

## Semester project: Automatic Grasping in Virtual Reality.



### Main Objective:

Implement an automatic grasping system to improve the interaction in virtual reality.

### Background:

The hand are important for immersion in Virtual Reality. Some gloves have been produced to track accurately the fingers with reduced latency. However there is no glove with an efficient haptic feedback system. They are too expensive, bulky and not with all the shape. Hence, we need to find a way to manipulate virtual objects without any haptic feedback. Most of the finger tracking system uses some metaphor to interact with these object. Thus, the visual feedback of the grasping does not seem natural and can break the immersion. That is why, we want to implement an automatic grasping system more natural. This system is already used in some game like Lone Echo (see the video :

[https://www.youtube.com/watch?v=CyP3LZNa\\_IA](https://www.youtube.com/watch?v=CyP3LZNa_IA)).

This method is not new and has been already developed by a former laboratory at EPFL. Hence, we want to implement this automatic grasping based on their two main papers (R. Boulic 1996) (Rezzonico n.d.).

### Project Idea:

In the laboratory, we have received new gloves called Manus VR. They work with Vive Tracker and the lighthouse system which is a new tracking system made by Valve. We intend to use these gloves to track the hand and the finger to reproduce their position a virtual world. To this end, you have to implement the automatic grasping; all the fingers have to be wrapped around the virtual object according to his shape (handshake, grasp a virtual object). This first step correspond to the work of Rezzonico et al. (Rezzonico n.d.). Then, you need to focus on the multi finger manipulation, which are manipulations of the object only with fingers inside the hand. You need to develop your program according to the work of Boulic et al. (R. Boulic 1996).

### Goal:

- Implement the automatic grasping based on the paper (Rezzonico n.d.).
- Implement local finger manipulation based on the paper (R. Boulic 1996).

- A Unity plugin ready to use has to be produced.

#### Requirements:

- Unity (scripting in C#/DLL in C++)
- 3D geometry and quaternions (Vectors, cross products, rotations)
- Read the two papers (R. Boulic 1996) (Rezzonico n.d.).

#### Information, materials and resource:

*Unity3D game engine*: <http://unity3d.com/learn>

*Manus VR*: <https://manus-vr.com/#product-anchor>

*Vive Tracker*: <https://www.vive.com/eu/vive-tracker/>

#### Bibliography

R. Boulic, Rezzonico S.,Thalmann D. 1996. "Multi Finger Manipulation of Virtual Objects."  
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Rezzonico, S., Huang, Z., Boulic, R., Magnenat Thalmann, N., Thalmann, D. n.d. "Consistent Grasping Interactions with Virtual Actors Based on the Multi-sensor Hand Model. ."  
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