Abstract Submitted
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Shape optimisation of an underwater Bernoulli gripper TIM FLINT[1], MATHIEU SELLIER[2], University of Canterbury — In this work, we are interested in maximising the suction produced by an underwater Bernoulli gripper. Bernoulli grippers work by exploiting low pressure regions caused by the acceleration of a working fluid through a narrow channel, between the gripper and a surface, to provide a suction force. This mechanism allows for non-contact adhesion to various surfaces and may be used to hold a robot to the hull of a ship while it inspects welds for example. A Bernoulli type pressure analysis was used to model the system with a Darcy friction factor approximation to include the effects of frictional losses. The analysis involved a constrained optimisation in order to avoid cavitation within the mechanism which would result in decreased performance and damage to surfaces. A sensitivity based method and gradient descent approach was used to find the optimum shape of a discretised surface. The model's accuracy has been quantified against finite volume computational fluid dynamics simulation (ANSYS CFX) using the k-ω SST turbulence model. Preliminary results indicate significant improvement in suction force when compared to a simple geometry by retaining a pressure just above that at which cavitation would occur over as much surface area as possible.

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