

Tending Ostreidae: Serenades for Settling - Bio-inspired Robotic Oysters

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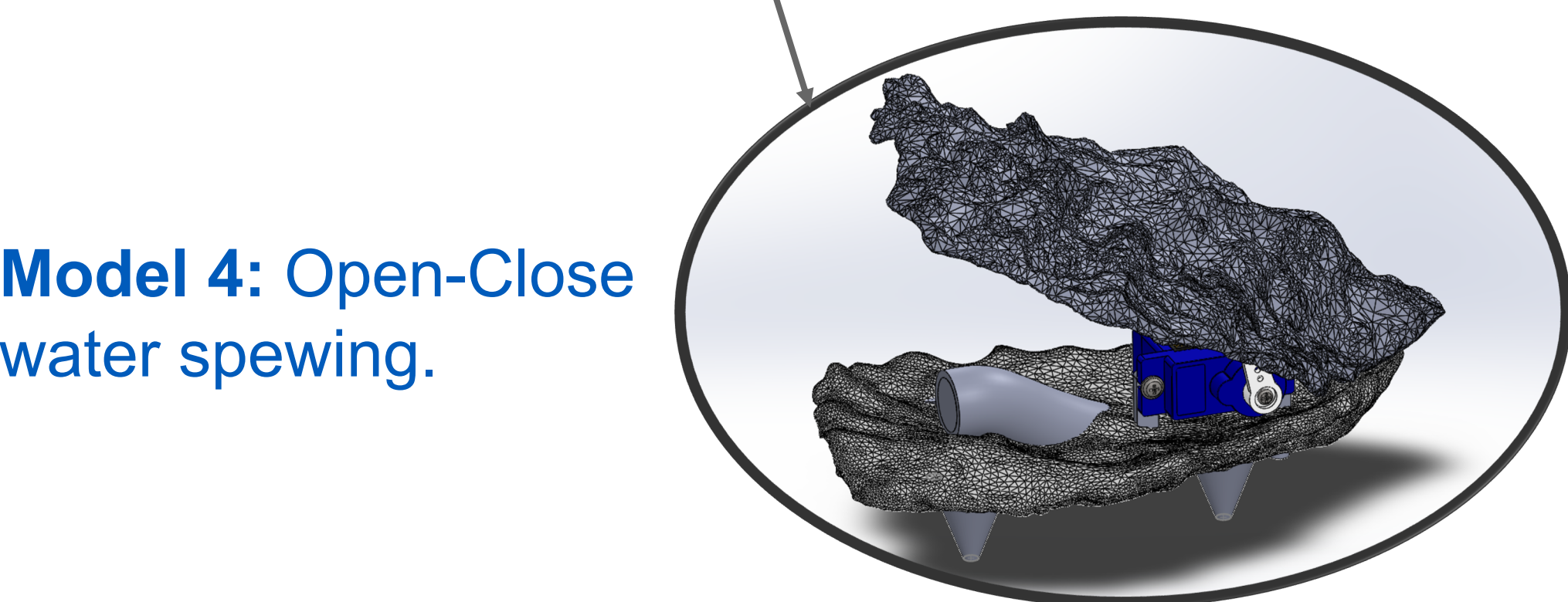
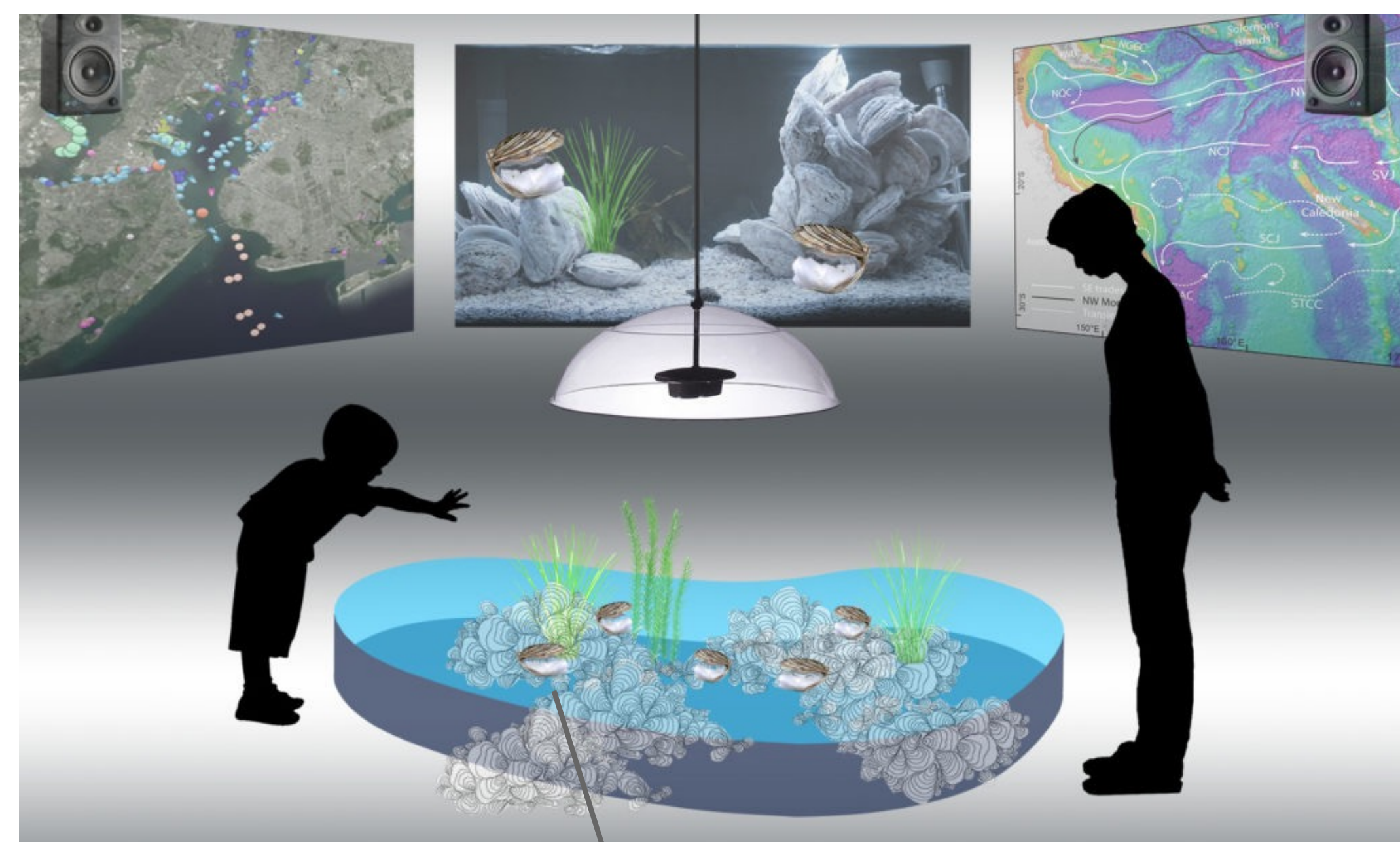
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MOTIVATION

