SOFA Haptic Avatar Plugin

SOFA Plugin Manual

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1 - Overall description

1.1 - Haptic Avatar

Haptic Avatar is a haptic device for minimally invasive surgical training, e.g. laparoscopy, arthroscopy and thoracoscopy. It has four degrees of freedom, all with force feedback, and a form factor that enables multiple and adjustable portal placement suitable for both individual and team training.

It features a port-like part where a representation of a surgical tool can be inserted and retracted. The tool will be detected and identified at insertion, which opens up new and more realistic possibilities for training.

Here are a representation of some of the possible setup :

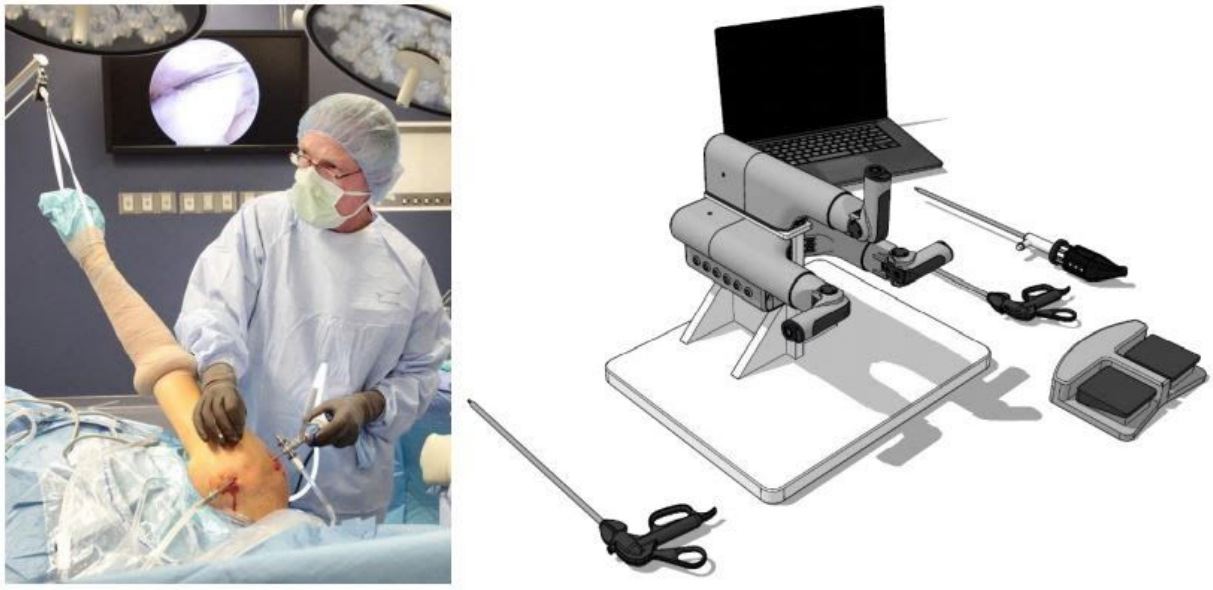


Figure 10. (Left) An arthroscopic shoulder procedure with the patient in lateral decubitus position. (Right) A simple corresponding setup for training.

