



LEAP Motion: a 3D interaction tool for a 3D modelling environment

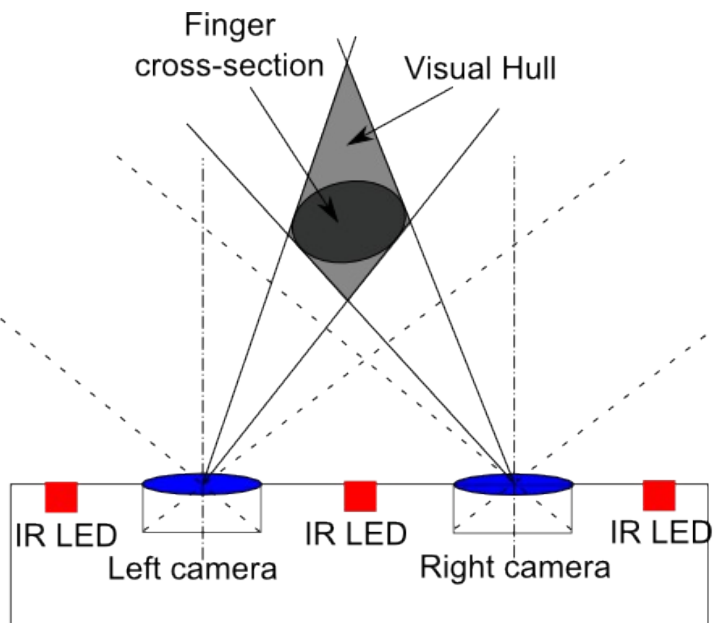
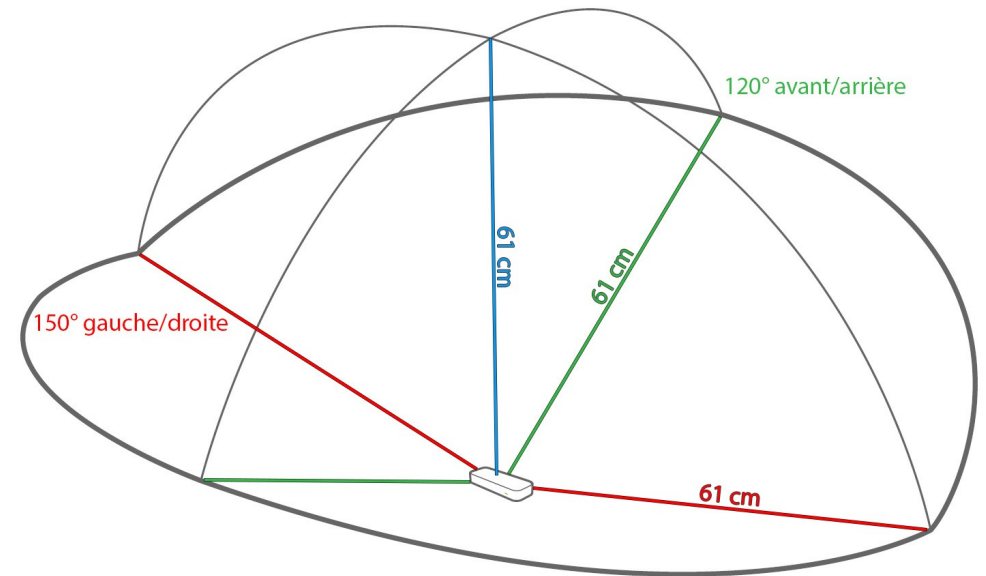
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Leap device



www.leapmotion.com



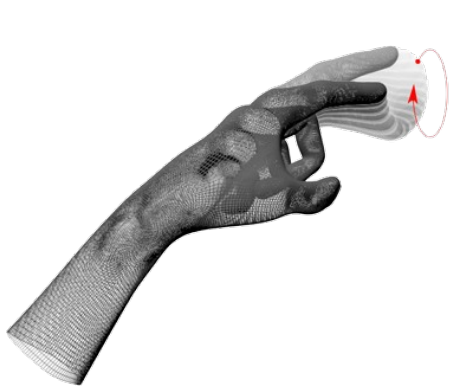
Working principle

LEAP Motion device uses two monochromatic infrared cameras and three infrared LEDs to monitor a roughly hemispherical area whose sizes are 610mm high, 150° wide and 120° deep.

