Group #25:

CIS II Background reading presentations

Annotation Framework for Recurring Appointments in Medical Applications using Augmented Reality

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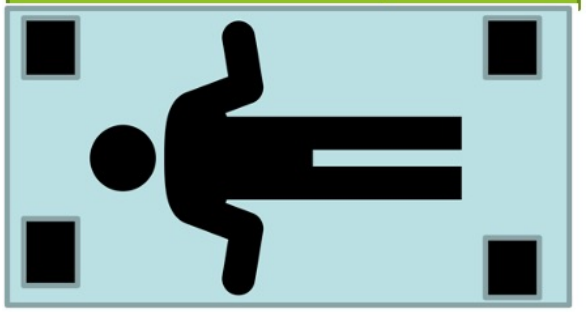
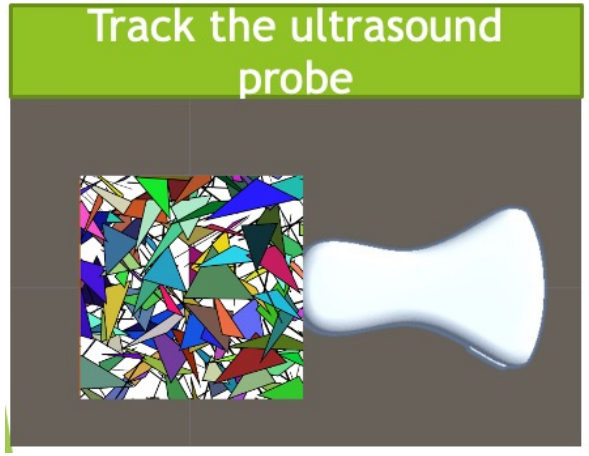
Project review

Track the human phantom



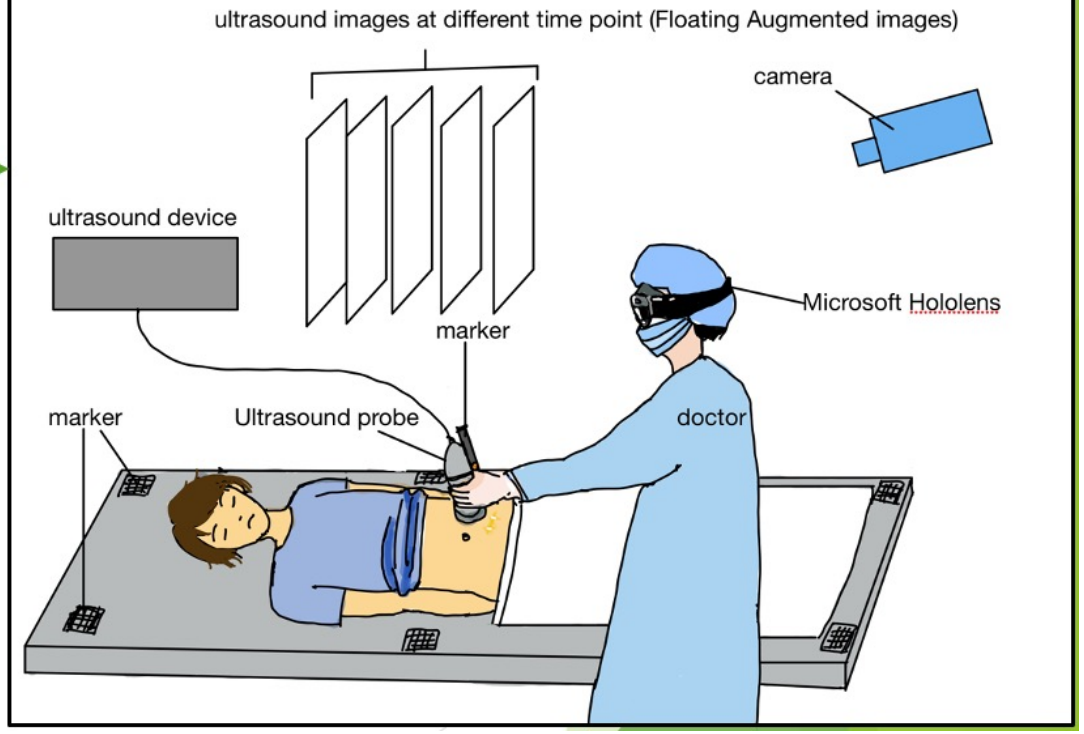
Track the ultrasound probe



Save the pose and position of the probe with anatomical image.