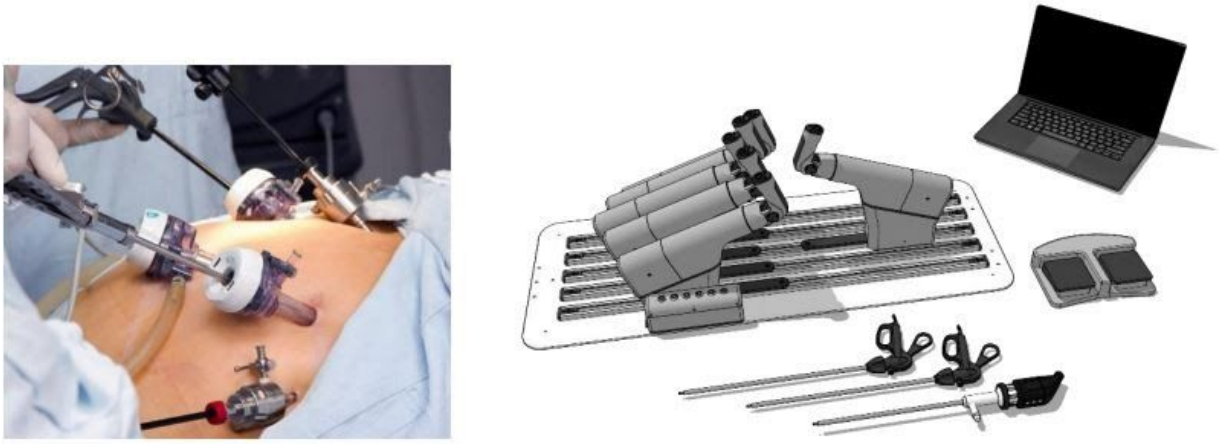


Figure 8. (Left) Picture of a bariatric surgery procedure. (Right) An example of a setup for laparoscopic general surgery.

For a full description of the device, please refer to the System Overview document.

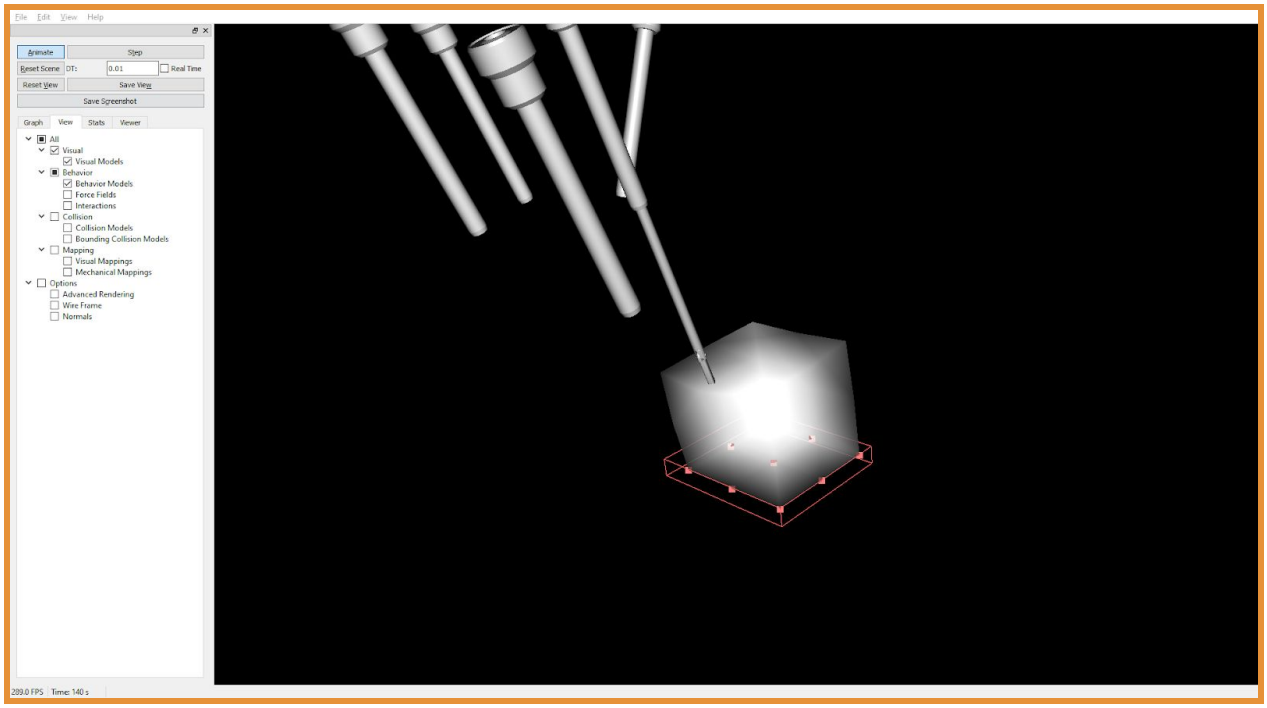
1.2 - SOFA

SOFA is an open-source framework for real-time interactive physics simulation, with an emphasis on soft body dynamics, robotics and medical simulation. Started in 2006, SOFA benefits today from a large international community made up of research centers and companies.

Thanks to its LGPL v2.1 open-source license (permissive and non-contaminating), SOFA is an innovation catalyst by making research efforts re-usable. SOFA is made up of a stable open-source core, providing state-of-the-art models and numerical methods, and many optional plugins (+150 open- and closed-source plugins) implemented specific features. The framework license and architecture therefore foster the development of prototypes and products under any commercial license.