Operating features (1)

The Leap Motion software can predict the positions of **fingers**, **hands** (arm and bone) and **pen-like tools**. Five fingers are always present for a hand. Hands can often cross over each other and still be tracked, in this case the controller estimates the position of the hidden hand.

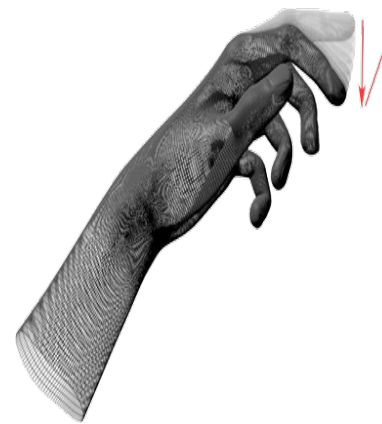
It is able to decode **four different gestures**.



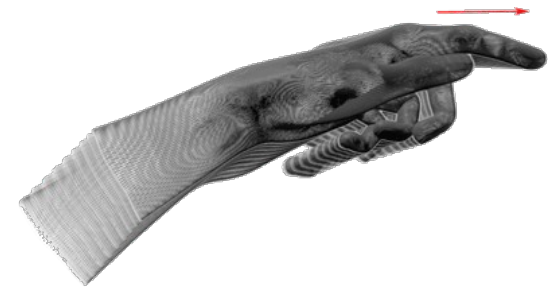
Circle Gesture



Swipe Gesture



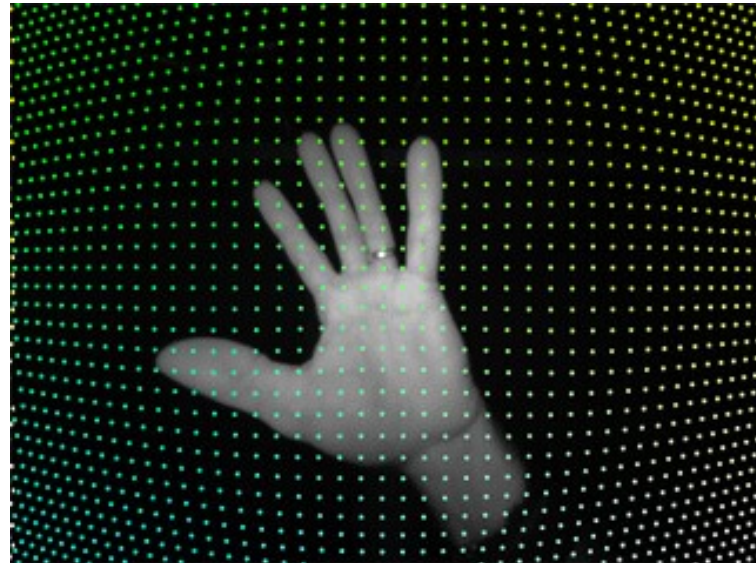
Key Tap Gesture



Screen Tap Gesture

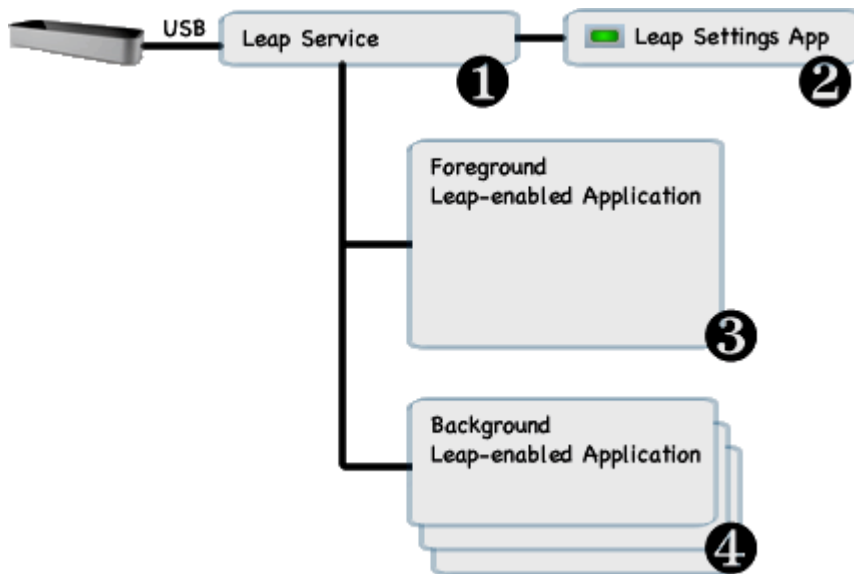
Operating features (2)

Motions are estimates of the basic types of movements inherent in the change of a user's hands over a period of time. Motions include **scale, rotation, and translation** (change in position). The Leap library provides **vector-matrix operations**. The **raw sensor images** can be got from the Leap Motion cameras.



