

Comparison of Various Methods of Sensing Sail Luffing

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The robotic revolution dramatically increased the number of tasks which robots perform. It continues to do so, especially within the maritime industry, where robotic applications are being developed across a wide variety of platforms from power to sail. One challenge faced when constructing sailing robots is the inability to determine the state of the sail if there is no human at the helm watching and reacting to constantly changing wind conditions. Traditional, flexible sails begin to “luff” or flap in the wind if are not set correctly. With this comes a decrease in sail efficiency and hull speed because the sails no longer generate maximum lift. In the worse case, the boat reaches a state of being in “irons” where it stalls in the water, bow to the wind. In previous research I showed sensors could be placed on the sail to detect this luffing. In this research, I present a quantitative comparison of three different methods of sensing sail luffing: piezoelectric vibration, air pressure, and acceleration. The relative effectiveness of these methods is compared against position data obtained using computer vision during sets of binary tests where the sail can be considered to luff or to hold its shape. Results are promising and show that each sensor is able to detect sail luffing. However, there are also clear use cases where one sensor is preferable.