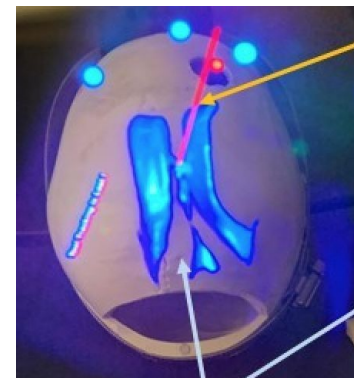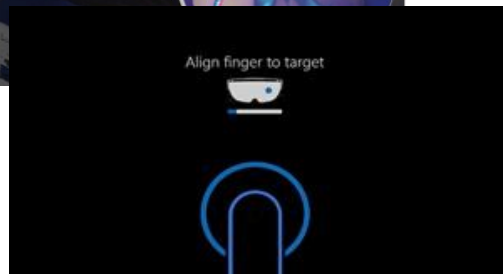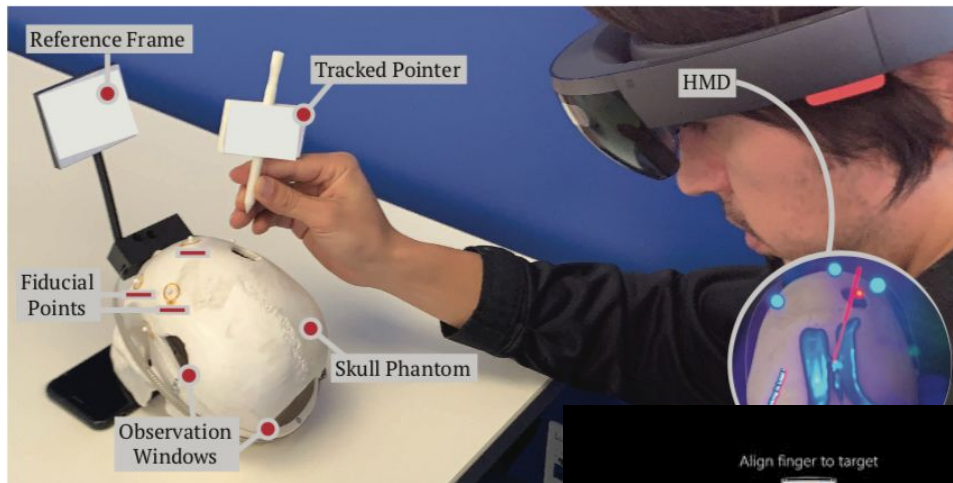# HMD-Based Navigation for Ventriculostomy Critical Review Presentation

Maia Stiber

# My Project: HMD-Based Navigation for Ventriculostomy

Mentors: Ehsan Azimi, Peter Kazanzides, Chien-Ming Huang, Dr. Judy Huang, and Dr. Camilo Molina



https://docs.microsoft.com/en-us/hololens/hololens-calibration

# A wearable mixed-reality holographic computer for guiding external ventricular drain insertion at the bedside

Ye Li, MD, PhD,[1] Xiaolei Chen, MD, PhD,[2] Ning Wang, MD, PhD,[1] Wenyao Zhang, PhD,[3] Dawei Li, MS,[3] Lei Zhang, MD,[1] Xin Qu, MD,[1] Weitao Cheng, MD,[1] Yueqiao Xu, MD,[1] Wenjin Chen, MD,[1] and Qiumei Yang, PhD[1]

