Creating a Novel Lateral Biopsy Device

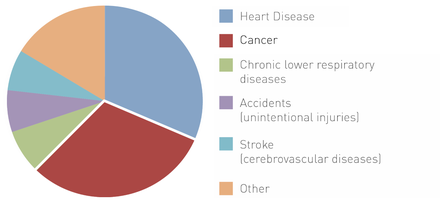
A capstone project sponsored by Auris Surgical Robotics at Olin College of Engineering

Olin College of Engineering
SCOPE 2016-17

AURIS

Objective: Increase the range of diagnostic procedures that can be performed endoscopically by creating a novel biopsy instrument that can laterally sample lesions.

Instrument Motivation



Cancer is the second leading cause of death in the US, taking the lives of hundreds of thousands of people each year. It often goes **undetected until the late stages**, when survival rates are lowest, because many cancers are asymptomatic in their localized stage. Additionally, lesions are often **difficult to access endoscopically**, resulting in the use of riskier diagnostic methods.

Endoscopic Diagnosis

For many internal lesions, diagnosis occurs using an **endoscope** that is inserted through an orifice and navigated through pathways in the body. The endoscope contains a camera and a working channel, through which tools can be inserted to collect tissue samples, or **biopsies**. These samples are examined to determine whether the lesion is cancerous. For endoscopically inaccessible lesions, current standards of care are **invasive** and have a **high risk of complication**.

Design Process

Research:

Gained a thorough understanding of the problem space including knowledge of the biology, mechanical requirements, and prior art.

Ideate:

Generated 12 preliminary concepts; grouped, modified, and combined into 3 distinct ideas that would address the problem.

Prototype:

Started with simple sketch models to explore concepts before moving on to scaled-up works-like models.

Refine:

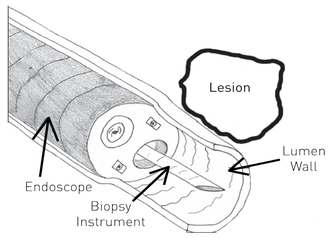
Centered on one idea and manufactured it to-scale; iterated upon this design in order to optimize performance.

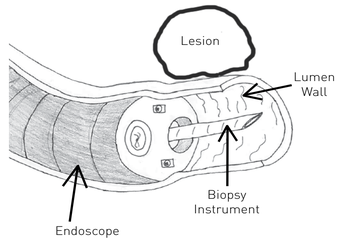
Test:

Evaluated the design in simulated medical environment; applied learnings to refining and improving performance of prototype.

Diagnostic Problems

Lesions located outside of narrow pathways are particularly difficult to access with traditional biopsy tools that fire directly in front of the endoscope. Articulating the scope to position the lesion in front results in the entire pathway bending, moving the lesion as well.





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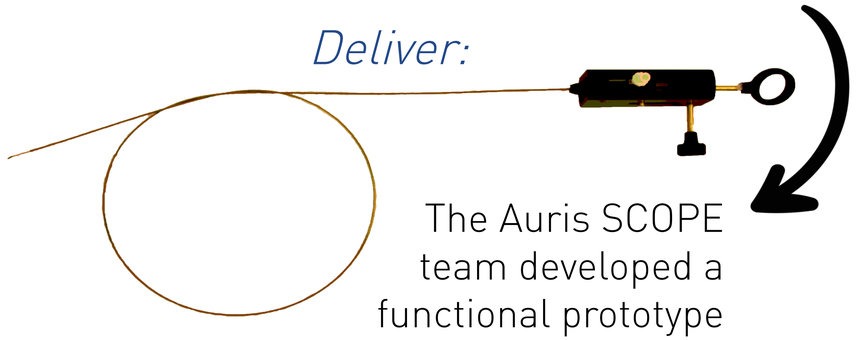

The Auris SCOPE team developed a functional prototype of a side-firing endoscopic biopsy device that is capable of accessing difficult to reach lesions, and tested it rigorously on-site at Auris.

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