https://www.ithome.com.tw/news/104200

Visualization with Hololens for recurring and diagnosis



Paper content

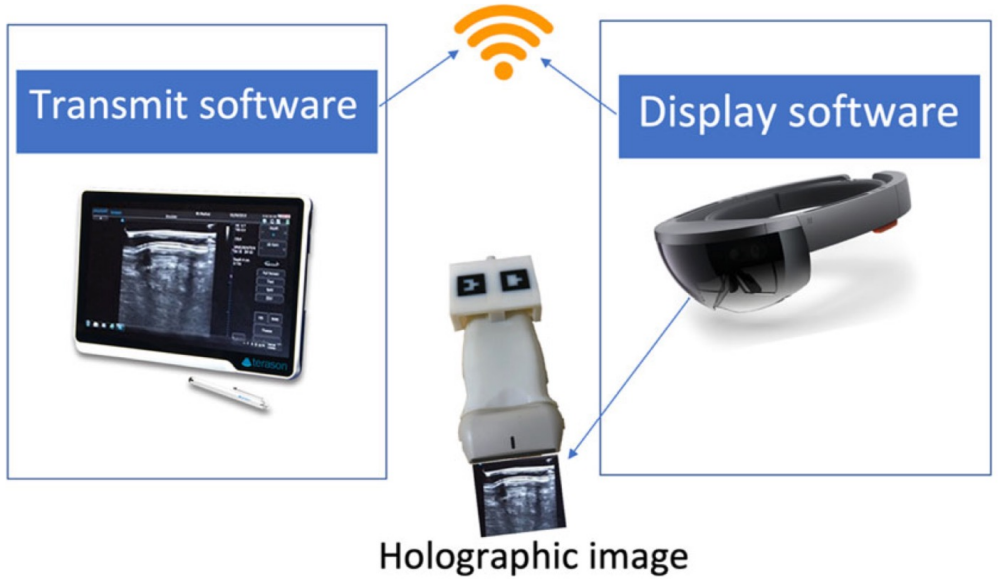
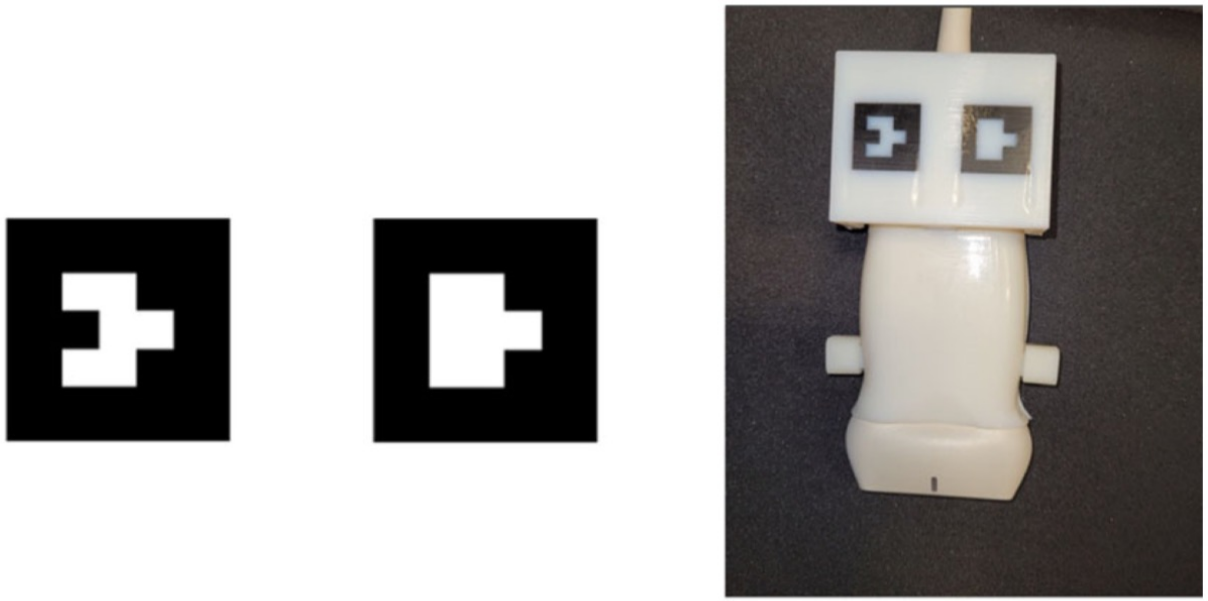


