Extending the simulation of the Raven Surgical Robot System

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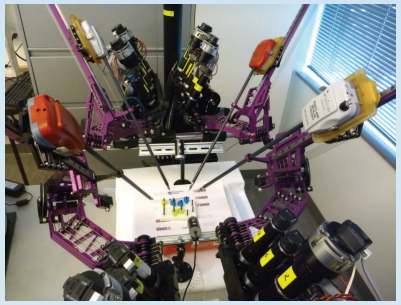
Motivation

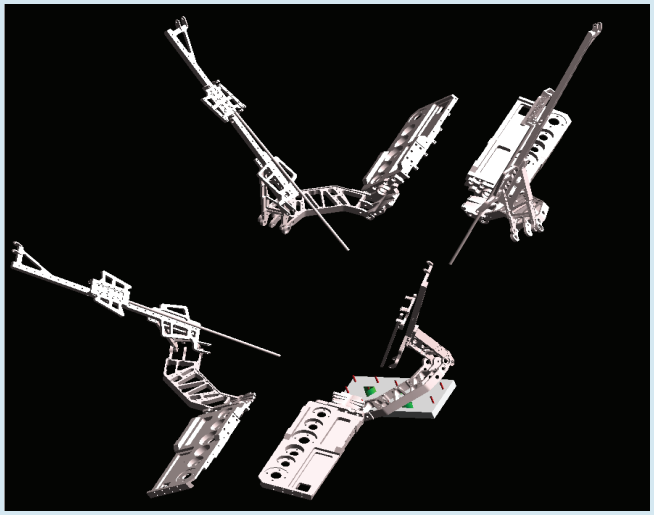
- Surgical robots allow surgeons to perform surgery remotely
- With the Raven Surgical Robotic System, four arms can be controlled by two surgeons collaboratively
- Controlling the robots requires training, but robots are expensive and not always accessible
- Training can be accomplished through a simulation

Objective

- Expand the simulation to include all four robotic arms
- Control the simulated arms with haptic devices to perform a surgical training task
- Incorporate SolidWorks representations of the robotic arms for a more realistic simulation



Raven Surgical Robot System



Expanding the Simulation

- Simulation written in OpenGL/C++.
- Arms can be moved with the haptic devices
- Surgical training task (small board with pegs and moveable objects) added to simulation
- When one of the tools closes on a moveable object, the object is picked up and can be moved around

Importing from SolidWorks

- Complicated models stored as .obj files, containing:
  - list of vertices,
  - list of vertex normals, and
  - instructions for combining vertices and normals into triangles
- Four distinct parts of the arms stored separately
- Model information loaded from files and rendered using OpenGL triangles
angles
- Uses inverse kinematics to determine joint angles and allow models to be controlled with haptic devices

Future Work

- Add force feedback with the haptic devices
- Simulate additional training tasks

SensAble Phantom Omni Haptic Devices