SDK Architecture & language

Native Application



C++



C# and Unity



Objective-C



Java

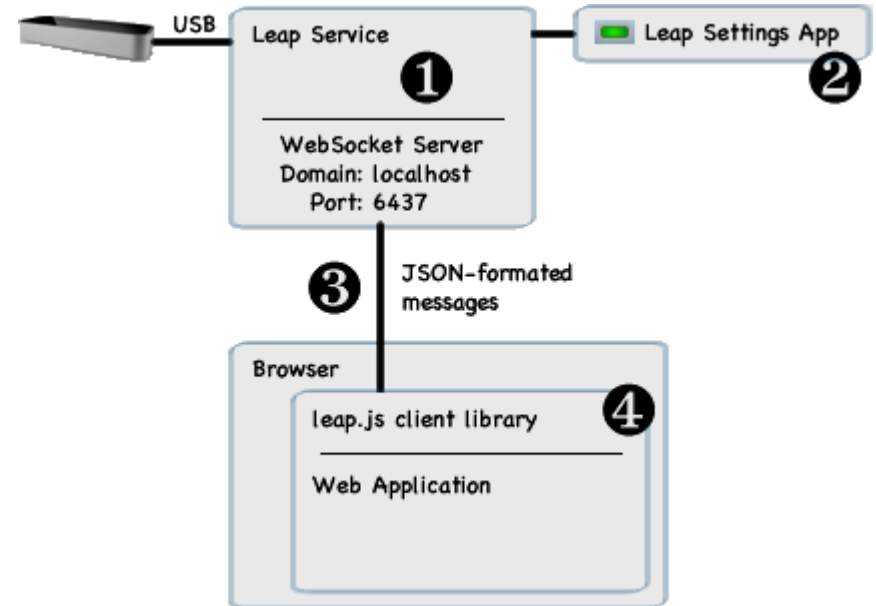


Python



