

MRI-based Augmented Reality Assisted Real-time Surgery Simulation and Navigation



Health & Wellness

Computer/AI/Data Processing and Information Technology

Opportunity

The implementation of augmented reality (AR) in medicine has opened up new avenues for surgical procedures, especially concerning complex operations on internal organs, such as neurosurgery. Current practices in complex surgeries often rely on 2D image guidance systems, which can limit the surgeon's ability to visualize precise 3D anatomical structures. While 2D guides function well for many procedures, the challenges increase considerably when dealing with intricately layered internal organs. Surgeons often need to mentally convert 2D images into a 3D model of the organ. This process, while often necessary, means surgeons have to split their attention between the operating site and an external display. AR technology has the potential to offer real-time, 3D, personalized views of the patient's anatomy. However, existing AR solutions typically lack real-time tracking for surgical navigation, which limits their utility in more complex procedures.

Technology

The invention at hand improves the existing practices by combining the advantages of magnetic resonance imaging (MRI) and AR technology to provide a real-time, personalized, and 3D visualization method of targeted internal organs during surgeries. It provides a robust and accurate navigation system allowing surgeons to visualize the exact surgical path and specific anatomical features during an operation. The invention involves obtaining 2D MRI images of the targeted internal organs, then recombining and segmenting these images using a non-linear function to generate a personalized 3D model. This model integrates seamlessly into an AR system that provides real-time feedback and navigation assistance during surgical operations, thus addressing the need for a non-human intervention and personalized 3D visualization method for complex surgeries.

Advantages

- Provides surgeons with a real-time, personalized 3D AR view of internal organs during surgery, enhancing their ability to perform precision procedures.
- Utilizes a combined optical and electromagnetic tracking system for accurately generating navigation coordinates.
- Minimizes the need for surgeons to divide their attention between the operating site and an external display.

IP Status
Patent filedTechnology Readiness
Level (TRL) ?

6

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Develop
ConceptProof
Concept

Funding

Build Value

- Delivers improved accuracy and safety in surgical procedures by enabling better visualization and understanding of the complex 3D structure of organs.
- Enhances the feasibility of minimally invasive surgeries by providing robust navigation assistance.

Applications

- Use in advanced surgical procedures, including neurosurgeries and spinal surgeries.
- Training programs for medical students and surgeons to understand complex anatomical structures and surgical techniques.
- Medical imaging research, with the potential to advance the field of AR integration in medicine.
- Development of advanced surgical tools and equipment with integrated AR capabilities.
- Potential integration with AI and machine learning systems for predictive modelling.

