SMART CRAB TRAP

INTELLIGENT CRAB MONITORING

08

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Background and Motivation

- Dungeness crab is a vital economic resource and a critical part of the Pacific Northwest oceanic food chain.
- Monitoring the health of the Puget sound and the abundancy of the crab population provides insight on how to care for our ecosystem and address critical issues like the effects of ocean acidification while maintaining a robust economy.
- Cost-effective data gathering is a crucial step in the process of developing realizable, collaborative, and data-driven solutions for current and future concerns in the Pacific Northwest's waterways.
- Monitoring Dungeness crab megalope – a stage in larval development – provides an opportunity to gather raw data on crab population as well as providing specimens for lab work.
- Current megalope monitoring efforts are conducted using a series of buoys equipped with timer-driven lights that attract megalope into a trap.

Previous Work

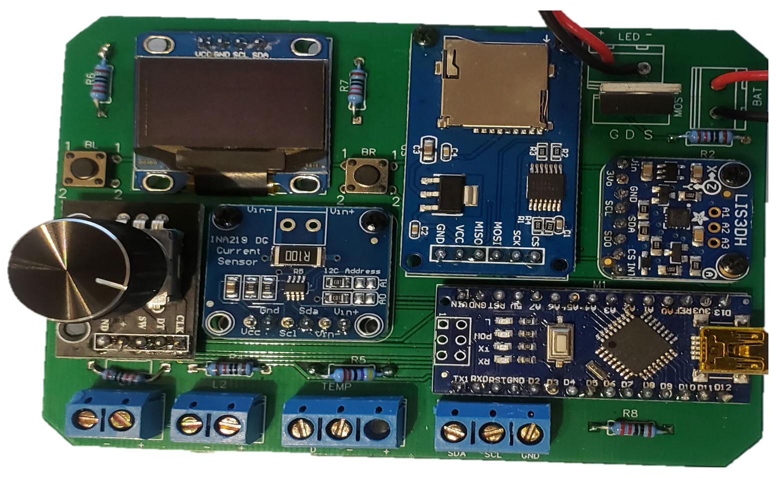


Figure 1 – An image of one of the sensor controller boards developed by previous cohorts. It is typically housed in a waterproof case with a battery. The case has waterproof ports through which the lighting and sensors are deployed.

- Previous capstone cohorts have designed an Arduino-based system capable of monitoring the temperature and wave action of the water column.
- This system fits easily into a waterproof case that is attached to a buoy, replacing one of the regular buoys
- This iteration of the SCT can deploy for approximately 26 hours before the battery runs out.

