

# Virtual Surgery on Geometric Model of Real-Human Organ Data

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## Abstract

Traditional Surgery methods involve collection of patient's data, data study and providing inferences to a surgeon to perform a specific procedure if required. General issues while conducting surgery are limited degree of freedom, side effects such as infection, haemorrhage etc. Virtual Reality Technology has aided these methods by incorporating techniques such as 3D model visualisation, training in synthetic environments, pre-operative planning etc., thereby assisting a medical personnel in conducting a real surgery.

Existing VR systems are implemented in two fronts i.e. visualisation, where real datasets are analysed in 2D/3D and surgery simulation, where pre-modelled datasets are used for simulating surgery scenarios. The literature documents that, a few attempts have been made to use real datasets for both visualisation and simulation. Hence, there exists a need to bridge this gap. The dissertation presents the development of a surgery application that processes any real dataset in its native format into a geometric model, deploying realistic surgery scenarios.

CT Images in DICOM format generated by the OsiriX Image Navigation Software, are processed into a geometric model containing contour surfaces. The model is deployed in the visualisation and surgery procedure scenes. The scenes are developed such that the user can perform 3D visualisation of the input dataset, navigate in the Virtual Environment and also conduct an incision procedure for user training and study. The implementation also involves a scalpel model used to conduct the procedure and applying textured environments for realism. Menu and text based GUI, with VR device interfacing are implemented in the system for user interaction.

The system proves the concept of virtual surgery. Enhancements can be made in future to develop a full fledged system that would be beneficial to surgeons for pre- operative planning and performing mock surgery on real data. Also, medical students can acquire surgical experience while exercising surgery procedures.

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