Aquatic Mammal Photogrammetry Tool

Fact sheet

The Aquatic Mammal Photogrammetry Tool (AMPT) uses machine learning to help researchers analyze large numbers of drone photos faster in order to provide health metrics for Southern Resident killer whales. It is the first machine learning tool of its kind to combine individual recognition with photogrammetry for killer whales.

Southern Resident Killer Whale Aerial Photogrammetry

For more than a decade Dr. Holly Fearnbach (SR3) and Dr. John Durban (Oregon State University) have been using aerial photogrammetry to assess the health of endangered Southern Resident killer whales. The team uses a remotely controlled octocopter drone to collect high resolution images that are analyzed to estimate size, monitor growth and assess body condition of individual Southern Resident killer whales. Monitoring individual condition over time allows researchers to identify if and when body condition changes, including identifying "animals of concern" (e.g. poor body condition) and vulnerable whales (e.g. pregnant) in the population. Quantitative health metrics produced from this study are provided to management groups to help guide management actions aimed at recovering the Southern Resident killer whale population.

Partnership with Vulcan Inc.

Vulcan's machine learning team works to accelerate discovery, development and scaled adoption of machine learning innovation for good. Until now, processing aerial photogrammetry images has relied on manual analysis done by humans, which makes it labor-intensive, expensive and slow. A semiannual dataset would take anywhere from 4 to 6 months to fully process.

Vulcan's machine learning team partnered with SR3 to see if they could accelerate the process. The team developed the Aquatic Mammal Photogrammetry Tool (AMPT) that uses machine learning and an end-user tool to dramatically decrease the time needed for image analysis, from around 6 months down to a matter of weeks, or even days. Early use of the new tool by SR3 researchers show a decrease of 25% in time taken for individual image processing. Additional time savings are expected at the batch level, and as users increase their familiarity with the tool. After testing whether machine learning could accurately assess health metrics, the team created a two-phase solution that closely replicates SR3's current workflow for image analysis.

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The tool is made up of two distinct pieces: machine learning and user measurement review.

Part I – Machine learning:

- A user uploads images into the ML part of the tool, built in Jupyter Notebook.
- Algorithms run and automatically detect and identify the animals in each image, helping to narrow down the full batch of images to the images most likely to be measurable for each animal.
- The user reviews and verifies the computer-generated suggestions.

Part 2 – User measurement review:

- All of the results from the machine learning tool are loaded into the user measurement review part of the tool, built as an ImageJ plugin.
- The user is then able to visually review and finalize all the health assessment measurements.

Initial Results

Faster turnaround on health metric data will allow SR3 researchers provide health metrics to management groups, including identifying vulnerable whales and whales of concern, with an aim to help guide management decisions directed towards the recovery of Southern Resident killer whales. Such decisions could include adaptive management actions like targeting specific salmon runs or limiting disturbance by vessels, with an aim to increase both the abundance and accessibility of Southern Resident killer whale's primary prey, Chinook salmon, throughout the year.