Towards Resiliency in Cyber-physical Systems for Robot-assisted Surgery Technology to Improve Safety of Robotic Surgery using STAMP Theory and Simulation

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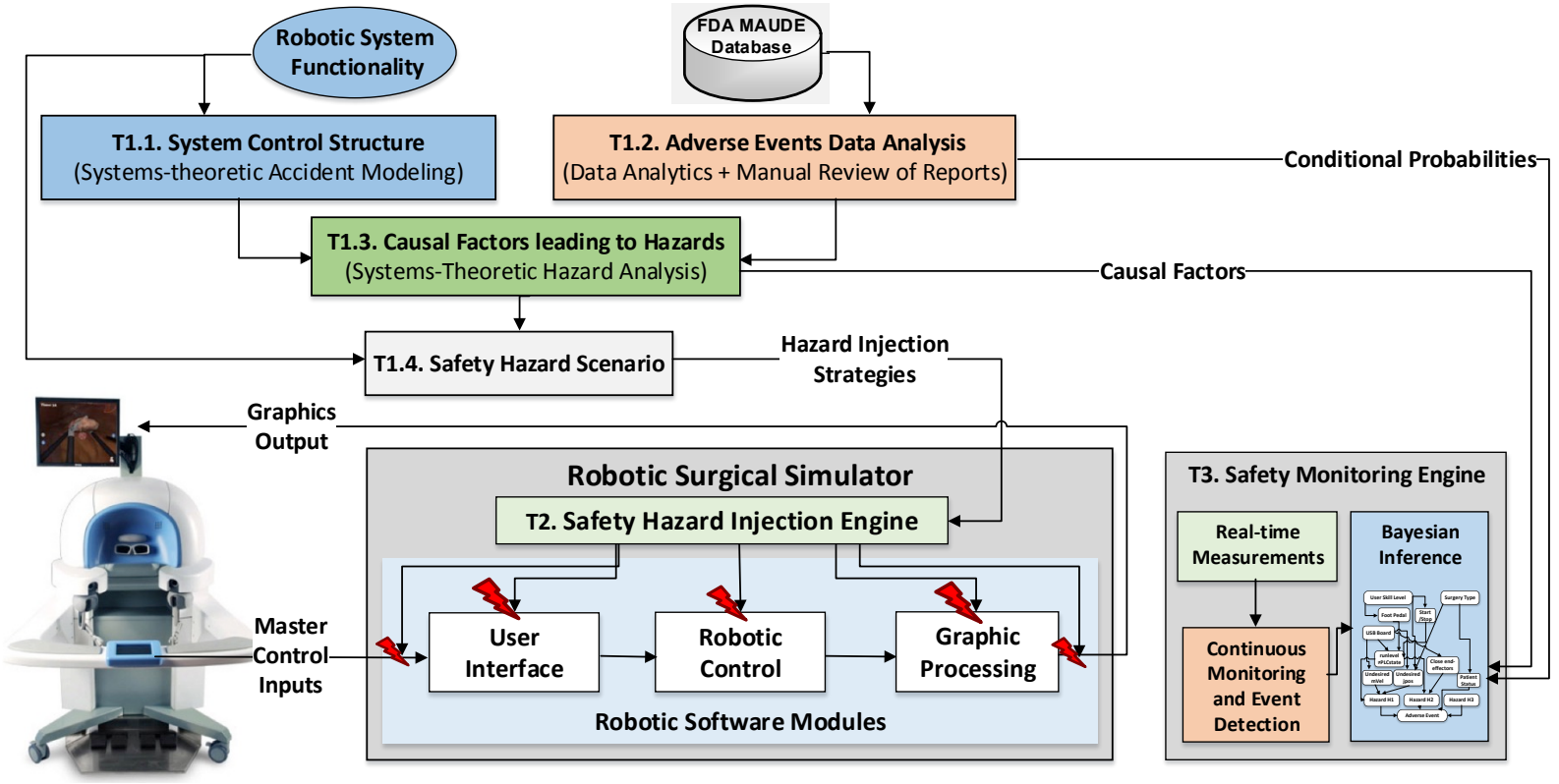
Description



