# Proposal: Finger tracking using touchless input devices

Goal

Goal of this project is the evaluation of finger tracking capabilities of touchless input devices. Primarily the Leap Motion will be investigated. Research of additional devices will also be conducted (e.g. Kinect) and compared with the Leap Motion.
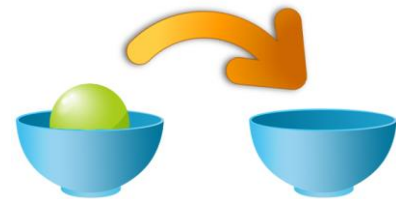
Ideas

To evaluate the finger tracking capabilities of a device, a *bounding volume hierarchy* of a human hand is reconstructed from the device's input data. Each finger contains three bounding volumes, one for each bone, in addition to two bounding volumes for the thumb. Fingers and thumb are attached on a bigger bounding volume for the palm/wrist. (https://www.youtube.com/watch?v=1LHBlY9go7M)
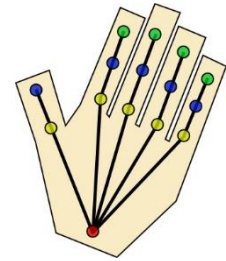
Then, the bounding volumes of the reconstructed hand are loaded into a real-time physic simulation environment. In this environment the hand can fully interact with other objects (also bounding volumes). The user can move his hand freely and interact with these objects in a very natural way – by touching and grabbing them. (https://www.youtube.com/watch?v=sAcTshfZCU8)

A simple scenario will be the task to move a ball from one bowl to another bowl. Further scenarios will be created and depending on their complexity various tasks can be performed, like grabbing and moving things or opening doors. Even more complex tasks like playing a game of Jenga or solving a Rubik's Cube are possible. (https://www.youtube.com/watch?feature=player_detailpage&v=uo3QrcZlr_E#t=87)

Depending on the accuracy of the device and to a certain degree the user's skills, the easiness of the task will be evaluated. With this evaluation data the suitability of the device in regard to its finger tracking capabilities can be measured.

Milestones and results

The project consists of the following milestones:

1. First, a short survey about devices suitable for finger tacking is created.
2. Based on these devices, a small framework will be developed for generating the bounding volume hierarchy of the user's hand. This milestone includes some basic visualization for the bounding volumes.
3. Thirdly, the bounding volumes from the hand are loaded into a physics simulation environment. This includes a simple scenario where the user has to grab and move an object (bowls example).
4. After the simple scenario, more advanced scenarios with complex interactions and sophisticated physics constraints will be created (e.g. solving a Rubik's Cube).
5. Based on the data gathered in these scenarios, a conclusion about the capability and suitability for finger tracking with the Leap Motion and other touchless input devices is drawn.