Mixed Reality Patient Training Virtual MRI Simulation

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INTRODUCTION

- Magnetic Resonance Imaging (MRI) is widely used and crucial for diagnosis
- The scanning process induces extreme anxiety for individuals, especially children, because of the volume, long duration, and enclosed space.
- This causes individual discomfort, an increased need for sedation of children, more scanning required due to pausing or interrupted scanning.
- Current training procedures include a physical mock scanner inside the facility, which requires an individual to be on site.
- **GOAL: Creation of a virtual reality mobile device application of an MRI simulation and training to be utilized prior to the scanning of pediatric patients.**

METHODS

SIMULATION

- Main three issues that can be simulated are noise, duration, and in scanner movement.
- Scanner sounds used were recorded from actual scanner.
- Pediatric MRI technicians were consulted for guidance in talking the patients through the process.

Figure 1. 3D model of MRI scanner in Unity programming

TRAINING

- Patient movement inside scanner creates issues when collecting data with MRI.
- With virtual simulation, head movement feedback can guide training of patients to hold still while inside the scanner.
- GOAL: Create a child-friendly way to simulate MRI with guidance and training procedures in order to decrease anxiety and optimize patients' abilities to be scanned efficiently.

RESULTS

- The 10-minute-long iOS or Android application begins with brief explanation of MRI procedure and machinery. Three scans are simulated, with ascending lengths of time for training purposes.
- At the start of scanning, the user's head position is registered, and a green reference sphere appears in view. If the user moves slightly, another tracker sphere turns yellow for a warning, and if the movement is

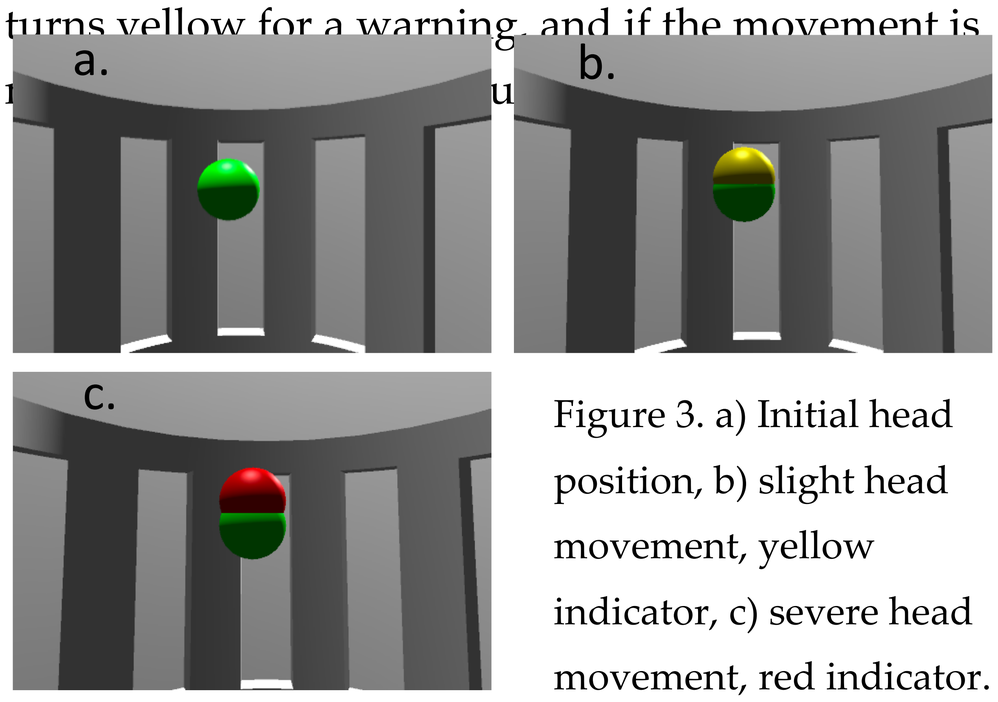
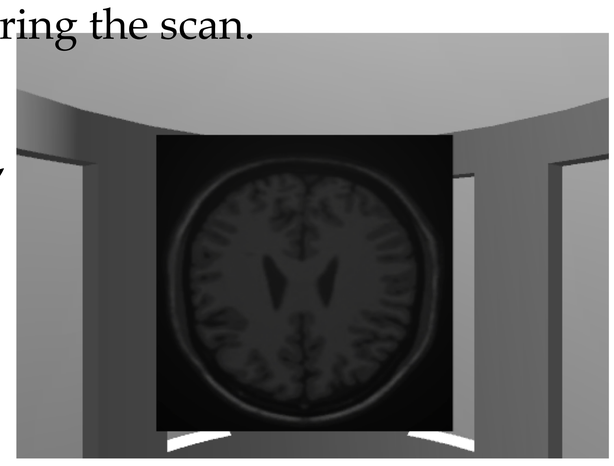


Figure 3. a) Initial head position, b) slight head movement, yellow indicator, c) severe head movement, red indicator.

- After each of the three scans, a sample MRI photo appears with blurring based on amount of head movement detected during the scan.

Figure 4. Sample MRI photo with no blurring, indicating no head movement during the scan.



DISCUSSION & CONCLUSION

Limitations:

1.) Effectiveness not yet measured

2.) Cannot replicate physical feeling of being enclosed

3.) Only appropriate for children of certain ages

Future Work

1.) Test app with pediatric patients prior to scanning

2.) Integrating augmented reality

3.) Creating different verbal guides for various ages

References: Carter, A.J., Greer, ML.C., Gray, S.E. *et al.* Mock MRI: reducing the need for anaesthesia in children. *Pediatr Radiol* 40, 1368–1374 (2010). https://doi.org/10.1007/s00247-010-1554-8

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