An Interface for Robotic Laparoscopic Ultrasound

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Laparoscopic ultrasound

Minimally invasive surgery with real-time imaging

Applications
• Biopsy, ablation
• Liver and kidney scanning and staging
• Lesion detection

[European Urology]
Problems

• Lack of probe mobility
• Long procedure times
• Can’t view live + imagery
• Want preoperative images
• Reference to previous lesions
• No tactile feedback (palpations!)
Robot assistance

• Reduce fatigue problems
• Display stereo video + ultrasound
• Improve manipulability

[C.M. Schneider ‘10]
Preliminary Testing

**Pros**

- Better probe positioning
- More Comfortable
- Lesion search confidence
- Confident for longer

**Cons**

- Needs sufficient training

[C.M. Schneider ‘10]
Problems

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Ready. Place head in View Port to operate.
• Are images enough?
• Long-term lesion position recall?
• What tools can help?

daVinci has lots of information!
Problems

- Lack of probe mobility ✓
- Long procedure times ✓
- Can’t view live + imagery ✓
- Want preoperative images ✓
- Reference to previous lesions ✓
- No tactile feedback ✗
Feedback

Suggestions:
• Node Removal
• Capture images w/o nodes
• Differentiate node geometry
• Fine tune controls/viewer
• Image labeler
Feedback
Platform Overview

- daVinci hardware
- Open Scene Graph
- CISST
- SAW / daVinci API
- Qt
Qt

Event Manager

Main Window

Add notes...
Add | Cancel
Open Scene Graph

3D graphics toolkit

• Lighting, Geometry, Cameras ...
Future work

Short term:
• Reliability
• Implement proposed changes

Long Term:
• Overhead node map
• Overlays
• Guidance, registration
• Make useable for normal LapUS
Questions?