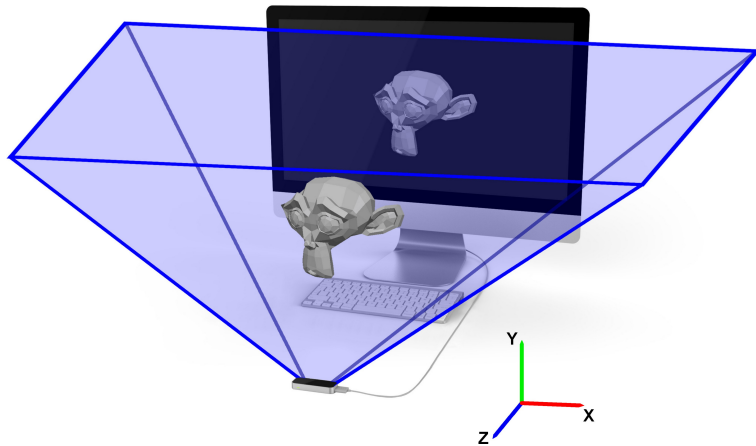
JavaScript

Web Application

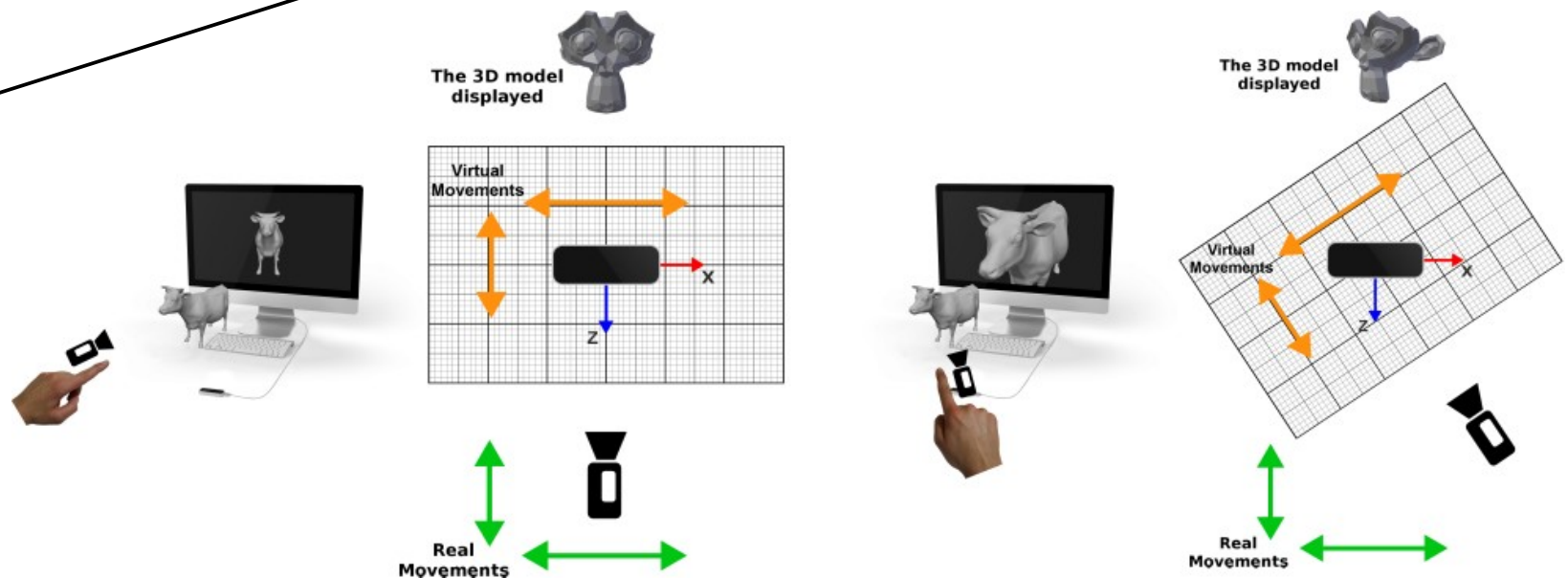
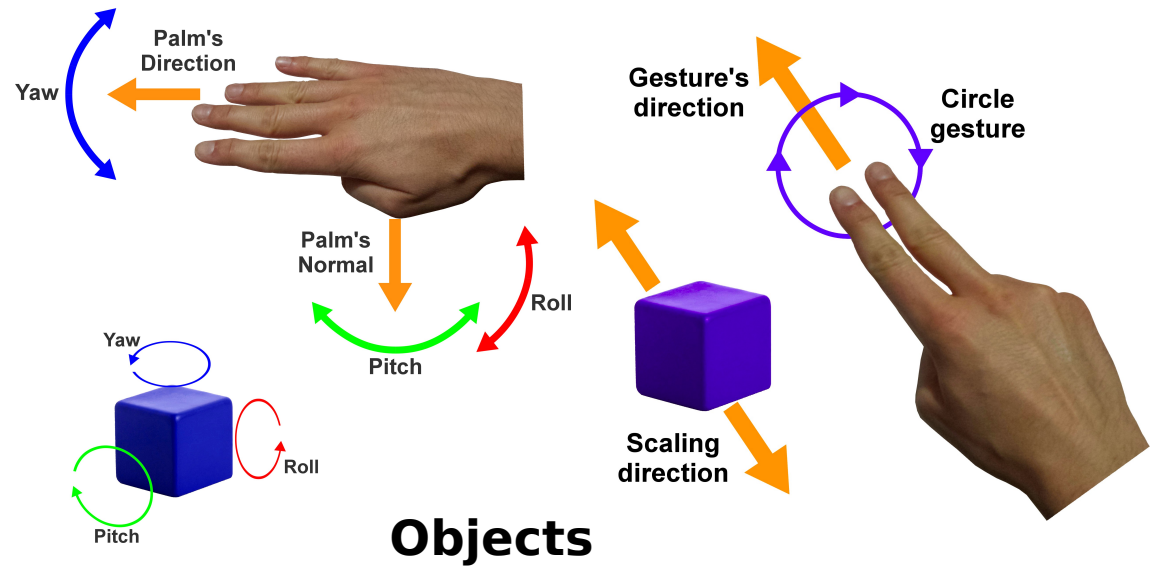