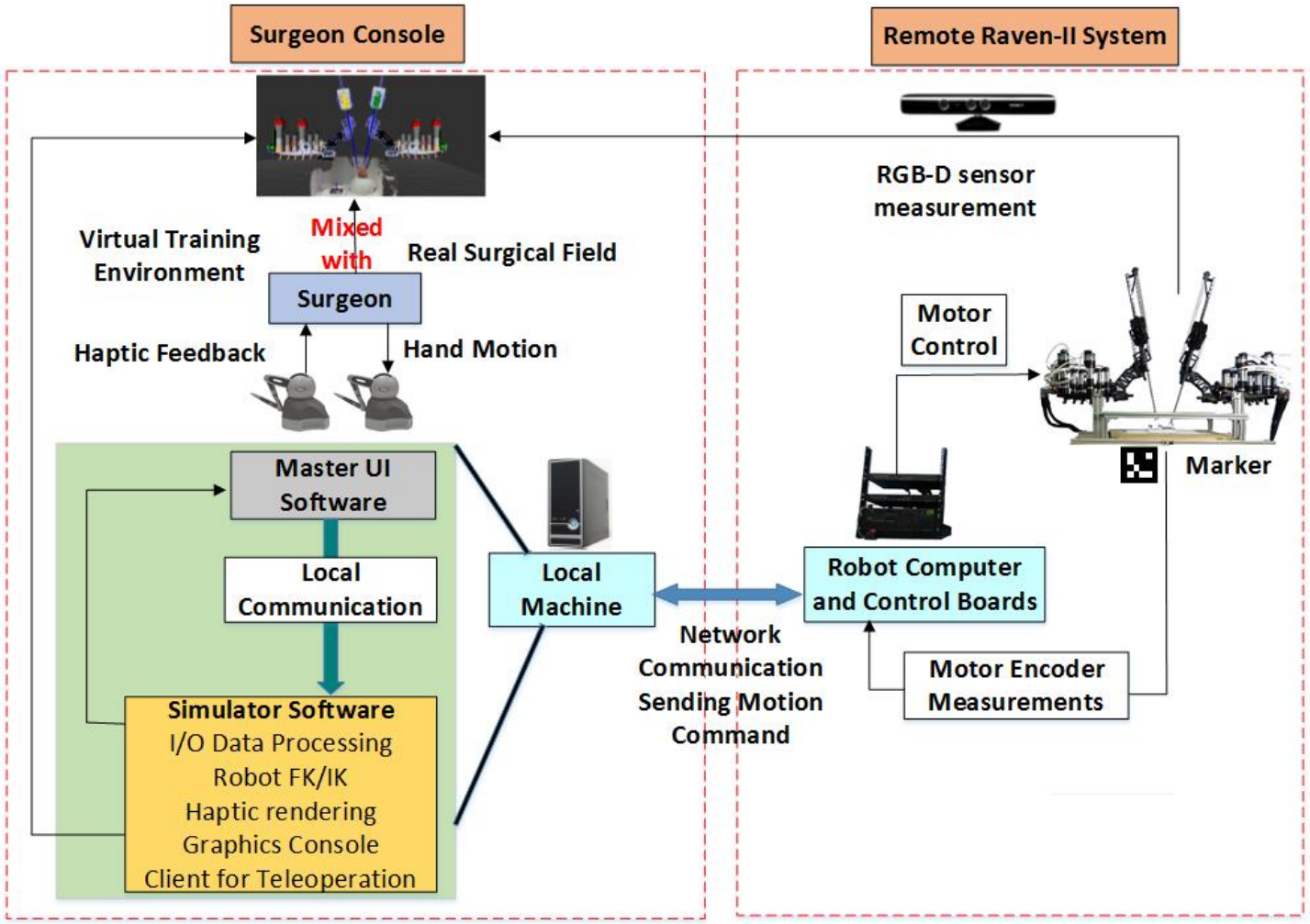
Systems-theoretic Analysis of Hazards and Incident Causes

Evaluation of System Resiliency to Realistic Hazard Scenarios

- **Robotic Surgical Simulator**
- **Safety Hazard Injection Engine**
- **Safety Monitoring Engine**

