The Perk Station: Percutaneous Intervention Training Suite

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Image-guided percutaneous (through the skin) needle-based surgery has become part of routine clinical practice in performing procedures such as biopsies, injections, and therapeutic implants. Trainees usually perform needle interventions under the supervision of a senior physician, which is a slow training process that lacks an objective and quantitative assessment of the surgical skill and performance. To address these issues we are developing the Perk Station, an inexpensive, simple and easily reproducible surgical navigation workstation for laboratory practice with non-biohazardous specimens.

The Perk Station (Fig. A4) comprises image overlay, laser overlay, and standard tracked freehand navigation in a single suite. The image overlay consists of a flat display and a half-silvered mirror mounted on a gantry. When the physician looks at the patient through the mirror, the CT/MR image appears to be floating inside the body with the correct size and position, as if the physician had 2D 'X-ray vision'. The laser overlay uses two laser planes; one transverse plane and one oblique sagittal plane. The intersection of these two laser planes marks the needle insertion path. A stand-alone laptop computer is used for image transfer, surgical plan, and appropriate rendering. The image overlay is mounted on one side with the laser overlay and tracked navigation system on the opposite side, so the user can swap between guidance techniques by turning the system around. The surgical planning and control interface is based on the 3D Slicer, open source medical image computing and visualization software.

To promote transferability, the complete design of the Perk Station, including hardware blueprints, phantom blueprints, and software source code, will be made publicly available as open source. Simple design and low costs allow interested parties to replicate the hardware and install the software. CT/MRI data and pre-made surgical plans will also be provided, so users can operate the Perk Station without having access to medical imaging facilities.

The Perk Station is designed to be a replicable and adaptable tool for teaching computer-assisted surgery at all levels, from high-school science classes to clinical residency. Small, portable, and light weight, the Perk Station will fit inside a suitcase when disassembled. It promises to serve the education and outreach mission of the CISST ERC.

The Perk Station is fully designed and awaits manufacturing. The physical embodiment will be presented at the SMIT 2008 conference. The system will debut in undergraduate teaching in fall 2008 at Queen's University.

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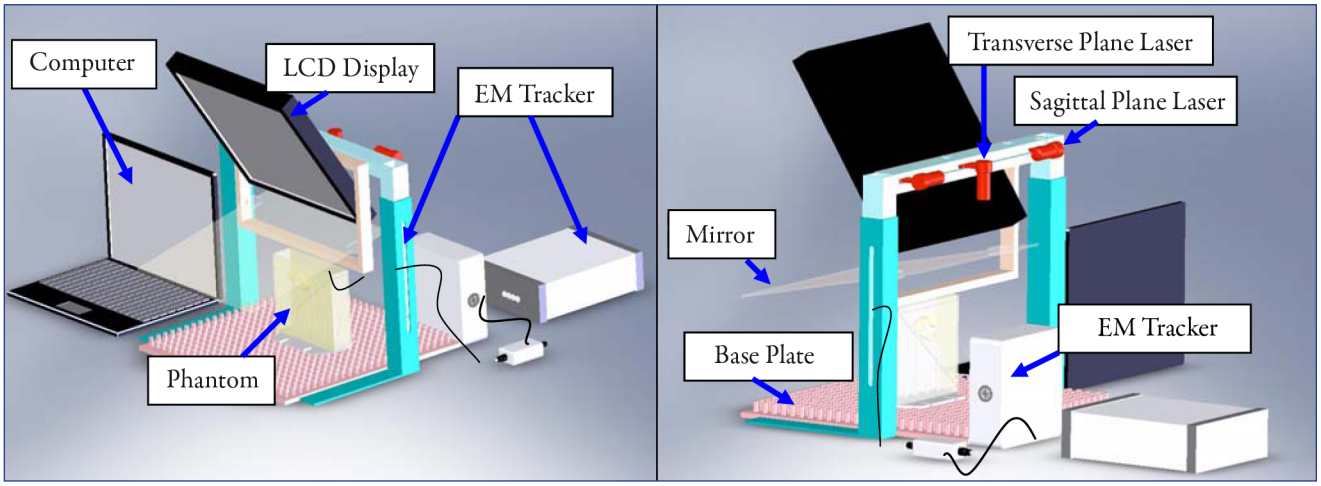

Fig. A4: CAD design of the Perk Station, w/ image overlay (left) and laser overlay & tracked navigation (right)