

Transoral Lung Access Device

Summary

Transoral lung access is preferable to traditional needle-based access due to the lower risk of lung collapse. However present bronchoscope-based devices enable access to only a small portion of the lung. The present device is a robotic image-guided bronchoscope to navigate the airway under closed-loop control to the target. It is designed to provide transoral access to any location in the lung, particularly the hard-to-reach peripheral regions.

Addressed Need

- ◇ American Cancer Society estimate of new lung cancer cases in 2016: >224,000
- ◇ Health Care cost estimate >\$ 12 Billion/annum
- ◇ More people die from lung cancer than any other type of cancer
- ◇ Cancer nodules need to be accessed for both diagnoses and treatment. Current access methods and devices have several limitations

Technology Description

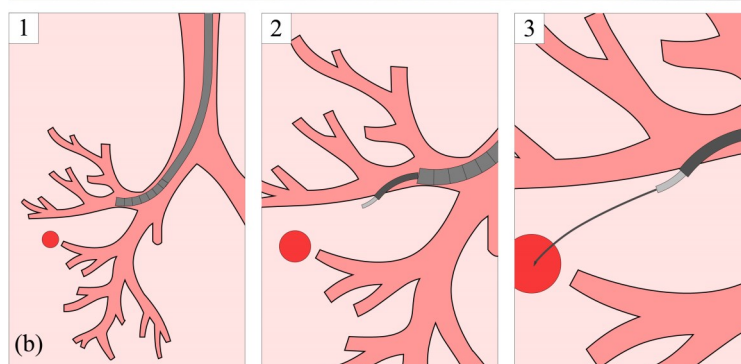
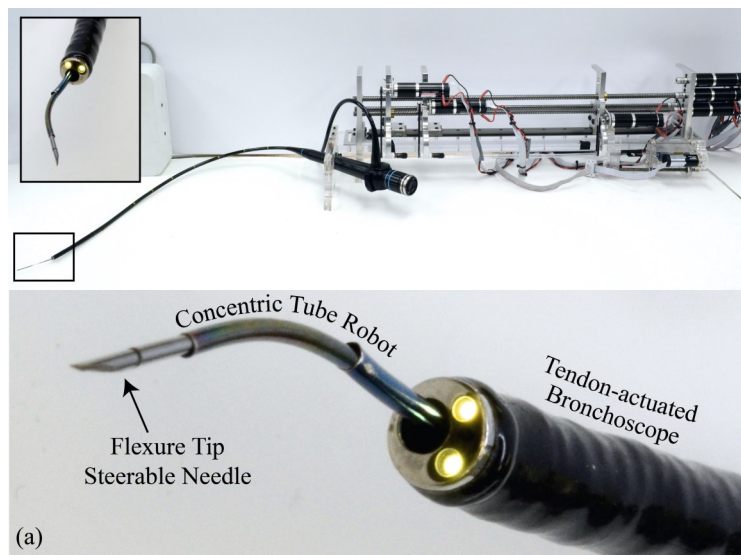
In the present device, telescoping, nested precurved tubes are guided under robotic control to travel through the bronchial wall and aim towards a target nodule. A steerable needle is then deployed from the precurved tubes and is delivered under closed loop control to the target nodule. The robotic actuation unit control allows for translation and rotation of the nested tubes and the steerable needle. The entire assembly can be deployed through the working channel of a bronchoscope.

Technology Features

- ◇ Accurate transoral access to a target nodule in lung
- ◇ Image-guided, robotic control
- ◇ System deploys through the working channel of a clinical bronchoscope

Technology Development Status

- ◇ Lab scale prototype built; control system developed



(a) The robotic system uses a clinical bronchoscope, a set of precurved tubes, and a steerable needle to accurately target nodules in the lung. (b) First, the bronchoscope is deployed to a location in the bronchial tree. Next, the precurved tubes are used to travel through the bronchial wall and aim in the direction of the target nodule. Finally, a steerable needle is deployed from the tubes to the target under closed-loop control.

Intellectual Property Status

- ◇ A Patent Application has been filed
- ◇ Publication: P. J. Swaney, A. W. Mahoney, B. I. Hartley, A. A. Ramirez, E. P. Lamers, R. H. Feins, R. Alterovitz, and R. J. Webster, III, "Toward Transoral Peripheral Lung Access: Combining Continuum Robots and Steerable Needles", *Journal of Medical Robotics Research*, In Press. Video: <https://youtu.be/sDX1JBVOzYU>

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