1.3 - SOFA Haptic Avatar Plugin

This manual will describe how Haptic Avatar devices are integrated and simulated inside SOFA through this plugin.



For a full description of the device functionalities and communication protocal, please refer to the Haptic Avatar Reference Manual.

2 - Plugin content

2.1 - Repository Folder

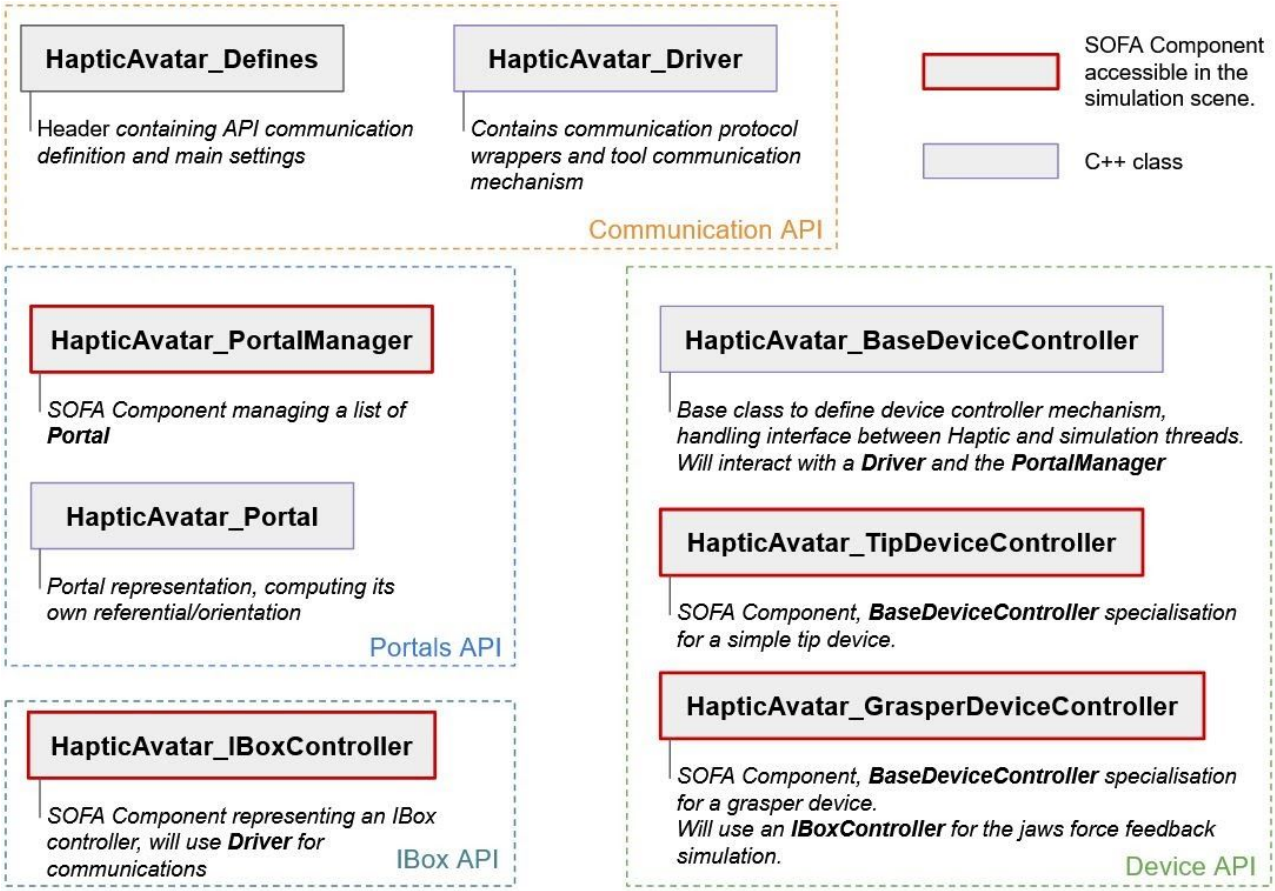
This SOFA Haptic Avatar plugin is available on GitHub here :
https://github.com/epernod/SofaHapticAvatar

This repository contains:

