Integration of the HTC Vive into the Medical Platform MeVisLab

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INTRODUCTION

Virtual Reality (VR) is an immersive technology that replicates an environment via computer-simulated reality. VR gets a lot of attention in computer games but has also great potential in other areas, like the medical domain. Examples are planning, simulations and training of medical interventions, like for facial surgeries where an aesthetic outcome is important. However, importing medical data into VR devices is not trivial, especially when a direct connection and visualization from your own application is needed. Furthermore, most researcher don't build their medical applications from scratch, rather they use platforms, like MeVisLab, Slicer or MITK. The platforms have in common that they integrate and build upon on libraries like ITK and VTK, further providing a more convenient graphical interface to them for the user.

In this contribution, we demonstrate the usage of a VR device for medical data under MeVisLab. Therefore, we integrated the OpenVR library into MeVisLab as an own module. This enables the direct and uncomplicated usage of head mounted displays, like the HTC Vive under MeVisLab. Summarized, medical data from other MeVisLab modules can directly be connected per drag-and-drop to our VR module and will be rendered inside the HTC Vive for an immersive inspection (Figure 1).

We developed a new module for the medical prototyping platform MeVisLab that provides an interface via the OpenVR library to head mounted devices, enabling the direct and uncomplicated usage of the HTC Vive under MeVisLab.

Fig. 1 HTC Vive

METHODS

Data – As datasets for testing and evaluating the integration we used several high-resolution Computed Tomography (CT) acquisitions from the clinical routine.

Workflow – A high level workflow diagram showing the communication and interaction between MeVisLab and the HTC Vive via OpenVR is presented in Figure 2.

Network – The overall MeVisLab network with our *HTCVive* module is presented in Figure 3. In this network, the medical data is loaded via a *WEMLoad* module (named *DataLoad*) and is directly passed to the *HTCVive* module (rectangle input at the bottom of the HTC Vive module).

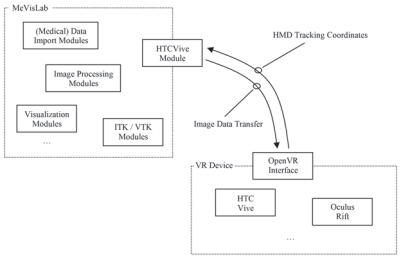

Fig. 2 High level workflow diagram showing the communication / interaction between MeVisLab and the HTC Vive via OpenVR.

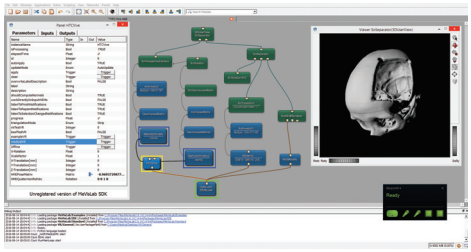

Fig. 3 The overall MeVisLab network with the *HTCVive* module and its interface, and parameters on the left side.

The OpenVR API provides a way to connect and interact with Virtual Reality displays without relying on a specific hardware vendor's SDK. Thus, our module could also communicate with other VR devices, like the Oculus Rift.

RESULTS

Overall, the goal of this contribution was to investigate the feasibility of using the HTC Vive under the medical prototyping platform MeVisLab.

The integration could be successfully achieved under Microsoft Windows 8.1 with the MeVisLab 2.8.1 (21-06-2016) Version for Windows Visual Studio 2015 X64 and OpenVR SDK 1.0.2 (Figure 4).

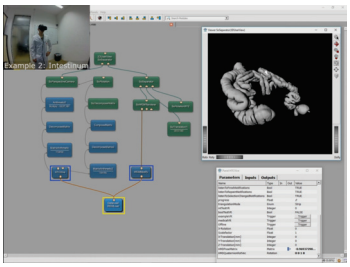

Fig. 4 Demonstration of the integration of the HTC Vive into the medical platform MeVisLab.

CONCLUSIONS

1. **The successful integration of OpenVR with MeVisLab has been demonstrated;**
2. **The developed solution allows MeVisLab programs to connect to virtual reality headset devices;**
3. **Real-time visualization of medical data in VR is now possible under MeVisLab;**
4. **For proof of concept, the integration has been tested with the HTC Vive device;**
5. **The HTC Vive module can be used in new MeVisLab networks or added to existing ones.**

There are several areas for future work, like the evaluation of our integration with a greater amount of medical data formats.

REFERENCES

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