- Same medical procedure
- User study involved actual patients

# Background
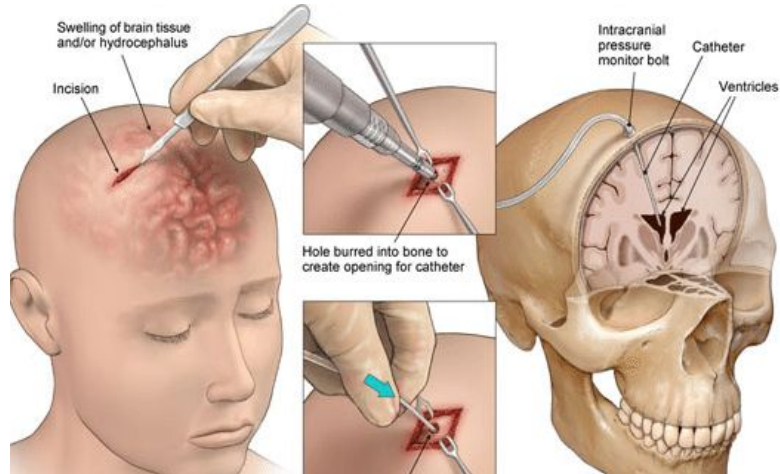


Ghandorh, Hamza & Mackenzie, Justin & De Ribaupierre, Sandrine & Eagleson, Roy. (2017). Development of Augmented Reality Training Simulator Systems for Neurosurgery Using Model-Driven Software Engineering. 10.1109/CCECE.2017.7946843.
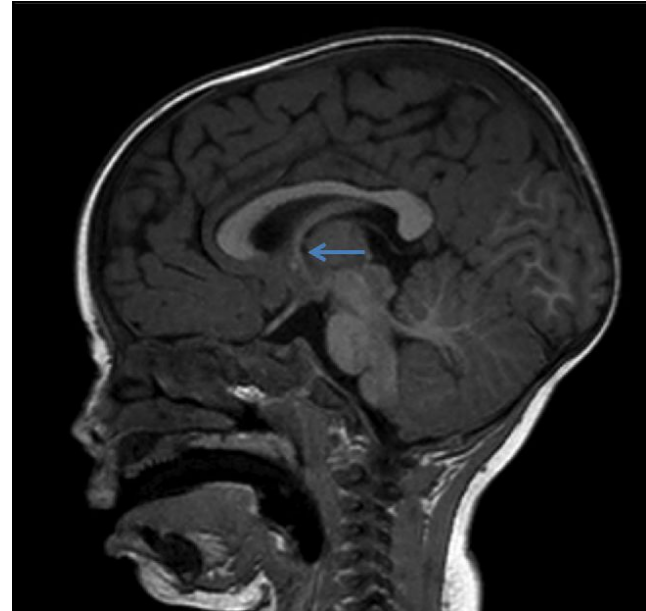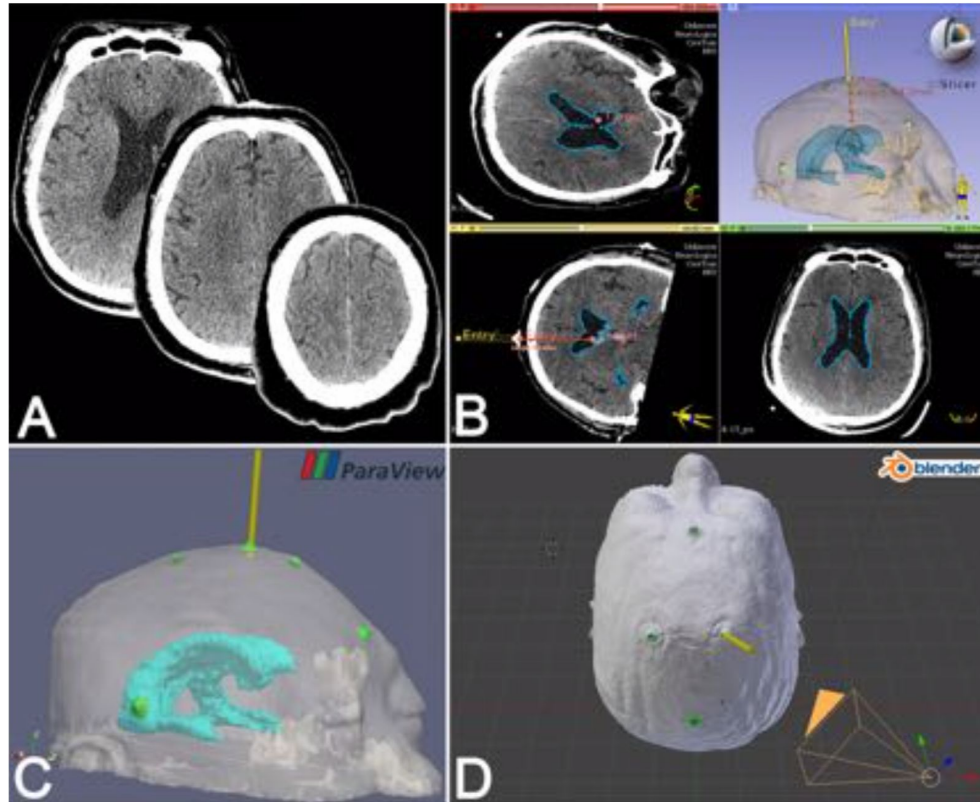


