Augmented Reality Electronic Procedure System (AR-eProc)

Lui Wang / ER6
lui.wang-1@nasa.gov

March 2015
Web based Authoring Tool

- HTML5 Technology
- Drag-n-drop user interface.
- Supports the full Semantics of the Procedure Representation Language
Objective:
To acquire images and measurements of the patient’s right and left kidney.

PARTS:
- Ultrasound CX50
- Ultrasound Probe - C5-1
- Probe Scanhead Cover
- Probe Connector Cover
- Reference Documents
- Keyboard and Probe Placement Cue Card
- Ultrasound Echo Gel (one bottle)
- Dry Wipes

---

**1 CONFIGURE CX50 ULTRASOUND DEVICE**

NOTE
- The body has two kidneys and they are not always symmetrical in shape or position. As a result, the operator will have to image and measure both kidneys. The right kidney is usually lower in the body by 1-2 inches and is easier to find.
- Supine position (lying down) is preferred for the patient and they can roll to the right and left for the right and left kidneys, respectively.

**U 1.1** Configure the CX50 Ultrasound Device with the C5-1 probe using procedure “5.10 Ultrasound - Configure CX50 Device”

**U 1.2** For “Preset” on the CX50, select “Abd Renal”

**U 1.3** The gel should be applied to the applied and resemble what is seen in Figure 1.

---

**Figure 1** Ultrasound probe with gel applied to the scan head. The thumb lying over the indicator notch (red arrow). The gel application in this picture (blue arrow) is correct for any of the probes that are used for any ultrasound image application.

**U 2 SCANNING PROCEDURE**

**U 2.1** Expose the patient’s abdomen...
Examples of AR-eProc Applications

- Prototypes of AR-eProc for Maintenance of Devices on the International Space Station, Deep Space Habitat and UnderSea Lab
  - Advanced Resistive Exercise Device Maintenance (ARED)
  - Total Organics Carbon Analyzer (TOCA) Cartridge Replacement Procedure
  - Miniature Exercise Device Assembly (MED) Procedure
  - Augmented Reality Ultrasound Medical Procedure Assistant
  - Deep Space Habitat (DSH) Assets Locator
Augmented Reality (AR-eProc ARED)
Augmented Reality (AR-eProc TOCA)
Glass Procedure  Just-in-time Training (JITT)

Sani-tank Purge Glass Procedure

Pressurize Tank
Main Lock: Sani Tank
Control Panel: Sani
Control Valve – Toggle between OFF and FLUSH as shown until Tank P = 50 psi.

Miniature Exercise Device Assembly & Dis-assembly Tasks
Augmented Reality to Enhance Crew Medical Training

Adjust the transducer according to the liver’s short axis by translating the probe towards the chest.
DSH Power System Hardware Locator
AR-eProc Technology Summary

- AR-eProc Applications Types
  - Marker-less Registration
    - Augmented Reality Advanced Exercise Device Cylinder Evac Proc.
    - AR TOCA Buffer Change out Proc.
  - Marker Registration
    - Deep Space Hab AR Assets Locator
    - AR TOCA Buffer Change out Proc.
  - No Registration
    - Autonomous Ultrasound guidance
    - GlassProc Just-in-time training for SEATESTII

- Develop Advanced GPU-based marker-less algorithms
Benefits

- Astronauts & Astronauts trainers identified the following benefits of the use of AR-eProc technology:
  - More efficient just in time training
  - Faster learning curve
  - Less prone to error
  - Faster procedure execution
  - More intuitive direct object annotation