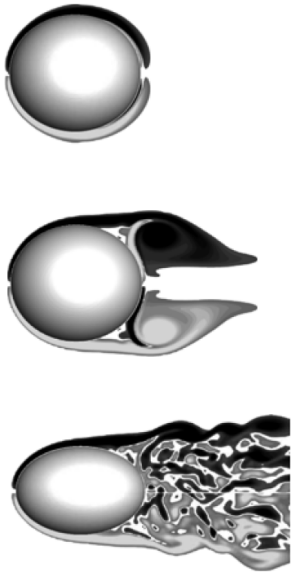

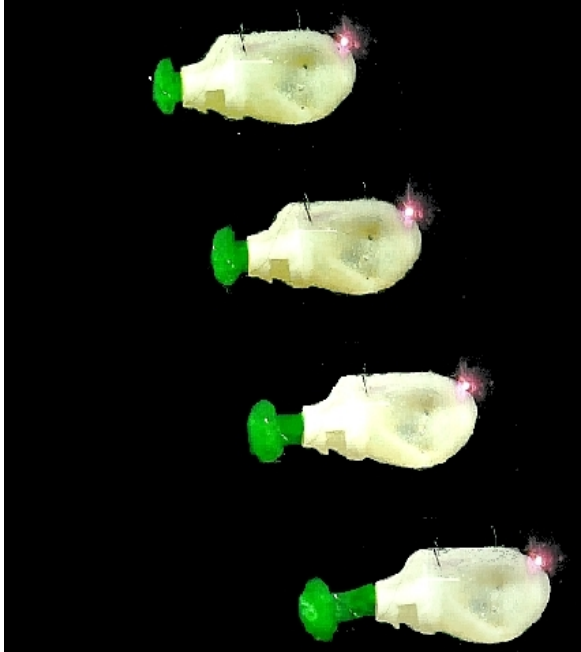

Relevant scientific publications:

- *Underwater pulsed-jet thrusters: actuator modelling and performance profiling* (2016), Giorgio-Serchi F. et al., The International Journal of Robotics Research.
- *Ultra-fast escape maneuver of an octopus-inspired robot* (2015), Weymouth et al., Bioinspiration and Biomimetics.
- *Biomimetic Vortex Propulsion: Toward the New Paradigm of Soft Unmanned Underwater Vehicles* (2013), Giorgio Serchi F. et al.,. IEEE/ASME Transactions on Mechatronics.
- *Ultra-fast escape of a deformable jet-propelled body* (2013), Weymouth G. et al., Journal of Fluid Mechanics.

Relevant divulgative publications:

- Robot zips away like an octopus (2015) Nature.
- A tentacled, flexible breakthrough (2014) The New York Times.
- *How to build a robot octopus* (2013) Scientific American.

Relevant international patents:

- Underwater Propeller Device with Pulsed Jets, WO2013/160801 A1.

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Soft-bodied shape-changing pulsed-jet vehicles

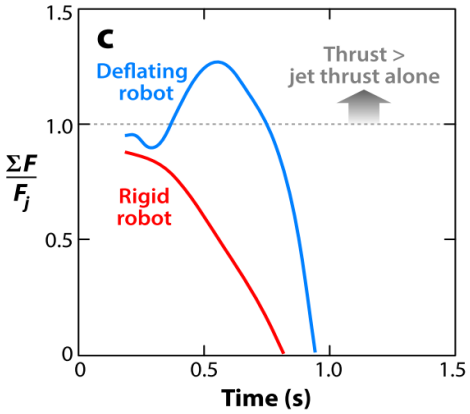
a soft unmanned underwater vehicle with enhanced maneuverability and efficiency

Soft Robotics design concept

SOFT AQUATIC ROBOTS

New disruptive design concepts are needed for the automation of tasks currently precluded to commercial underwater robots. Soft robotics enables innovative vehicles which exploit unsteady hydrodynamic forces to increase their maneuverability and efficiency. Structural compliance inherently provides these robots with the capability to operate in close proximity with submerged structures and perform agile navigation in highly cluttered environments.

Non-dimensional propulsive force



SHAPE-CHANGE THRUST ENHANCEMENT

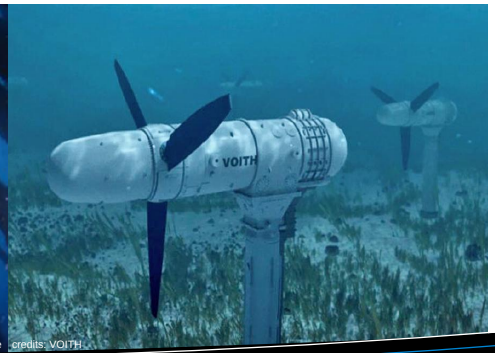
This kind of vehicles propel themselves by performing a routine of inflation and deflation during which they ingest and expel water. This produces a sequence of jets which thrust the vehicles forward.

Shape-variation effects can increase thrust as much as 30%, providing up to 130% acceleration and 200% speed compared to an equivalent fixed-shape vehicle (left hand side and bottom figure).

Optimal modulation of the flow features of the issuing jet provides an increase in average impulse as high as 42% compared to a continuous jet (see *Krueger and Gahrib, Physics of Fluid, 2003)*.

Soft-bodied, pulsed-jet propelled vehicles for enhanced underwater **maneuverability** and **efficiency**

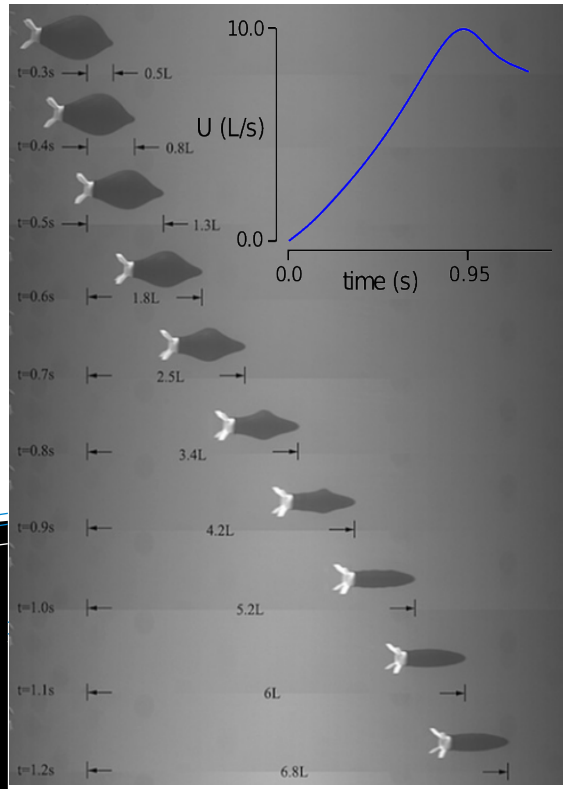
credits: Texasonsite



credits: VOITH

FIELDS OF APPLICATION

As opposed to standard ROVs and AUVs, the soft bodied robot we are developing can exploit its structural compliance and enhanced maneuverability to deal with otherwise unfeasible tasks such as performing inspection and sampling missions in cluttered and highly unstructured submerged environments. This will make this kind of vehicles suitable for marine operations such as those entailed with offshore engineering, mantainance of marine renewables energy harvesting plants, rescue operations, underwater mines countermeasures, port security and environmental monitoring.



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