Collaborative VR for Liver Surgery Planning using Wearable Data Gloves: An Interactive Demonstration

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\textbf{A B S T R A C T}

Preoperative planning for liver surgery is a critical procedure to assess a potential resection and it supports surgeons to define the affected vessels and resection volume. Traditional surgical planning systems are widely used to support the planning with the usage of desktop-based 3D and 2D visualizations. However, desktop-based systems offer limited interactions and visualizations compared to virtual reality (VR) \cite{3}. A suitable technique to support collaboration among surgeons is required. Our previous works \cite{1, 2} illustrate that using collaborative VR is essential to enhance communication, teamwork, and over-distance collaboration. In this work, we present a collaborative VR prototype to support liver surgery planning with intuitive interactions using wearable data gloves and VR controllers. The users can explore the patient data in both 2D and 3D representations. Thereafter, a virtual resection is specified by drawing lines on the 3D model representation. The virtual resection is further refined to keep safety margins from the tumors. Moreover, real-time risk maps are visualized to support the surgeons during the modification. Finally, the results of the virtual resection are visualized as resection volumes with their indicated amount and colors. Future work aims to conduct an extensive clinical study to compare the suitability of these input devices.

\textbf{Keywords:} Virtual Reality, Collaborative VR, Liver Surgery Planning, Medical Training, Data Gloves, Medical VR.

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\textbf{REFERENCES}


\textbf{Demo Video:} \url{https://youtu.be/AOWCVn2iRFY}

\begin{figure}[h]
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\includegraphics[width=\textwidth]{fig1.png}
\caption{Overview of our collaborative VR prototype for liver surgery planning: (a) two users virtually collaborate in the virtual environment, (b) the exploration of patient data on 2D slices and tumor contours, and (c) the collaborative users perform in the real world.}
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