



Unity-based VR Application for Medical Data Exploration

Project Management and Software Development
for Medical Applications

General Info

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Project Abstract

The goal of this project is to develop a Unity-based VR app for exploring and manipulating 3D data models. In order to facilitate the perception of the user and improve performance, the app should integrate interactive tools with multisensory feedback. In order to successfully complete the project, the student needs Unity knowledge and C# programming skills.

Background and Motivation

There is a growing need for better perceptual tools with the advances in the real-time data processing. With mixed reality, we can provide users with real-time, multisensory information that enhances training and surgical performance. One of the advantages of our auditory perception is that we can perceive multiple layers of sound simultaneously, which can work complementary to the visual limitations. Sonification, as a related field of study, is aiming at transforming data relations into perceived relations in an acoustic signal to facilitate communication or interpretation that is systematic and reproducible. Using sound as feedback is becoming a trend in state-of-the-art AR applications [1, 2, 3]. Sonification provides novel solutions to overcome interaction challenges with computer-assisted systems, by exploiting alternative perceptual channels of the user.

In this project, a Unity-based virtual reality (VR) application will be developed to provide users with interactive tools for exploring 3D medical images, such as CT and MRI, efficiently and effectively. Additionally, the app will incorporate visualization

and sonification components to enrich the interaction with multisensory feedback.

Student's Tasks Description

The student will build a Unity VR app for HTC Vives head-mounted display which provides the virtual scene, where the user can explore and manipulate the 3D model using its controllers. Additionally, there are audiovisual components to be developed, which together with interaction tools serve as an integrated application for 3D data model exploration and manipulation.

Technical Prerequisites

- C#
- Unity
- Preferably an Audio Programming Tool, e.g., SuperCollider [4], or Chuck [5], Native Audio Plugin SDK of Unity

References

[1] Matinfar, Sasan, et al. "Surgical soundtracks: automatic acoustic augmentation of surgical procedures." *International Journal of Computer Assisted Radiology and Surgery* 13.9 (2018): 1345-1355.

[2] Matinfar, Sasan, et al. "Sonification for Process Monitoring in Highly Sensitive Surgical Tasks." *Proceedings of the Nordic Sound and Music Computing Conference 2019 (Nordic SMC 2019)*. 2019.

[3] Matinfar, Sasan, et al. "Sonification as a Reliable Alternative to Conventional Visual Surgical Navigation." *arXiv preprint arXiv:2206.15291* (2022).

[4] <https://supercollider.github.io/>

[5] <https://chuck.stanford.edu/>