Findings

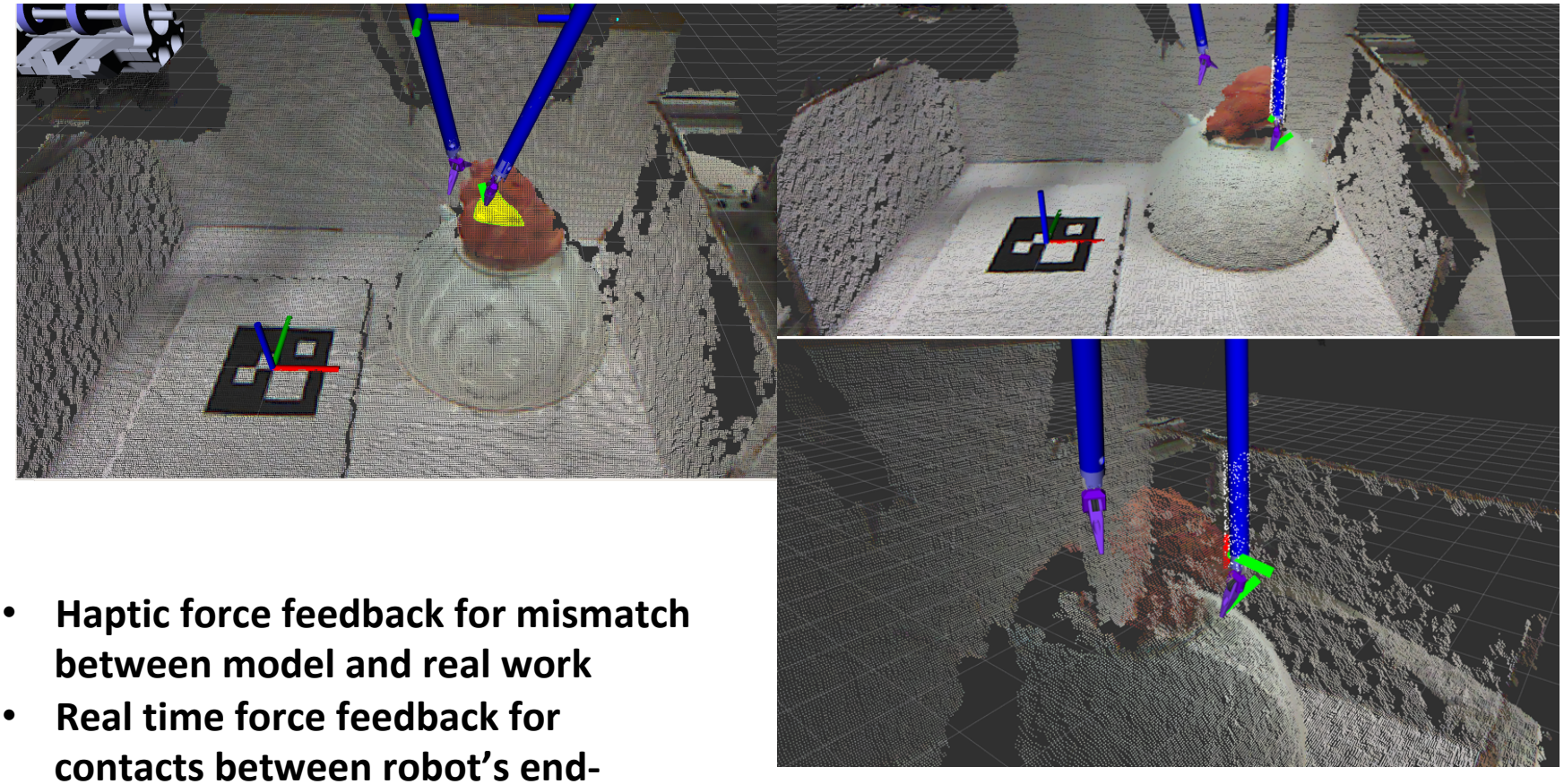
Mixed Reality Surgical Simulator with Real Time Haptic Feedback



- Simulation Model of Raven Robot with
- Mixed with point cloud with real time interaction between real and virtual surgical tool
- Feedback to users
- Run both modes or mixed mode

Findings

Mixed Reality Surgical Simulator with Real Time Haptic Feedback



- **Haptic force feedback for mismatch between model and real work**
- **Real time force feedback for contacts between robot's end-effector and instrument tool shaft with the organ for safe operation**

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