ROBOTIC FISH WITH MACRO FIBER COMPOSITE PROPULSION SYSTEM

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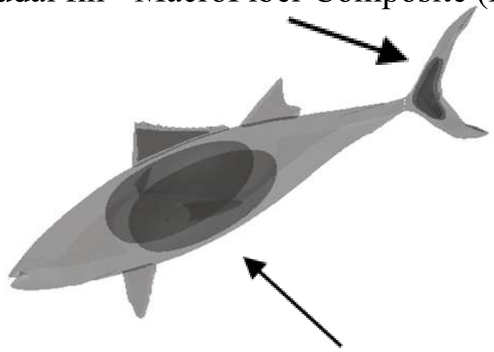
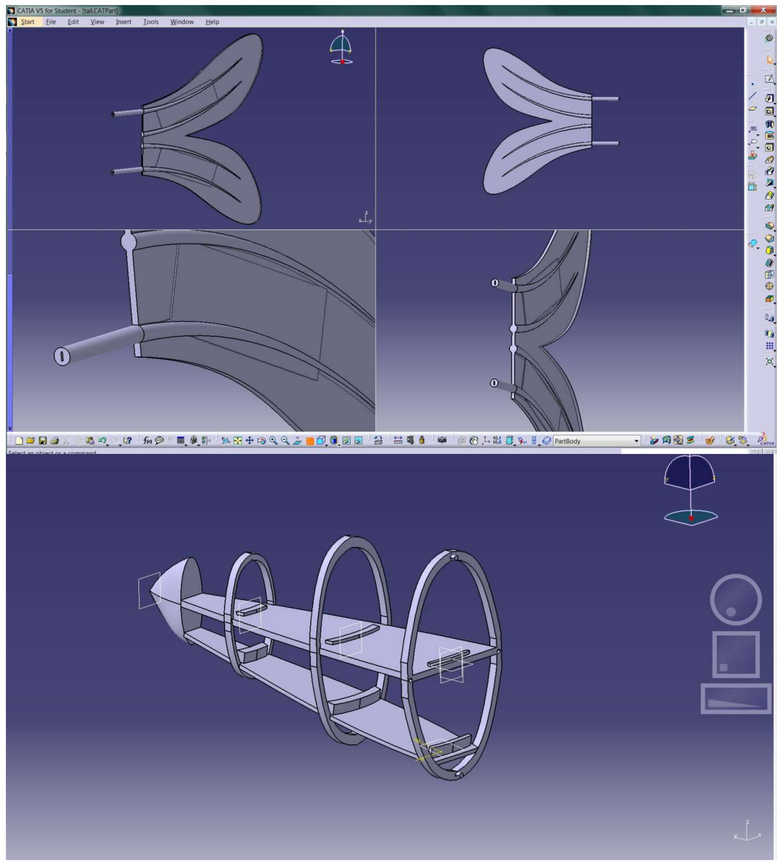
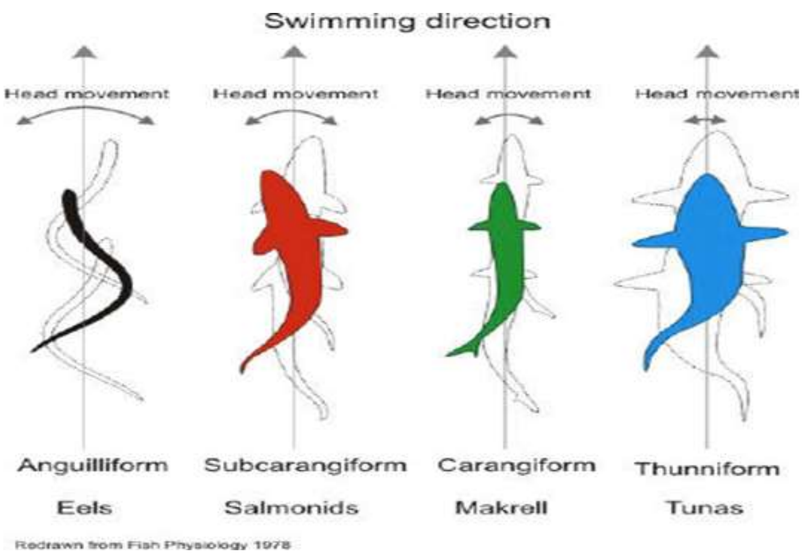
The main objective of this project is to build and test a robotic fish with its propulsion system based on Macro Fiber Composites (MFC). These state-of-the-art actuators based on active materials offer several potential advantages for robotic fish applications compared to traditional servo motors. One important benefit is that smart actuators are light-weight and can be embedded directly into the structure of a fish torso or control surface. In addition, they are eco-friendly. Our goal is therefore to fabricate a robotic fish motion using biometric fish locomotion using MFCs.

Caudal fin - MacroFiber Composite (MFC) actuator



Electronic Control Unit (ECU) and ballast system





Obstacles:

- Rigidity of tail which decreases MFC deflection
- Limited maximum voltage lowers maximum MFC deflection
- Water-proofing the systems inside the fish
- Controlling the depth of the fish underwater using a ballast system

References:

[1] Helfman, Collette. "Functional Morphology: Locomotion & Feeding." . Hillsborough Community College. Web. 3 Mar 2014. <https://www.hccfl.edu/media/469852/ch. 8 (functional morphology-locomotion).ppt.>.

[2] *Swimming direction*. 1978. Graphic. n.p. Web. 3 Mar 2014. <http://esi.stanford.edu/exercise/exercise4.htm>.

[3] Awan, Mohsin. "Top 10 Fastest Fish in the World." *The top tenz explore your World*. Animals, Nature, 01 Nov 2012. Web. 3 Mar. 2014. <http://thetoptenz.net/fastest-fish-in-world/>.

[4] Sfakiiotakis, Michael, David Lane, and Bruce Davies. "Review of Fish Swimming modes for Aquatic Locomotion." . IEEE Journal of Oceanic Engineering, n.d. Web. 3 Mar 2014. <http://www.societyofrobots.com/robottheory/Review_of_Fish_Swimming_Modes.pdf>.