

Motorized Fixation to Tubular Retractor in Brain Surgery

Utilizing Microscopic and Instrumental Alignment

Traditional methods for tumor retraction impart excessive pressure on the brain, leading to injury.

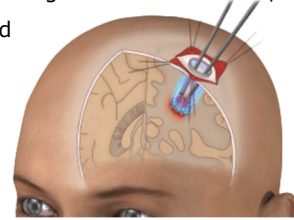
~ **63K cases/year** cause retraction-induced injury.

\$2,500/day increased hospital stay results in a **\$3 billion burden** on US healthcare system.



Novel solution: **Tubular retraction** is a state-of-the-art method used to access deep tumors in brain surgery.

A tube-shaped device is inserted into the brain to provide an operable corridor, providing access for surgical tools. However, manual devices used to adjust retractors are sometimes:



- ❖ slow
- ❖ imprecise
- ❖ unconstrained

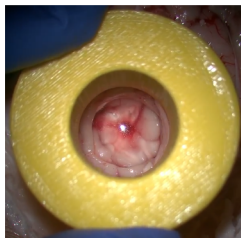
So, motion is likely to lead to injury.

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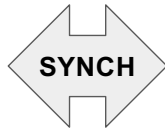
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• **What students will do:**

1. provide retractor **stabilization** and **automated motion** through **medical device design** and **electronics**
1. retractor location **coordinate mapping** for **synchronized motion** with A the **surgical microscope** and B **instruments**.

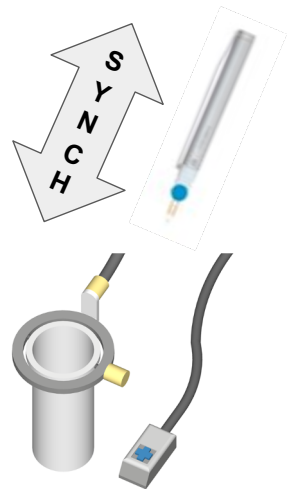


View through tubular retractor



View through surgical microscope

A



B



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- Deliverables:**
 - Prototyped retractor connecting component with bi-axial motorized rotation
 - Retractor synchronization with surgical microscope and auto-alignment w/ surgical tools
 - Bonus: Alternate control method using polar coordinates
- Size group:** 2-3
- Skills:**
 - Required: Programming, coordinate mapping, a good math head and 🧠 3D visualization
 - Nice to have: Electronics, Control Theory, CAD, Prototyping, ME Design
- Mentors:**



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APPENDIX

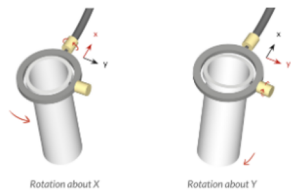


Fig 1. Deliverable. The tubular retractor rotates for angulation. It rotates about the base motor and the axle on the connecting component (both yellow). Wires that are responsible for rotating the spindle are not shown.



Figure 3. NICO Corporation's Shepherd's Hook technology.
 The thin metal hook around the retractor is a manual stabilization device, but is difficult to use.



Figure 2: Tubular retractors used in industry.
 Vycor Medical's VBAS retractors.



Figure 4: Flexible snake arm.
 The base of this structure is clamped onto a patient's hospital bed or retraction system mounted around the patient's head. A tool used in the brain is clamped to the opposite end of the arm. The arm is curved in the surgeon's preferred shape. The middle knob is tightened and the arm becomes rigid.