AN EXTENDED REALITY INTERFACE FOR INTERVENTIONAL MRI

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1. Introduction

MRI offers detailed procedural feedback during image-guided interventions. However, visualization is limited to a remote screen inside the MRI room, while controls are located outside. This leads to frequent pauses for communication and adjustments, hampering the clinical workflow. As a result, the full potential of MRI remains largely underutilized.

2. Objectives

This work aims to develop an extended reality (XR) tool for improving the efficiency and clinical impact of MRI-guided interventions by providing real-time imaging data display, in-room scan-plane control and the capability to integrate holographic visualizations during interventional procedures.

3. Methods

An XR application was created for a head-mounted(HMD) XR device. MR images were transmitted to the HMD via a messaging protocol[1]. Gesture commands were sent to the scanner through an SQL database. MR compatibility was tested for attraction force and bi-directional electromagnetic interference. A cardiac ablation was emulated using an anthropomorphic cardiac phantom[2] to create a hologram[3], an ablation catheter and an active tracking sequence.

4. Results

Our XR tool includes an image display, a scan-plane control cube and a catheter-tip component coupled with a hologram. The HMD was MR-compatible up to 60 cm from the scanner. No image artifacts or SNR degradation was found. The imaging latency during real-time imaging was ~1.3 sec. and the command latency ~0.5 sec.

5. Conclusion

Our XR tool allows for easy and intuitive control over the scan-plane directly from within the MRI room, potentially reducing procedural time and cost. The option to use holographic renderings can enhance the anatomical guidance during interventional procedures by providing 3D context to the interventionist[4].

6. References

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