

A Study of Oscillating Fins as Bioinspired Propulsors for Marine Vehicles

Why?

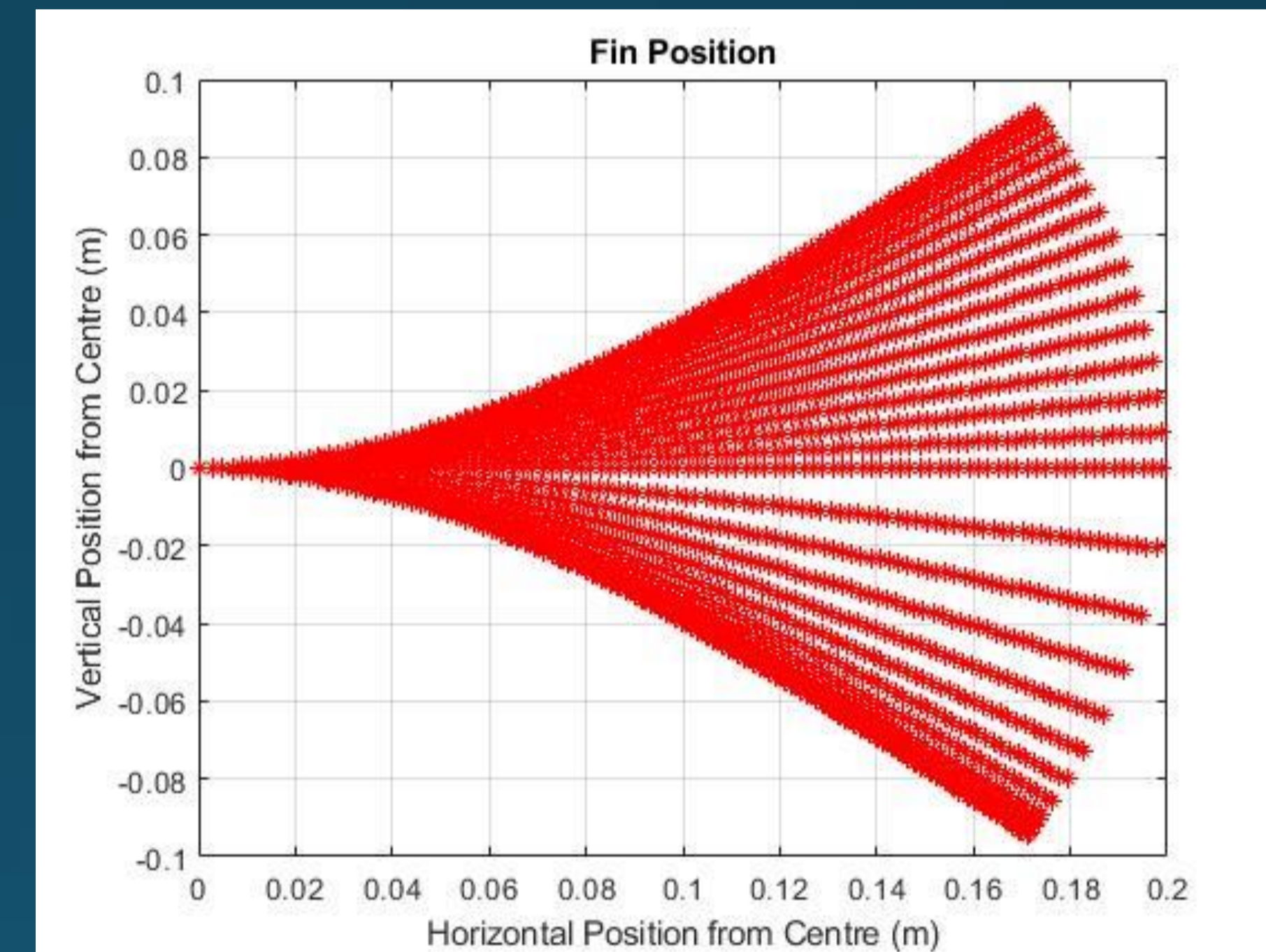
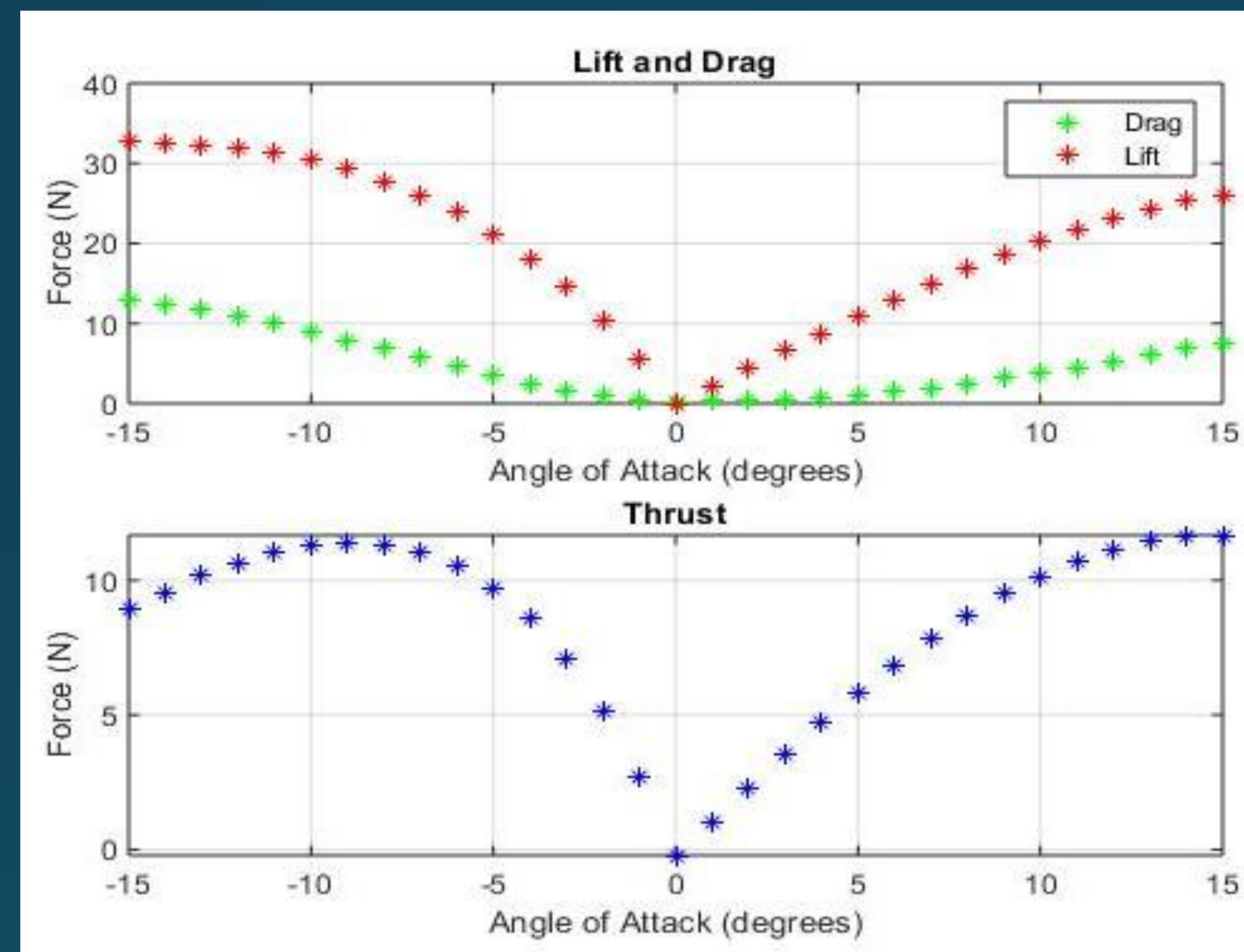
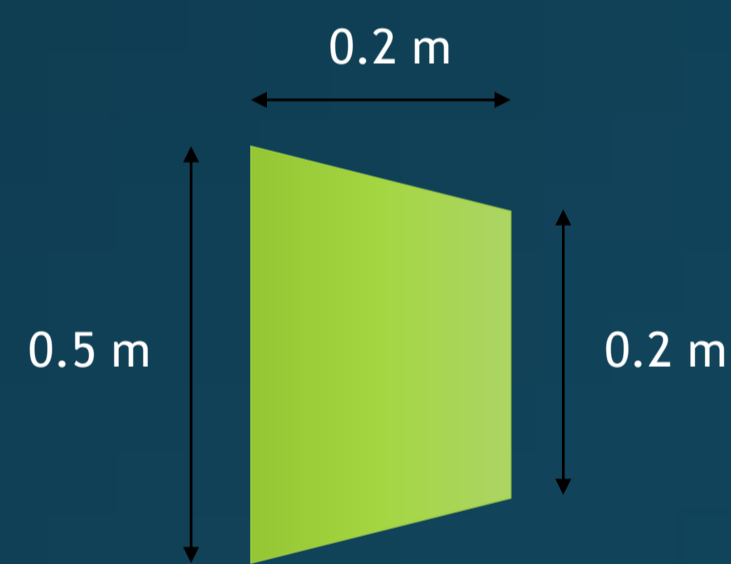
Current types of propulsion for marine vehicles such as Propellers produce large amounts of noise which can be damaging to marine life.

Previous studies have looked into the use of an oscillating fin similar to that of a caudal fin on a fish, however these have been limited and either been purely experimental or using computer simulations.

Aim

The aim of this study is to produce a mathematical model to predict the forces and efficiency produced by an oscillating fin of varying sizes and shapes

Trapezoid fin (0.2m x 0.2m x 0.5m)
Average Thrust: 8.24N
Efficiency: 42.2%



The code can also predict how much the fin flexes and how this affects the thrust it produces

Method

Using various theoretical methods the drag, thrust and lift of can be calculated using a code written in matlab. Using this the forces at each angle of attack to the flow of water can be calculated and thus the average thrust and efficiency can be found as shown in the graph above.

Conclusion

As can be seen above the efficiency is about 15-20% lower than that of a propeller and would not be appropriate for some vehicles, however for use on remotely operated vehicles the thrust produced is viable in certain conditions for instance during research/observation of marine life.

Moving forward

Since this is just theoretical work, experimental research is needed to provide data to check against.