R. Shane Tubbs, Peter Oakes, Ilavarasy Maran, Christian Salib and Marios Loukas. "The foramen of Monro: a review of its anatomy, history, pathology, and surgery." *Child's Nervous System* 30 (2014): 1645-1649.
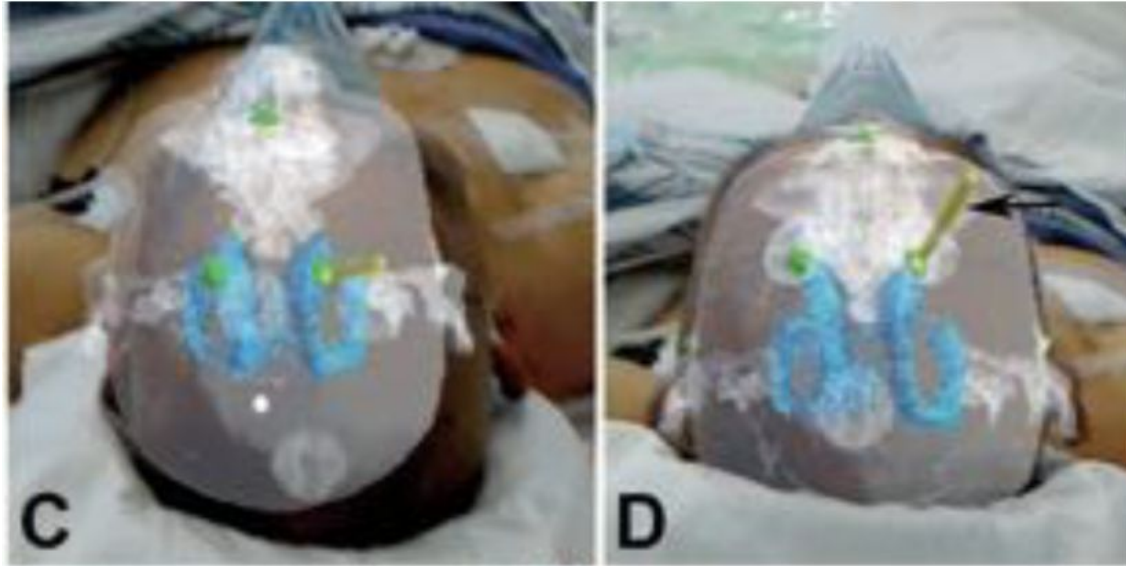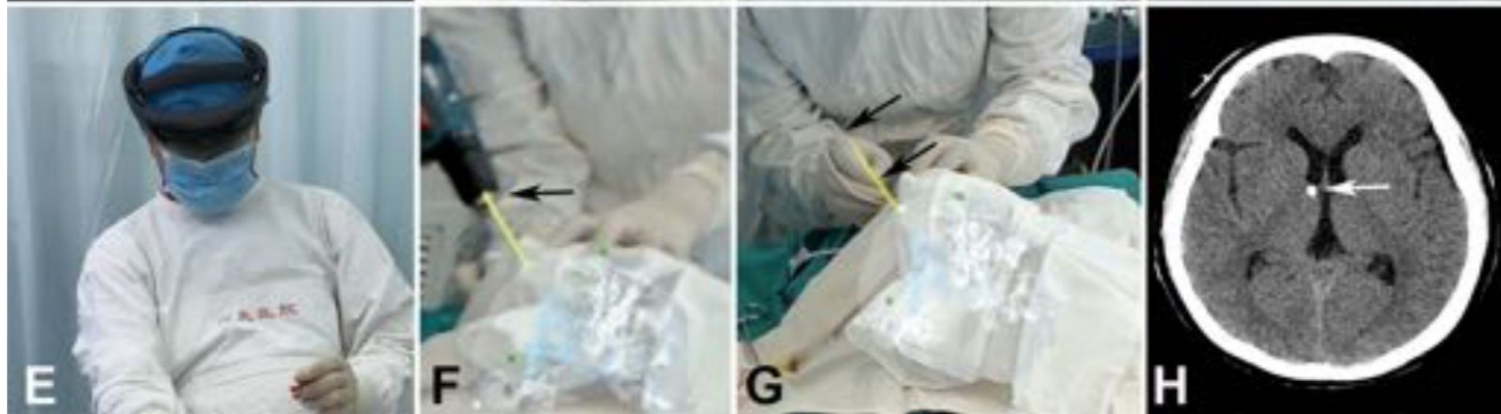
# Proposed System Summary: Overview
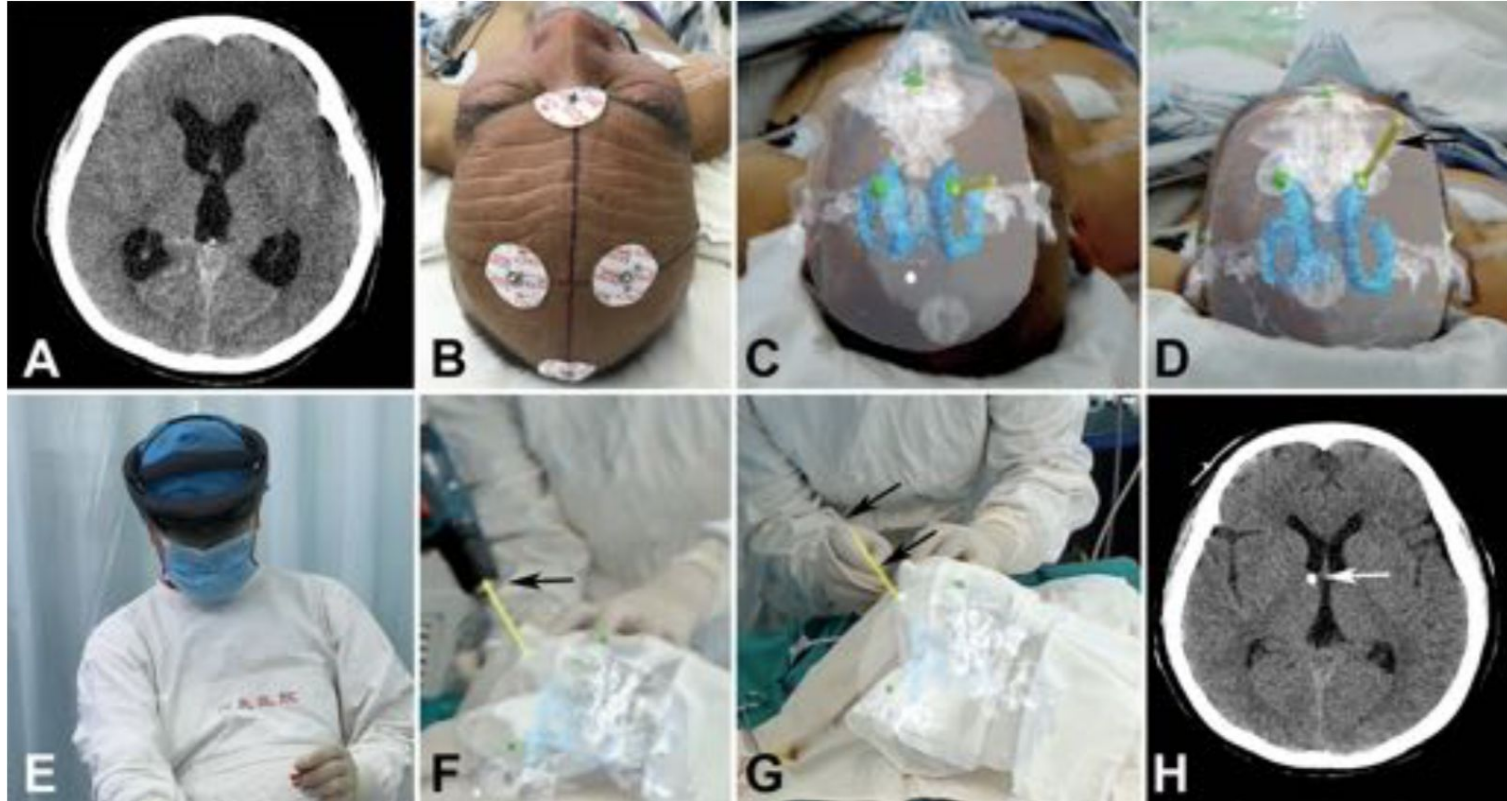
# System Summary: Preoperative Processing

