



3-D Maneuverable Feedback-Controlled Micro Swimming Drone for Biomedical Applications



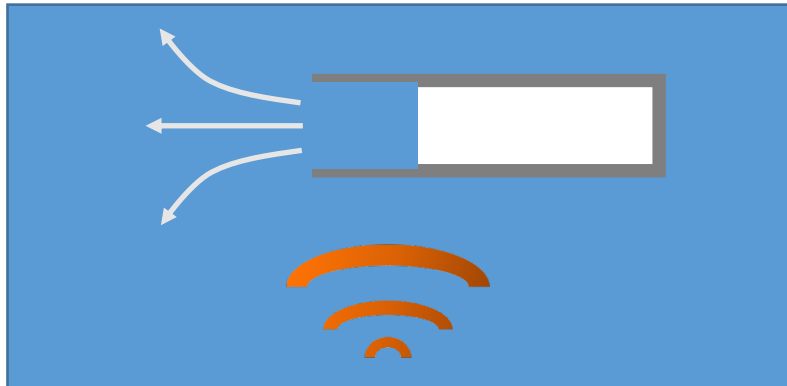
ECCS-1637815/Sep 2016~Aug 2020/University of Pittsburgh/SK Cho, N Sharma and K Kim

Challenge

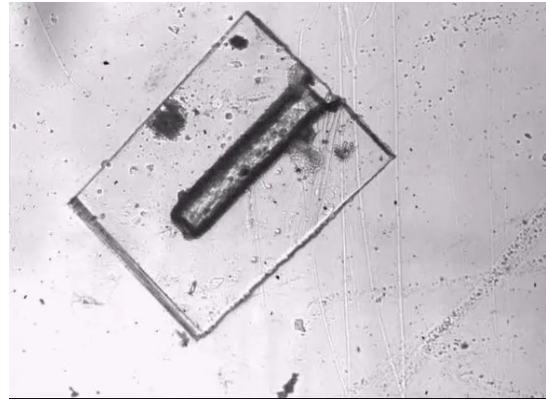
Develop a Micro Swimming Drone
Navigating Human Body for Drug
Delivery, Bio-Sensing and Bio-Surgery

Solution

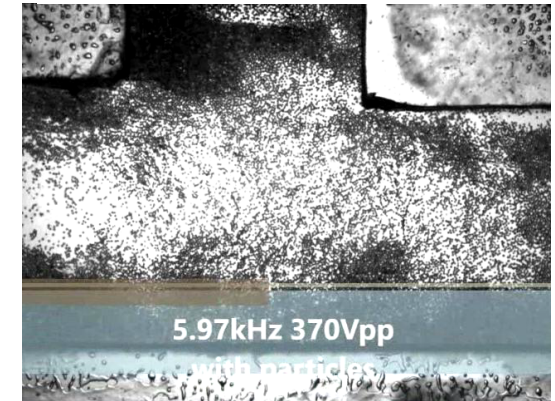
Bubble-powered propulsion:
wireless, remote acoustic
excitation



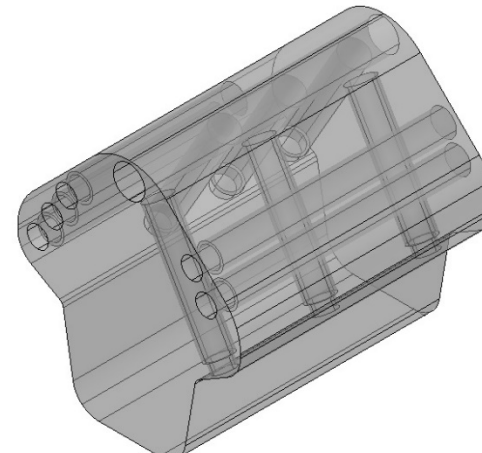
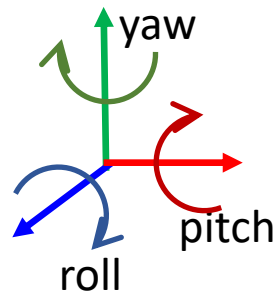
1-D μ -swimmer



2-D μ -swimmer



3-D μ -swimmer





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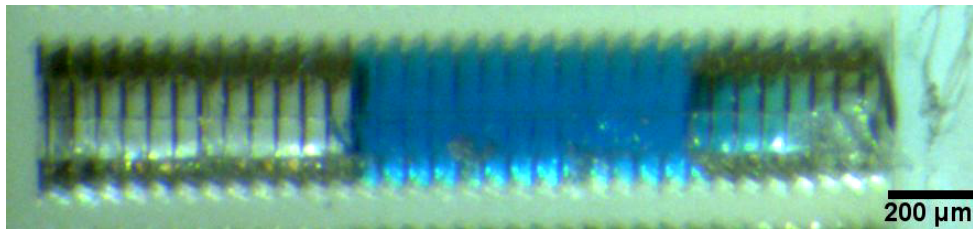


