

## Design, Modelling, and Fabrication of Bioinspired Frog Robot for Synchronous and Asynchronous Swimming

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**Abstract :** This paper proposes the bioinspired soft frog robot. All printing technology was used for the fabrication of the robot. Polyjet printing was used to print the front and back limbs, while ultrathin filament was used to print the body of the robot, which makes it a complete soft swimming robot. The dual thrust generation approach has been proposed by embedding the main muscle and antagonistic muscle in all the limbs, which enables it to attain high speed (18 mm/s), and significant control of swimming in dual modes (synchronous and asynchronous modes). To achieve the swimming motion of the frog, the design, motivated by the rigorous modelling and real frog dynamics analysis, enabled the as-developed frog robot (FROBOT) to swim at a significant level of consistency with the real frog. The FROBOT (weighing 65 g) can swim at different controllable frequencies (0.5-2Hz) and can turn in any direction by following custom-made LabVIEW software's commands which enables it to swim at speed up to 18 mm/s on the surface of deep water (100 cm) with excellent weight balance.

**Keywords :** soft robotics, soft actuator, frog robot, 3D printing

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