



# Immersive Surgical Procedure Replay in VR

Project Management and Software Development  
for Medical Applications

## General Info

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## Project Abstract

This project aims to leverage the 3D data collected from the ATLAS clinical trials [1], where surgeries were captured using a live 3D reconstruction system with Azure Kinect RGBD cameras. The objective is to convert this data, which is in a proprietary compressed format, into a format that is more universally compatible. There is already a proof of concept code available. The project will involve tasks such as data conversion and the development of a basic yet functional VR replay interface. By visualizing these surgeries in VR, we could create an immersive replay experience that can serve as an educational or analysis tool.

## Background and Motivation

During the ATLAS clinical trials [1], a capture setup involving four Azure Kinect RGBD cameras was employed to create live 3D reconstructions of the ongoing surgeries [2]. This setup not only facilitated a real-time, comprehensive view of the surgical procedures but also allowed for the data to be stored in a custom, compressed format.

By utilizing the collected 3D data to visualize surgeries in Virtual Reality (VR), we aim to create an immersive replay experience. This would enable medical professionals to review and analyze surgical procedures from multiple angles, enhancing educational outcomes and postoperative analysis. The VR environment offers a controlled, interactive platform where every aspect of the surgery can be explored.

Moreover, the transition from traditional review methods to an immersive VR experience could improve how medical personnel are trained, providing a more hands-on approach without the risks associated with live surgery. This project proposes not only to utilize existing data but also to set a precedent for future clinical documentation and training methods, making complex surgeries more accessible and comprehensible for medical professionals.

## Student's Tasks Description

Transcode the stored data into a compatible format.

Build and integrate a VR environment that supports interactive replay of surgeries.

Develop preliminary 3D UI for VR replay.

Student will gain expertise in VR and 3D data processing.

## Technical Prerequisites

The student should be familiar with Unity/C#.

The student should come to NARVIS lab to use the workstation (or remote access) and VR equipment.

## References

[1] ATLAS Clinical Trials <https://www.lmu-klinikum.de/aktuelles/newsmeldungen/team-der-klinik-fur-allgemein-viszeral-und-transplantationschirurgie-gewinnt-german-medical-award-2020/0788a470ed17b0f7>

[2] Eck, U., Wechner, M., Pankratz, F., Yu, K., Lazarovici, M., & Navab, N. (2023). Real-Time 3D Reconstruction Pipeline for Room-Scale, Immersive, Medical Teleconsultation. Applied Sciences, 13(18), 10199.

Please send the completed proposal to [tianyu.song@tum.de](mailto:tianyu.song@tum.de), [shervin.dehghani@tum.de](mailto:shervin.dehghani@tum.de) and [felix.tristram@tum.de](mailto:felix.tristram@tum.de). Please note that this proposal will be evaluated by the BMC coordinators and will be assigned to a student only in case of acceptance.