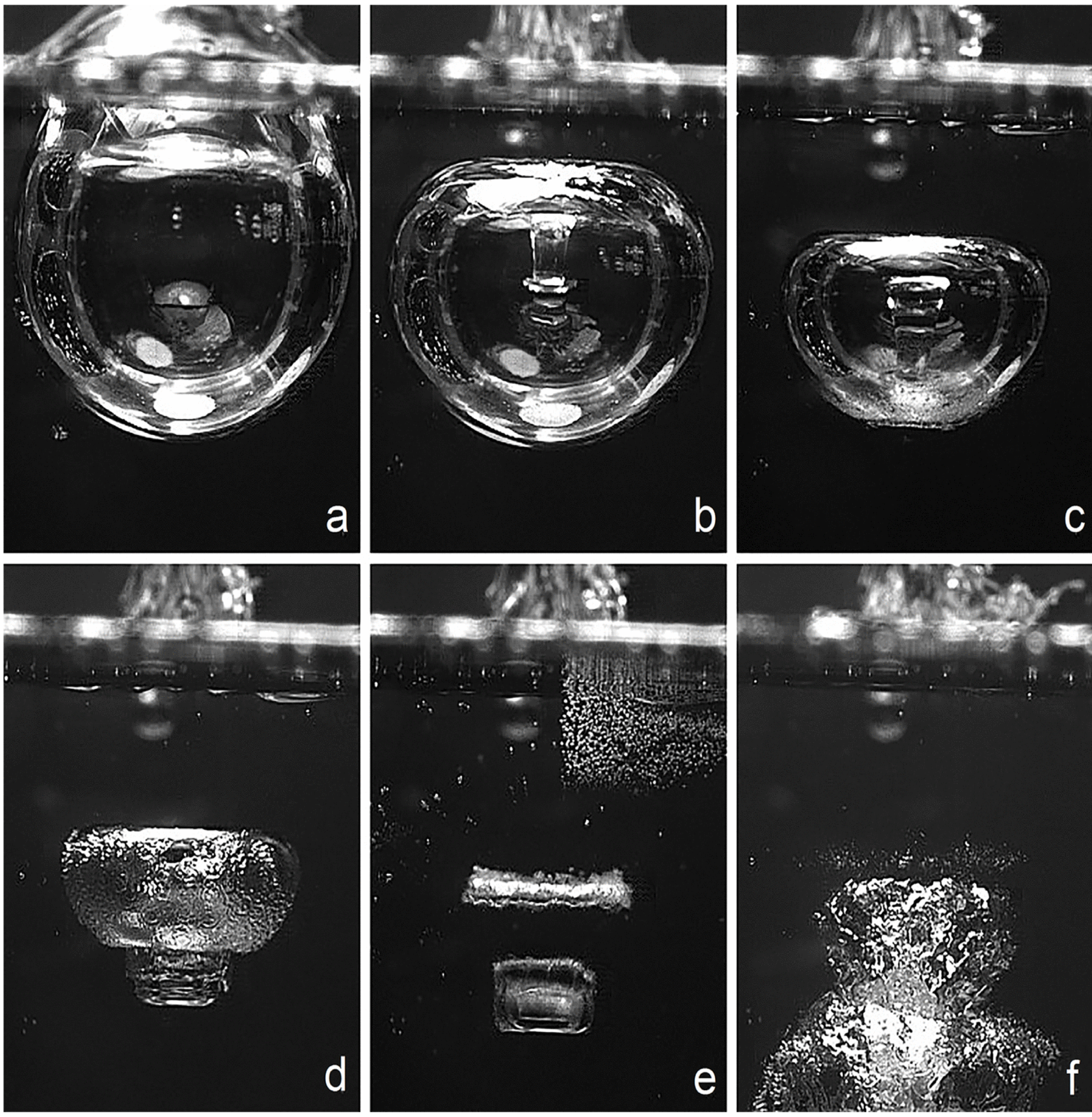
Lucerne University of
Applied Sciences and Arts