- Can we improve the usability of a 3D modelling environment?
- Evaluate if the LEAP Motion can be used in a 3D modelling environment: gesture-based actions but also punctual actions.
- Define new actions that use hands, fingers and pen-like tool to operate on the mesh.
- Define a paradigm that does not require an intensive training and can be used by non-expert users.

The project

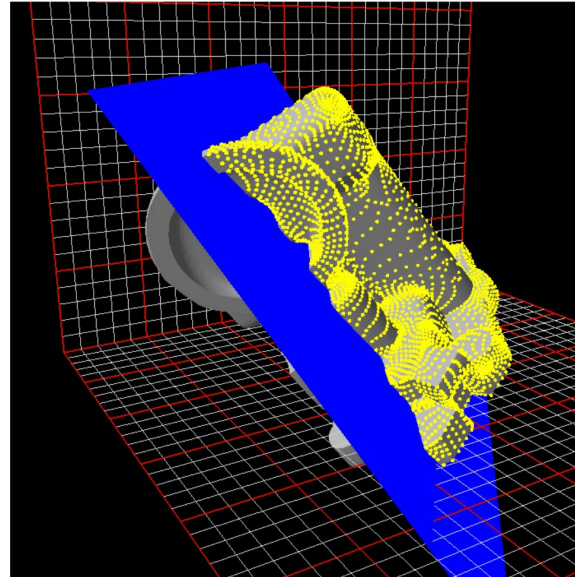
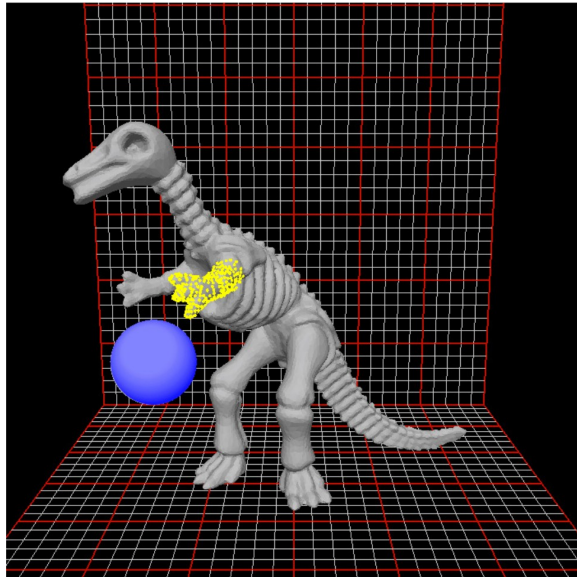