# System Summary: Registration

# Proposed System Summary: During Procedure

# Preliminary Study

- One neurosurgeons
- 15 EVD Procedures done with HMD and 15 done without
- Hypothesis: Is the proposed system feasible and accurate?
- Technical Feasibility Measures
  - Additional Time Required
  - Number of Projection Shifts
  - Number of Re-registrations
- Technical Accuracy Measures
  - Accuracy of Insertion
  - Number of Passes

# Technical Feasibility Measures

- Average additional total time: 40.20 minutes
- No procedure complications
- Average number of re-registrations: 0.43

**Total Additional Time Required by Proposed System**
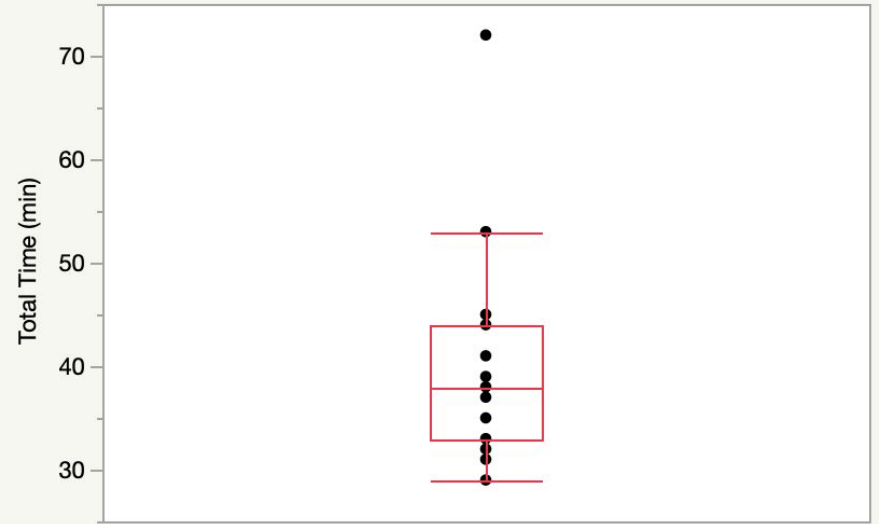
# Technical Accuracy Measures

- Significant improvement from control to MR for catheter dist.
  - Average MR Distance: 4.34mm
  - Average Baseline Distance: 11.26mm
- Significant improvement from control to MR for # of passes
  - Average MR Distance: 1.07mm
  - Average Baseline Distance: 2.33mm

**Distance between Catheter Tip and Target**
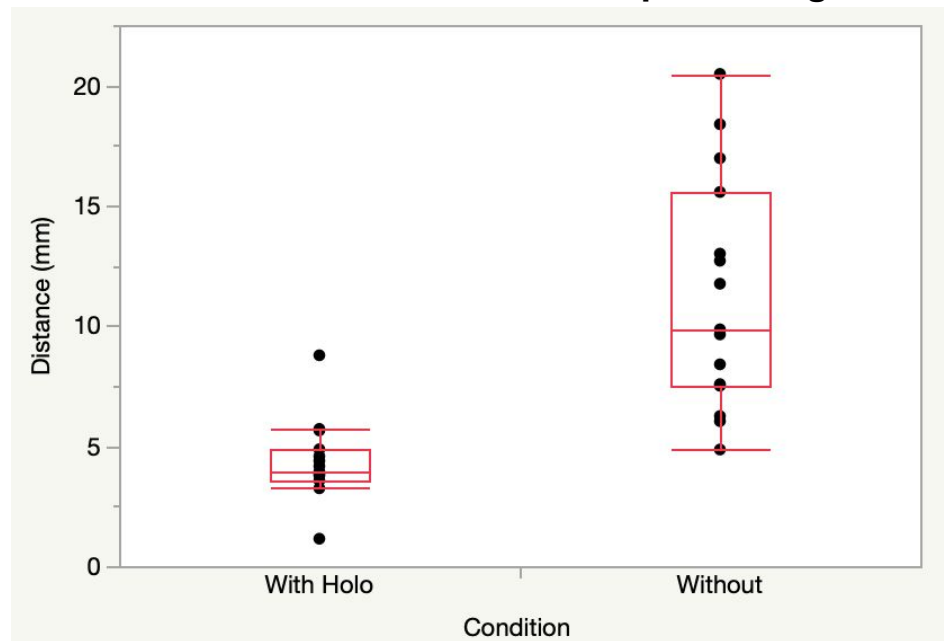
# Assessment

**Strengths**

- Real-world Application
- System covered entire procedure

**Weakness**

- System and study irreproducible
  - Does not provide enough information about the proposed system
- Only used one neurosurgeon in study
- Tabular representation of results

**Relevance**

- Same application and similar workflow
- Additional way to evaluate similar implementation

# Questions?