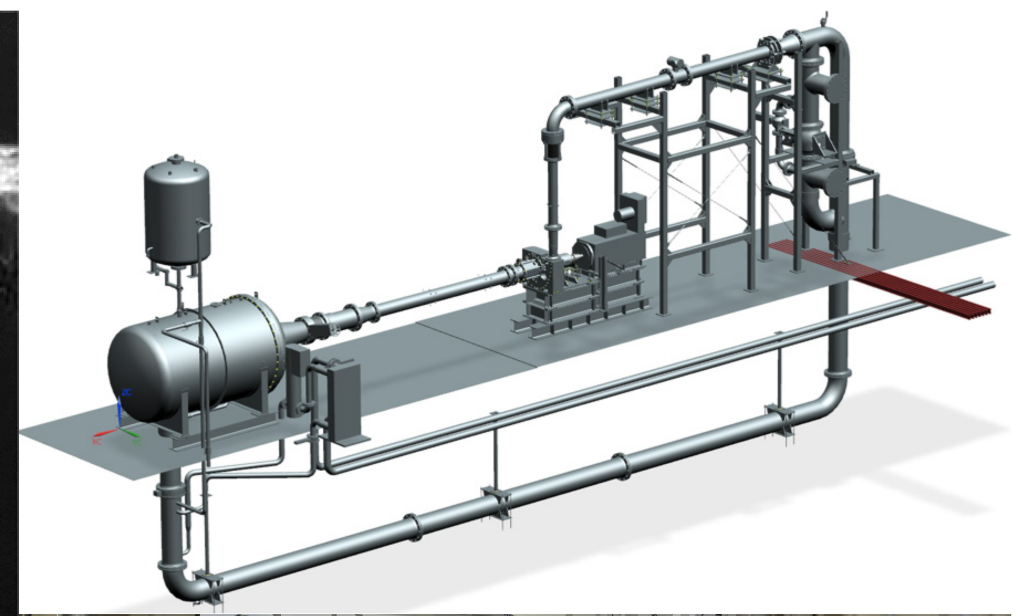
HOCHSCHULE
LUZERN

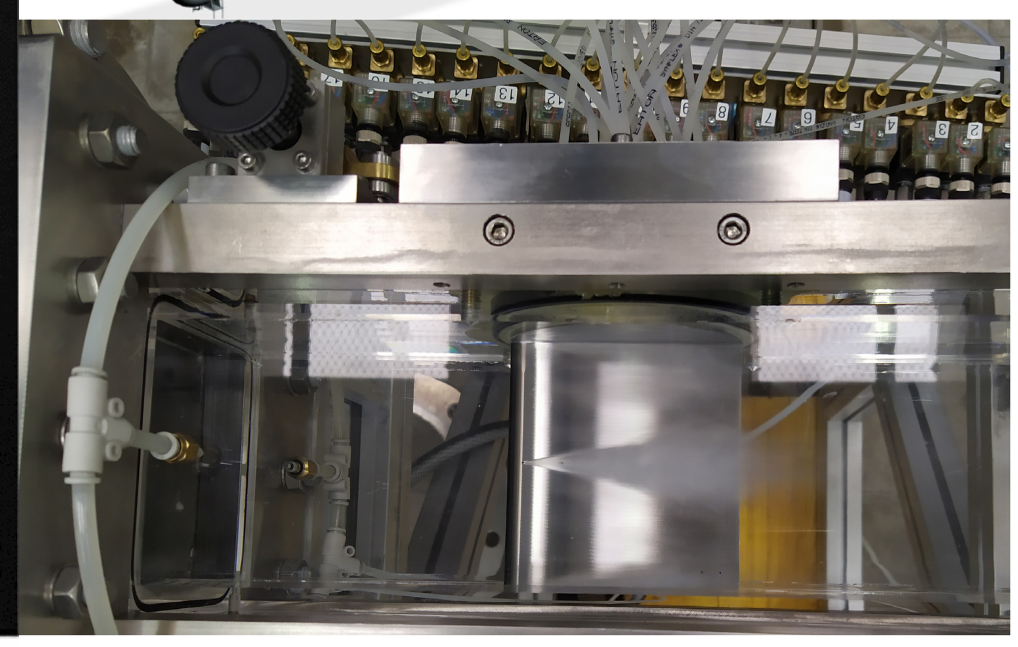
Technik & Architektur
FH Zentralschweiz

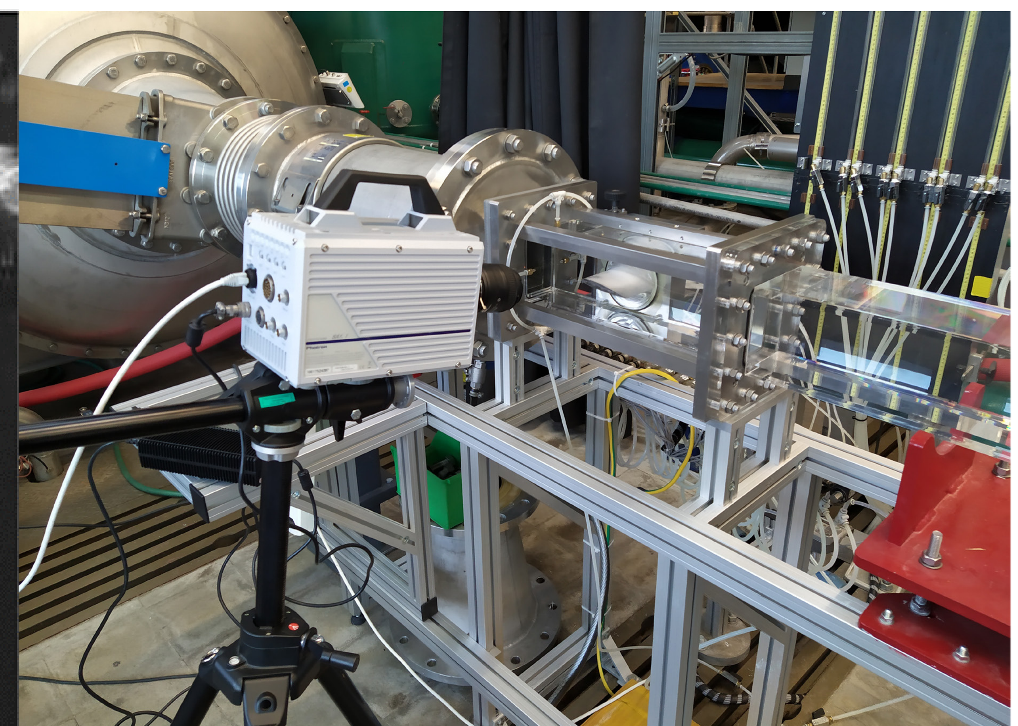
Bachelor's thesis in Energy Systems Engineering

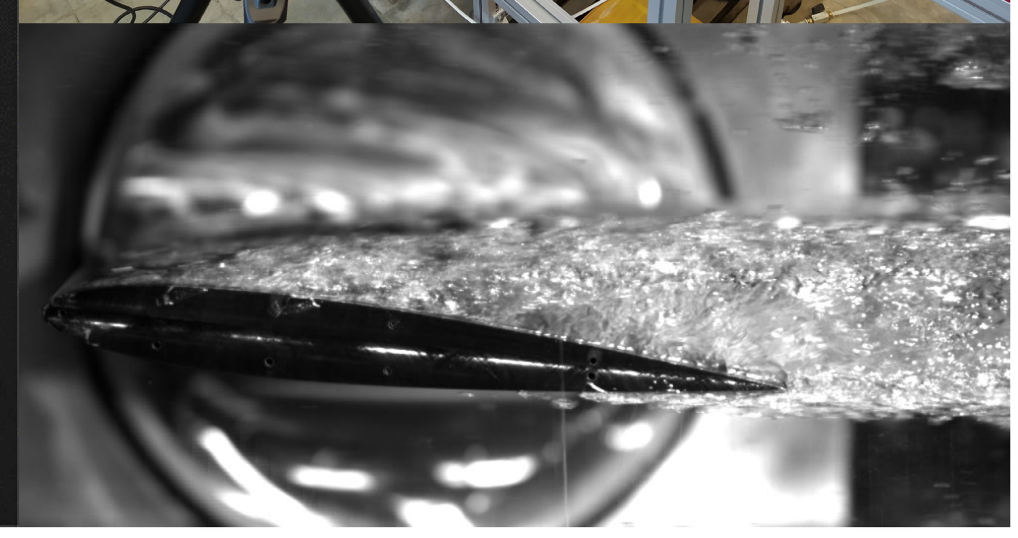
Cavitation Measurements on a Hydrofoil with Tip Gap Variation











Cavitation measurements on a hydrofoil with the variation of the tip gap

Background
With turbomachinery (turbines & pumps) operating in water, there is always a risk of damage due to cavitation. Rapid fluid flow around the blades can cause regions where the pressure decreases to a point where the water starts to boil, producing bubbles or cavities. Once pressure increases again, these cavities implode, resulting in a shock wave impact with the blades of the machine.

Problem
The collapse of cavitation bubbles and collision with machinery over time can produce considerable damage to parts of the turbomachinery. It can decrease efficiency and increase instability during operation. It is therefore necessary to study this phenomenon in order to mitigate its negative impact.

Method
The experimental work for this project was conducted using a pump test rig at the Hochschule Luzern hydro laboratory. Using the test rig, the parameters of the closed loop system (i.e. water flow rate, tank pressure, and angle of incidence of hydrofoil) are varied to create various cavitation conditions required to examine behavior of cavitation over the hydrofoil. Pressure distribution data is collected with 19 sensors using LABVIEW and visualizations are carried out with a high-speed camera. The post processing analysis of the data is carried out on MATLAB.

Goal
Continuing the work of previous bachelor projects, a tip gap was added between the section wall of the water channel and the side of the hydrofoil. Results were compared with findings from the previous project, however more work is required including further increasing the tip gap to obtain reliable data. This experimental work will aid the in further development of computational cavitation CFD models and will be useful for their verification and validation.

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HS21