The Effect of Propeller Design on Underwater Remotely Operated Vehicle Speed

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Underwater remotely operated vehicles (ROVs) are becoming more widely used in ocean exploration and underwater infrastructures. SeaPerch is an underwater robotics program, similar to other robotics programs, but with the added challenge of completing tasks underwater. Student participation and success in the SeaPerch program can ultimately lead to a new generation of engineers who will become innovators in the field of underwater robotics. This project sought to improve a SeaPerch ROV that performed very well during the 2022 competition season at task completion but needs to move faster through the water. The goal of this project was to determine if the speed of the ROV could be increased by altering the propeller design, specifically the pitch angle and number of blades. Propellers were designed using a parametric 3D modeling program and then printed using a resin 3D printer. Two-, three-, and four-blade propellers with 15°, 30°, and 45° pitch angles were manufactured. Propeller performance was evaluated by measuring the time it took the SeaPerch ROV to traverse an in-ground swimming pool. This experiment showed that the speed of an underwater ROV is affected by propeller design. Lower pitch angles and less blades yielded the fastest speeds. An approximately 8% increase in speed can be achieved by replacing the stock propellers on the 2022 SeaPerch competition ROV with two-blade propellers having a 15° pitch angle, specifically propellers made from 3D printed resin. These results will be taken into consideration in the design and construction of the 2023 SeaPerch competition ROV.