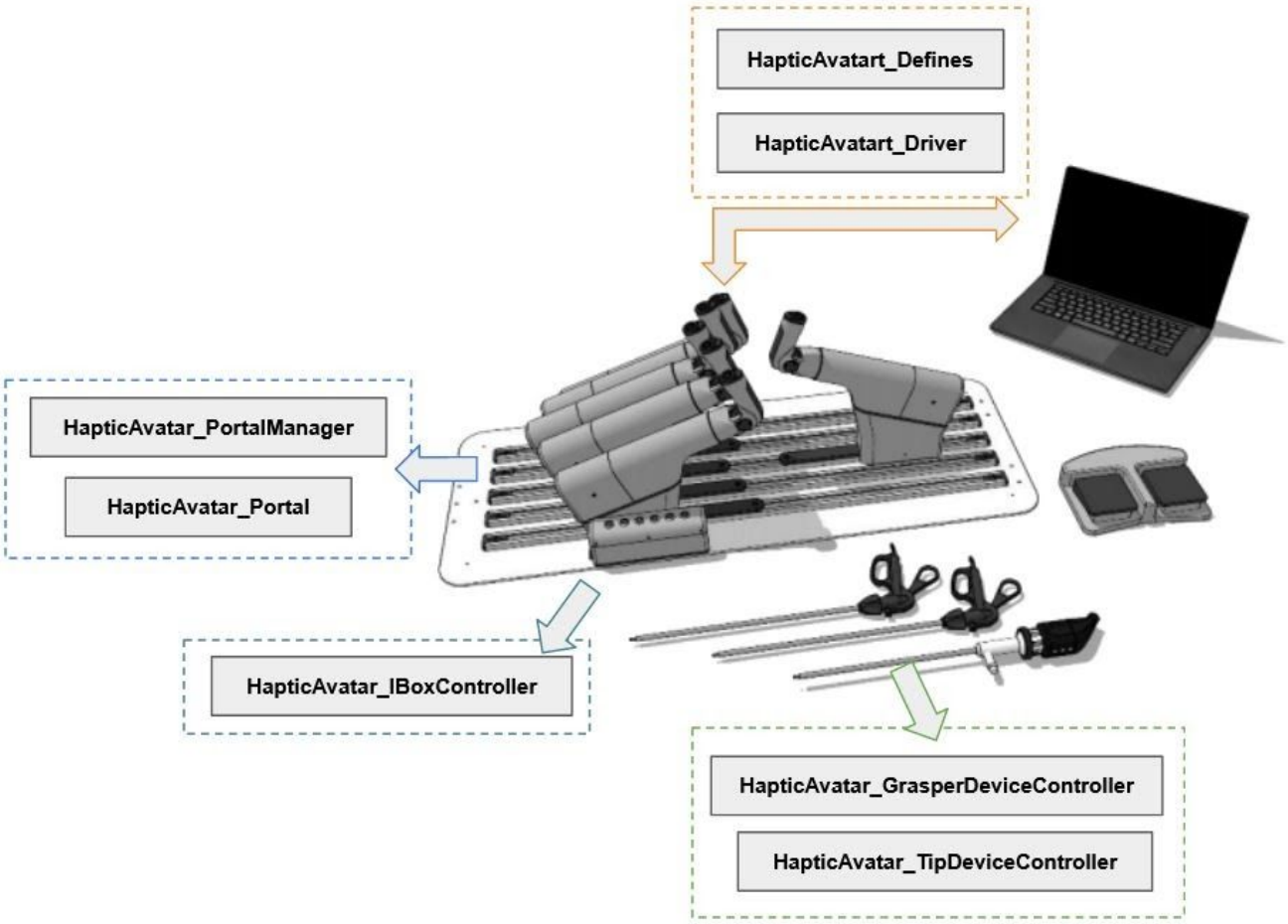
- **examples:** A list demo examples
- **src:** the plugin c++ code classes
- **doc:** this documentation as well as device manual reference

2.2 - Code architecture

Here is the list of classes available in this plugin with a small description



2.3 - SW vs HW



2.4 - List of examples

HAvatar_tool_motion
HAvatar_tool_rigidCactus
HAvatar_tool_rigidCube

HAvatar_deformableCube

HAvatar_grasper_motion
HAvatar_grasper_motion2

HAvatar_grasper_rigidCube

3 - Plugin installation

4 - Haptic Simulation mechanism