Fig. 1 Two main software modules of the HoloUS app: the transmit and display modules. The ultrasound image is displayed virtually inside the HoloLens

- Nguyen, T., Plishker, W., Matisoff, A. *et al.* HoloUS: Augmented reality visualization of live ultrasound images using HoloLens for ultrasound-guided procedures. *Int J CARS* **17,** 385–391 (2022). https://doi.org/10.1007/s11548-021-02526-7

Ultrasound probe tracking



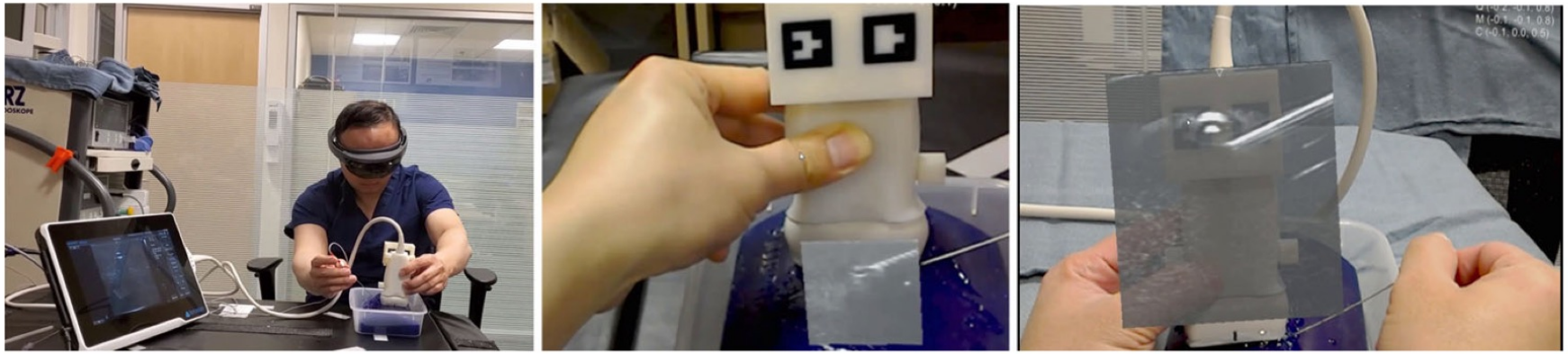
(a) (b)

Fig. 2 **a** The two markers recognizable by the ARToolKit. **b** The transducer with the 3D-printed case

- Use ARToolKit library

Application

Fig. 5 HoloUS app being used with HoloLens and Terason ultrasound system (left panel). The app allows the operator to switch between tracking mode (middle panel) and floating mode (right panel)



Two modes:

- Tracking mode
  - Closely track the movement, better for diagnosis.
- Floating mode
  - Ignore small movement, better for treatment.

Voice commands

- Control the virtual ultrasound image

Measurements of the technical performances

- **Technical characterization:**
  - **Frame rate:** Employ the built-in visual profiler Unity component of the Microsoft Mixed-Reality Toolkit.
  - **Tracking accuracy：** Calculate with the HoloLens’ s camera matrix by measuring the reprojection error between the detected marker points and their corresponding reprojected points.
  - **Latency:** Measure the latency between the needle tip appear on the ultrasound monitor and in the virtual image.
- **System Evaluation:**
  - **User study:** Compare the completion time of the novice and expert group when they carry out ultrasound-guided needle tasks using either the HoloLens or the conventional ultrasound display.
  - **Assess the usability of the HoloUS app:** Design a questionnaire to gauge AR visualization quality, ease of use, user-friendliness, and other aspects.

Analysis of the paper

- Pros:
  - The description of the research techniques is very detailed.
  - Innovation in application
  - Two modes in visualization
- Cons:
  - Not deep enough
  - Bad image quality
  - Problems in observing
  - Low frame rate

Thanks!