Development of a Underwater Soft Robot based on Morphological Features of Ray



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Biological Inspiration

Experiment

1Realizing ray-like locomotion

Morphological features of ray

Musculoskeletal structure

Disk-shaped pectoral fins have a radial skeleton



Compliance of the pectoral fin Fins are highly compliant for upward foldings





Low

stiffnes





Ray-inspired Robots

Development of a soft robot based on morphological features

Robot : Type A



Robot : Type B

Bone structure Soft material (Shore 50) Air tube Pneumatic actuator Tail **Pectoral Fin Body** Polyurethane (Shore 5) Hard material

Control system

This system consists of the control PC, the valve control unit and the robot.







2Adaptive deformation of the robot

Compliance to obstacles

Our prototype robot responds flexibly to external forces by changing its motion adaptively. This results confirms that our developed prototype robot is flexible enough to adapt to external forces, and at the same time it is able to continue its swimming behavior. This compliance to external forces suggests that the developed robot is suited for swimming in presence of complex environments like irregular seabed.