Environment



Camera

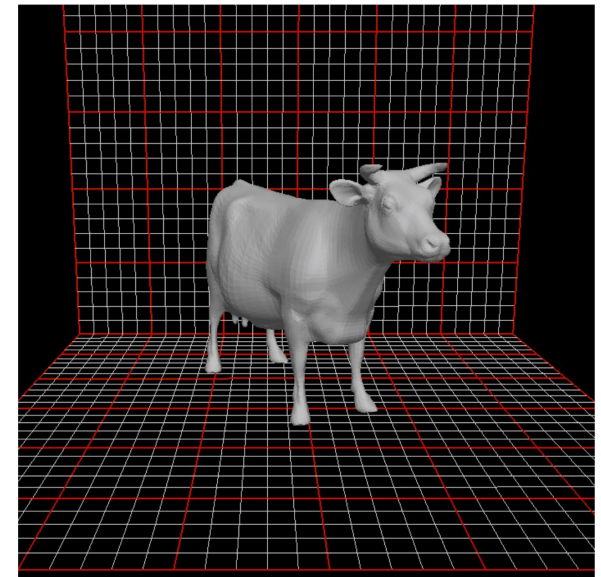
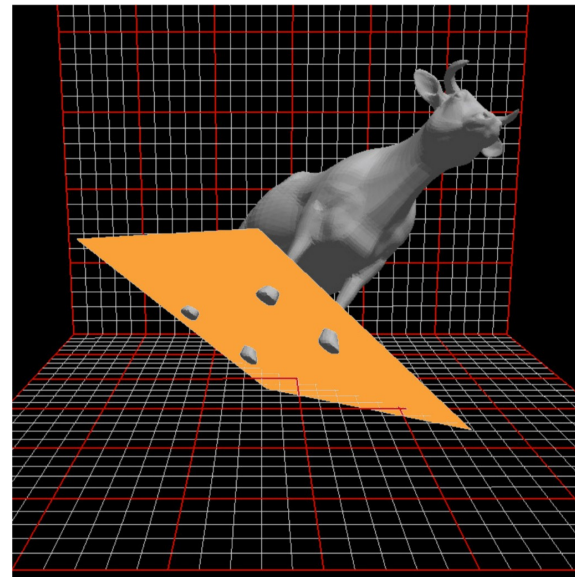
Some operations on mesh



Selection



Alignment



- ❖ Improve the visualization feedback with some other features like shadows, bounding box projection, hands' avatar. The aim is to **improve the user experience**.
- ❖ Study and implement new global and local transformations. The idea behind is to exploit **fingers and pen-like tools to modify the object**.
- ❖ Right now there aren't any objects creation functionalities. Once again, how we can use hands, fingers and pen-like tools to **implement extrusion and curves modelling or a new creation paradigm**.

- ❖ Implement **collision and alignment** features to help the user.
- ❖ Integrate the objects **deformation tool** (meshviz) improving its performances. OpenCL introduced solver for linear systems.
- ❖ Exploit the row images collected by the LEAP. The idea is to introduce real objects into the virtual scene, for example using IR markers.
- ❖ Improve the 3D interface (an example: [menu](#)).
- ❖ Integration with Blender exploiting its built-in python interpreter.
- ❖ Integration with WebGL to create online 3D modelling application.