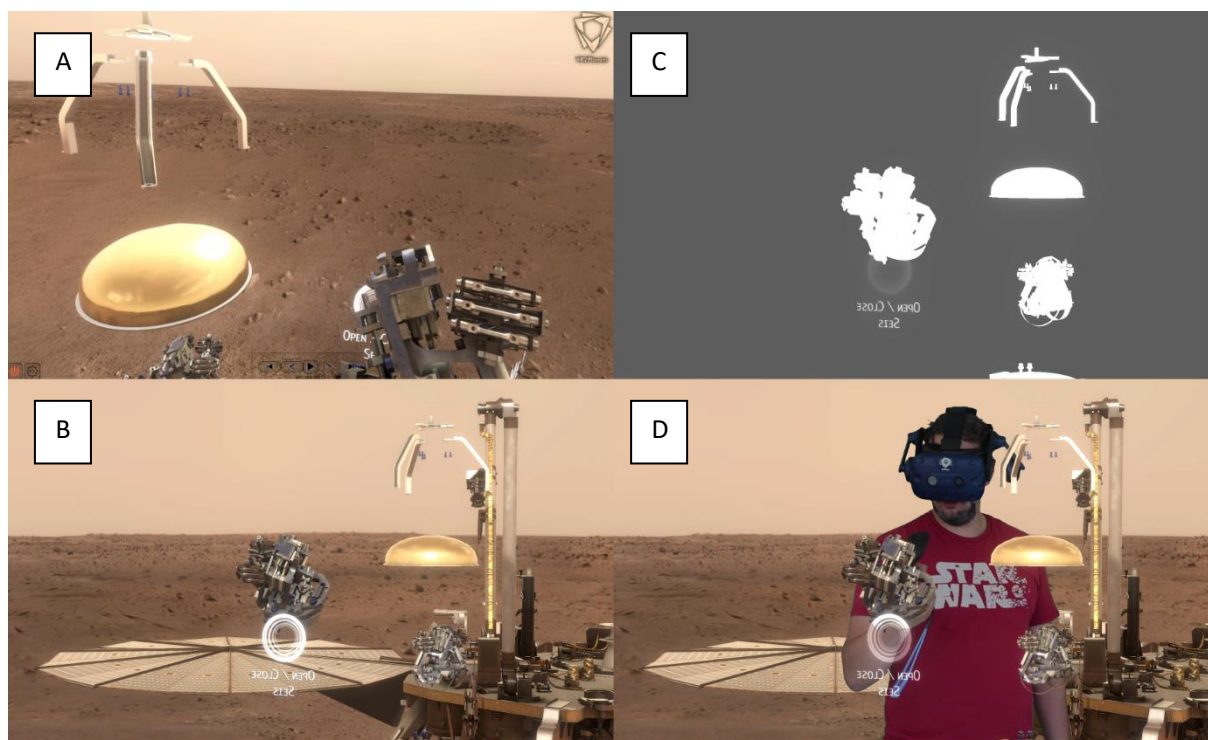
- A: video stream from the virtual reality headset
- B: video stream of the virtual camera whose position is linked to the real camera
- C: depth mask to identify the 3D elements shown above the user
- D: final rendering

With the help of a specific software, all the video streams necessary for the editing are processed in real time. The video stream from the camera filming the user was processed to remove the green background and to keep only the user's movements. The clipped user was then embedded in the video stream of the camera filming the virtual world. This software is also able to define a vertical plane whose position is defined by the position of the user in the real stream. This tool allows to define the 3D objects in front of the user to organize hierarchically the depth of the virtual elements to be displayed in the final video rendering. The result of this treatment process is a real user embedded in a virtual world with a perception by the audience "as if it were in a real world".

Collaborative sessions

The video then presents the capabilities of collaboration between remote users. This functionality offers the possibility for users to see and talk to each other.

The multi-user interaction in virtual reality brings a human dimension to the immersive experience. It is then possible for users to exchange their points of view and analyses on the experience they share.

The software used during the GeoPlaNet workshop, and created by VR2Planets, allows users to benefit from several tools that enrich the user experience:

- Voice transfer
- Teleportation
- Multiscale
- Laser pointer
- Measurements tools

Pedagogical activities in virtual reality

The video then focuses on the interaction tools specifically created to perform educational activities on real data.

VR2Planets
Virtual reality for geosciences and education
contact@vr2planets.com

The software developed by VR2Planet allows several remote users to be in the same virtual environment by managing the quality of the user: teacher or student, as well as the type of session since 2 different modes are available: course, practical work. The teacher has a tool (button) to switch from one mode to the other.

Virtual Courses

In "course" mode, the teachers are the only administrators of the immersive course session, the students are then followers and only the teacher can use the measurement tools. In "practical work" mode, all the students are sent in autonomy, they are then alone on their field and can use the measurement tools. During the practical work mode, the teacher can navigate from one student to another in order to help them in their learning experience to take measurements in the right places and to acquire the reflexes of an operator in the real field.

On the virtual field, educational content, in the form of figures, diagrams, and texts have been arranged and appear as the session progresses. In the "practical work" mode, all the students are sent in autonomy, they are then alone on their field and can use the measuring tools. During the practical work mode, the teacher can navigate from one student to another in order to help them in their learning experience to take measurements in the right places and to acquire the reflexes of an operator in the real field.

Link to the video :

https://drive.google.com/file/d/1onZdOmUJgEQeP2Z3zqncAlOvy5th9vlz/view