On-Demand Dose-Controllable Drug Release

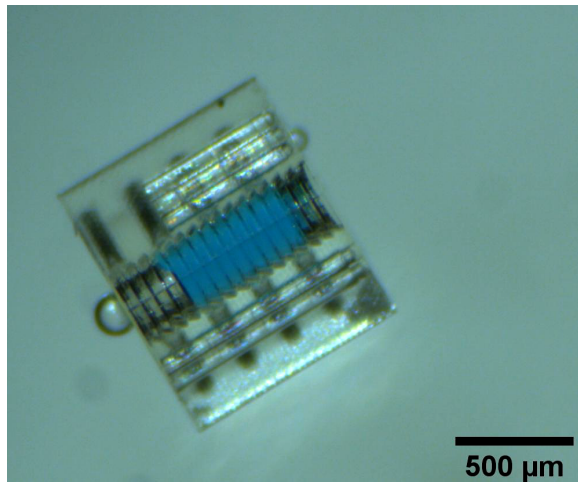
Bubble 1

Loaded drug

Bubble 2

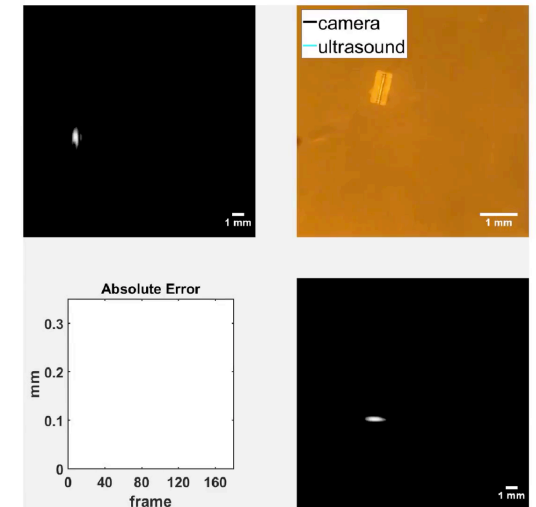
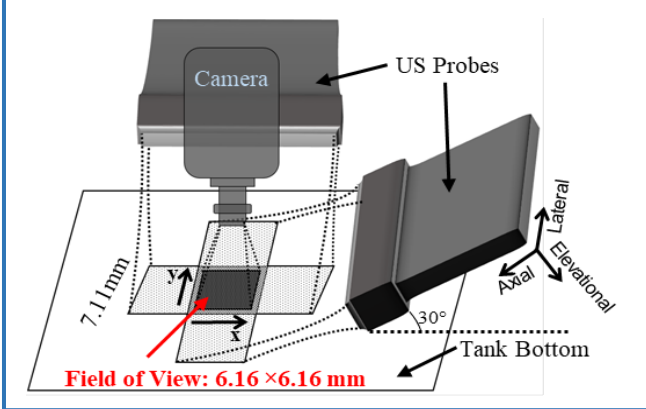


Integrated

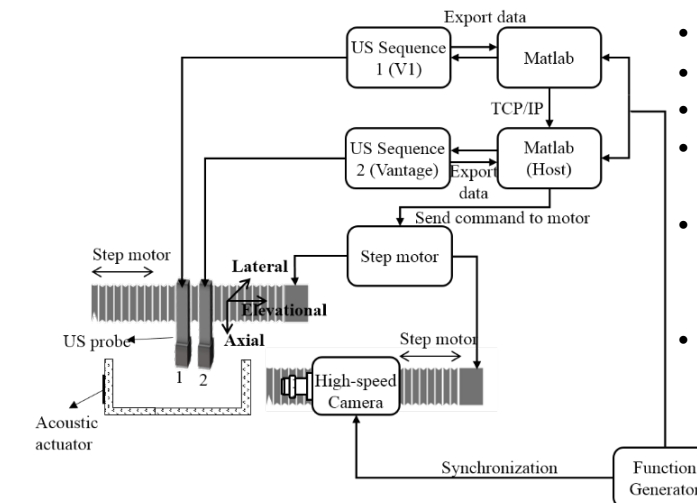


2D Imaging and Tracking

Experimental Set-Up



3D Imaging and Tracking



- 2 ultrasound probes
- 1 step motor
- Probe 1: elevational motion
- Probe 2: axial and lateral motion
- Probe 2 serves as the main probe to locate the micro drone
- Probe 1 is used for determining the moving direction of the drone