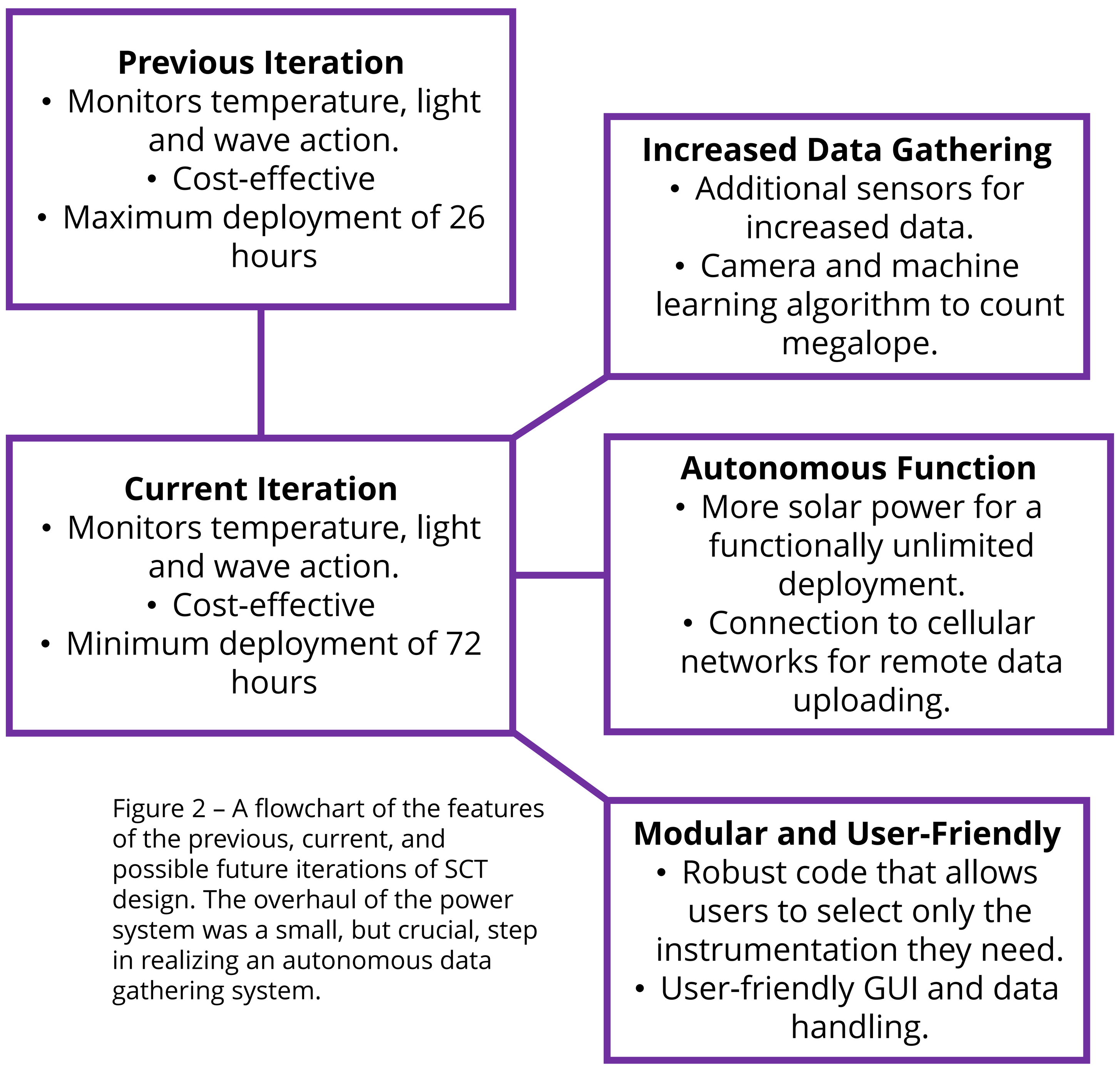


Figure 2 – A flowchart of the features of the previous, current, and possible future iterations of SCT design. The overhaul of the power system was a small, but crucial, step in realizing an autonomous data gathering system.

Smart Crab Trap Requirements

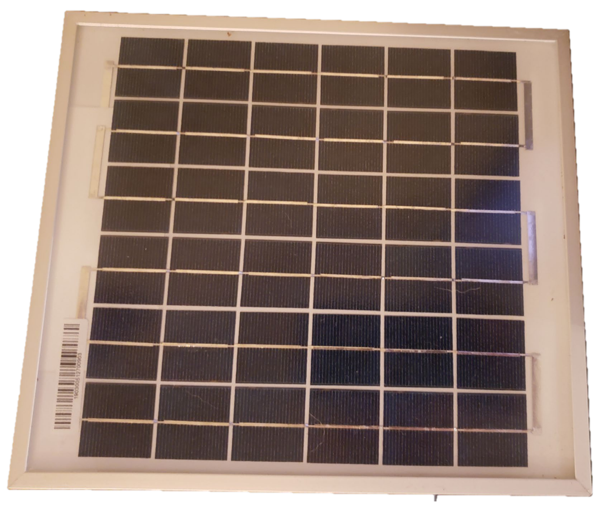
- Developing a Smart Crab Trap (SCT) provides an instrument that can not only help monitor the health and abundance of the local crab population but can also monitor the local water column in which the trap is deployed.
- The system must be robust, capable of extended deployment, and be cost-effective if it is to be adopted for use by the various municipal and tribal governments that are affected by the abundance and health of the Dungeness crab population.
- The SCT design should be able to be easily integrated into the existing system of crab monitoring buoys, augmenting the array already in place.
- The SCT should fulfill the functions of a crab buoy already integrated into the system – that is, it should be a light-driven crab trap as well as an environmental monitoring system.

Goals for this Cohort

- Upgrade the power system to provide enough power for a minimum of three days' deployment without human intervention.
- Ensure the SCT is tamper-proof and protected from the environment, including inclement weather and rough seas.
- The prototype should be easy to handle and should be able to be set up, deployed, collected, and broken down by a single individual working on the deck of a small boat.
- The footprint of the SCT should fit easily within the buoys used by the other crab traps in the network.

Power for Long-Term Deployment

Figure 3 – The 5W, 18V nominal solar panel connected to the power system of the SCT. The trickle charge provided by this panel increased the operational deployment of the SCT by over 280%.



- Installing a larger battery increased projected deployment time to 46 hours.
- The larger battery was connected to a solar panel and a charge controller to allow trickle charging of the battery.
- Using the average of the past ten years ' irradiance for the first and last months of crabbing season, the output power, additional instrumentation, and efficiency of the solar panel, a model was constructed to estimate the minimum power generated by the panel. I
- Based on this model, the minimum deployment time before the batteries of the SCT die is 74 hours.
- The upgraded power system fits within a slightly larger case than the previous prototype and is still easily handled by a single person.

Future Work, References, and Acknowledgments

- Implement cellular tower connection for hands-free data gathering.
- Combine with ML camera system to preform counting of megalope entering trap.
- Implement release system to periodically flush the trap out, preserving the megalope population.
- Further improvements to the power system for fully autonomous, season-long deployment

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