- For Oysters, sound is a more reliable indicator than chemical exudates or patterns of light [1]
- Billion Oyster Project [2] - a NYC based nonprofit working to ecologically restore the city's waterways through oyster reseeded/repopulating initiatives
- "Tending Ostreidae: Serenades for Settling" [3] is multimedia operatic installation - settlement patterns are impacted by anthropogenic noise
- The project focuses on the oyster reseeded initiatives in the waterways of New York City's harbor — once the largest harvesting region for oysters in the 1800's
- Sound responsive robotic oysters created at different stages of their life cycle (larvae, pediveliger, reproductive adult, etc.) will respond to sonic data collected from the harbor



PROJECT VISION

- Bio-Inspired Robotic Oyster Model
- Open-close sliding link actuation mechanism
 - Underwater Robotic Environment, anthropogenic noise response integrated with water filtration system
 - Ability to walk on the water bed

MECHANICAL DESIGN

SLIDING LINK MECHANISM

- Kinematic link length calculation for Open-Close angle
- Overall motor torque calculation consider forces like mass of shell, water resistance.

HINGE MECHANISM

- Material elasticity and corresponding thickness was considered to make the hinge joint easy push-pull to connect upper and lower shell.

WATER SPEWING MECHANISM

- AC water pump is integrated with the microcontroller.
- Internal pipe connection in 3-D assembly.
- Aeration mode used to mix water and air to create bubbling effect.

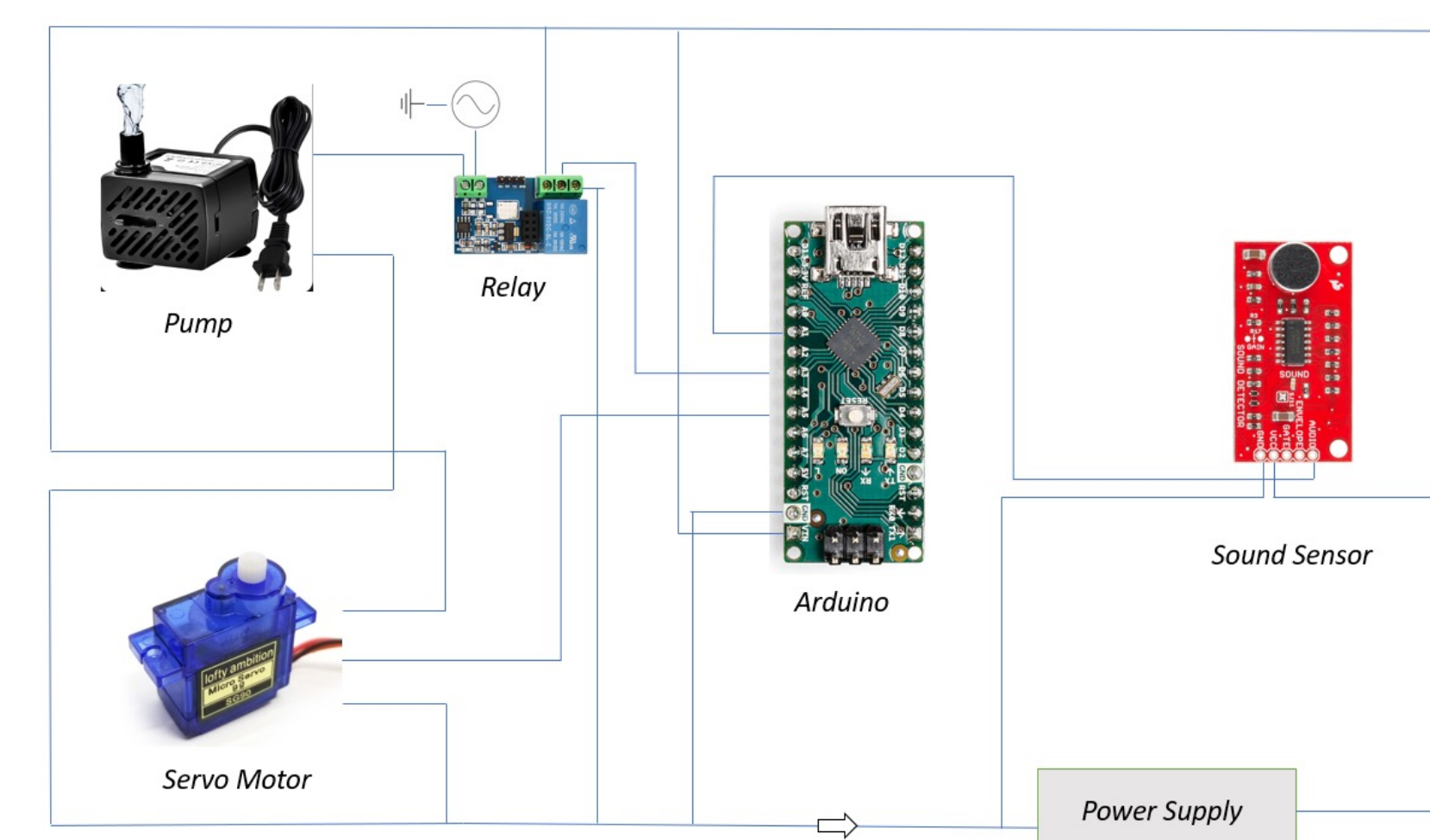


Some Mechanical Test Failures

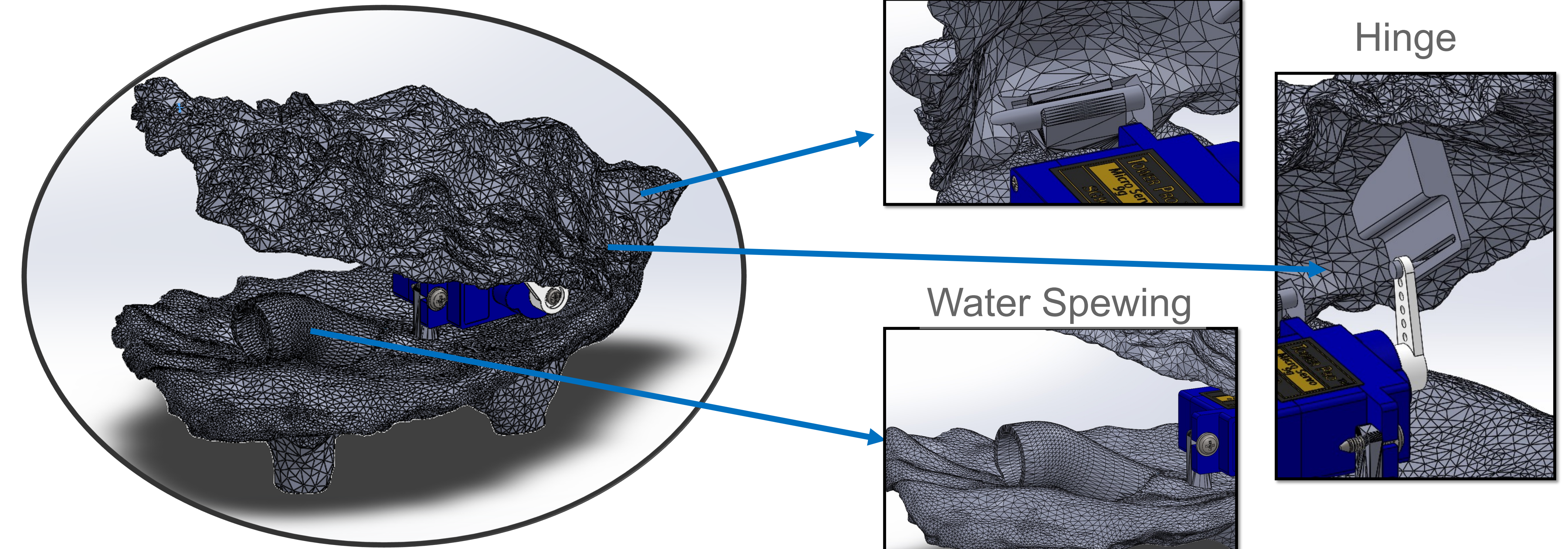


Aeration Mode Testing

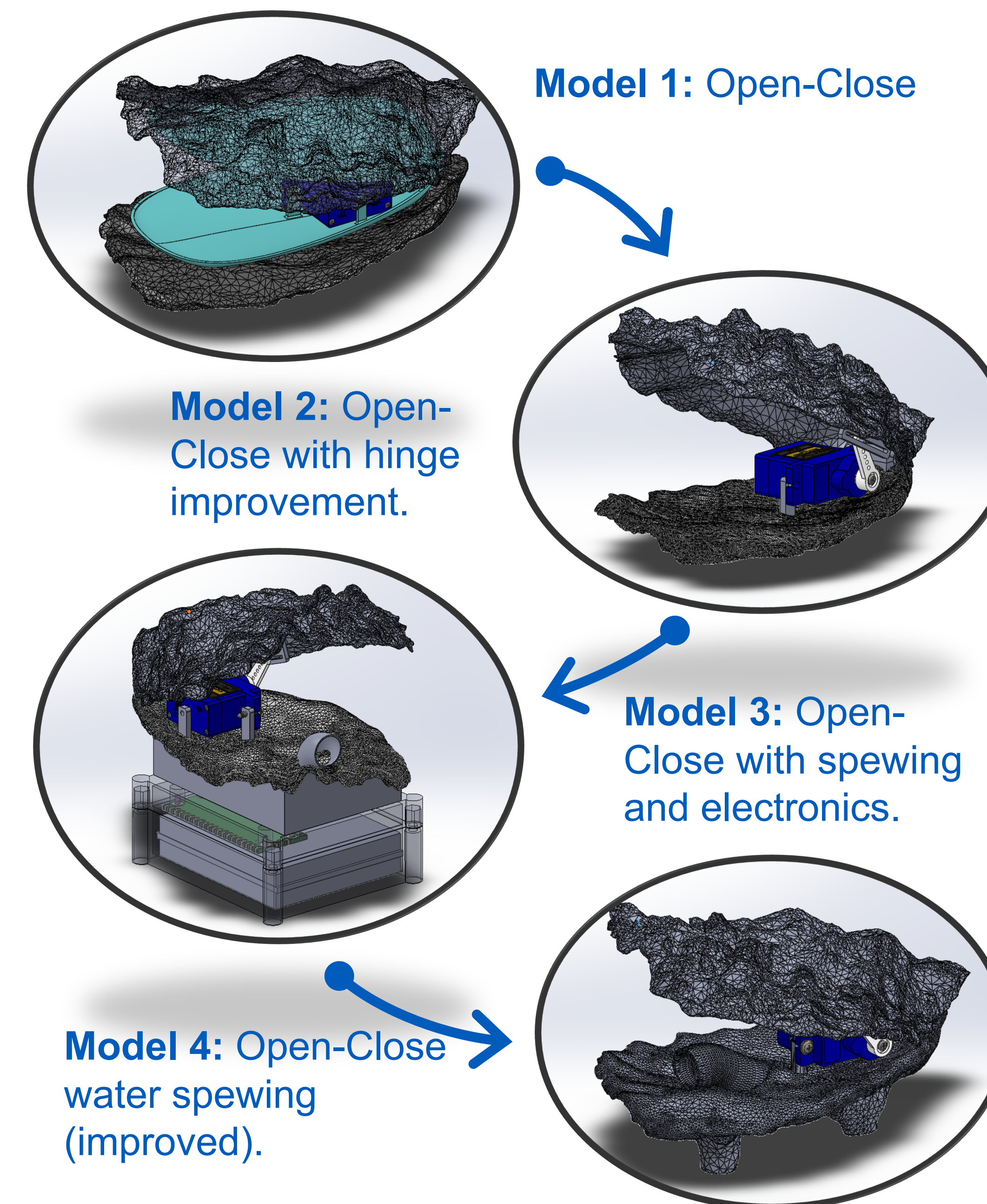
ELECTRICAL DESIGN



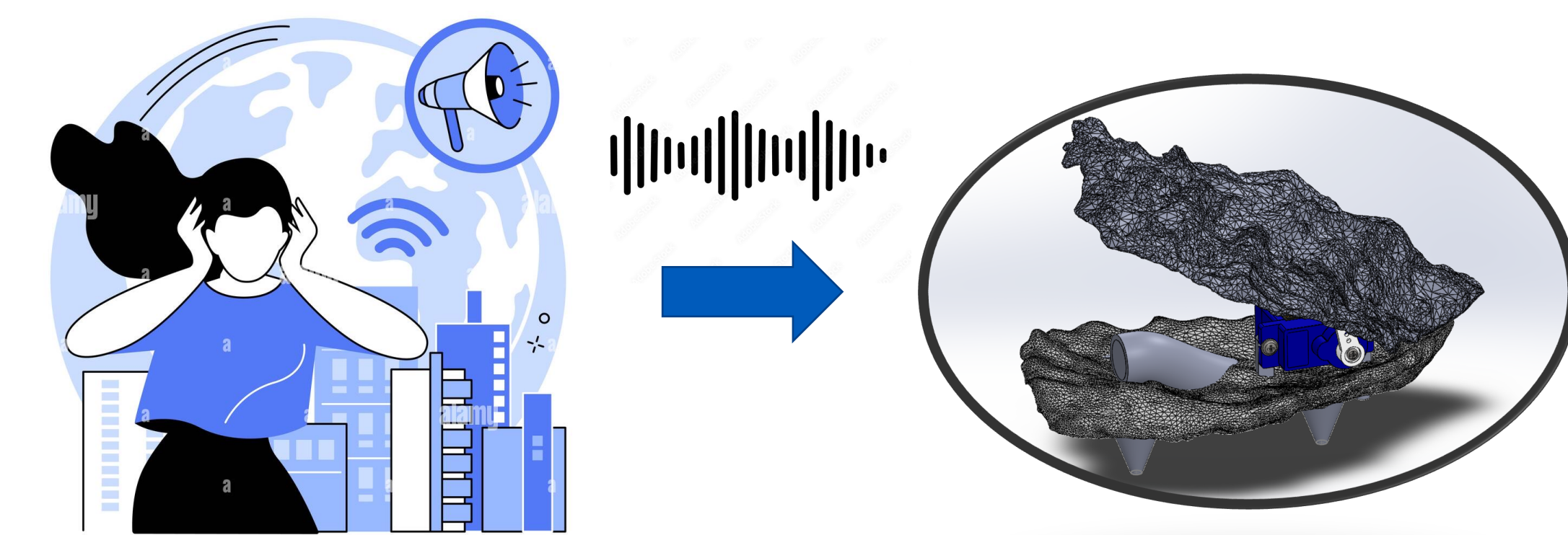
CURRENT DESIGN



DESIGN EVOLUTION



SOUND POLLUTION DEMO



- Measure ambient noise pollution
- Open lid
- Spew water proportional to ambient noise

FUTURE WORK

- Walking version to mimic early oyster lifecycle
- Attach battery and connect pump for autonomous mobility

REFERENCES

1. <https://news.ncsu.edu/2013/10/oyster-sound/>
2. <https://www.billionoysterproject.org/>
3. <https://stephanierothenberg.com/tending-ostreidae-serenades-for-settling/>