HABscope

A Portable Red Tide Detection/Counting System For Under $500

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GCOOS-RA

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HABSCOPE TEAM
HAB forecasts are low resolution – per county or a subset of beaches
Long lead time for results – up to a week
Limited staff for sampling
Original concept: volunteers with smart phones
Low-cost “Instructables” microscope w/laser pointer lens
Videos uploaded to GCOOS for hosting
Videos reviewed by HAB analyst
Provide localized data for NOAA forecasting models
PROBLEMS WITH INITIAL CONCEPT

- Extremely hard to align camera with lens hole
- Low quality laser pointer lens
- Magnification too high
- Very limited field of view
- No protection from environmental conditions
- Vibration/bumping a problem
NEW PLAN

- Off-the-shelf microscope
- Apple iPod Touch
- 3D printed adapter by GJK
- Straight Talk hot spot
- Total Cost: $500
HABSCOPE IN ACTION
VOLUNTEERS COLLECT WATER SAMPLES

The Right Way
VOLUNTEERS COLLECT WATER SAMPLES

The Wrong Way
Processing on-site
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TRAINING IMAGES

Brevis

Not Brevis
• Written in Python
• Uses OpenCV for image processing
• Uses Keras for Deep Learning framework
• Uses Google TensorFlow for neural networks
• 20,000+ *K. brevis* images for training
• 1,500 ‘non-brevis’ images for training
• 50 epochs (iterations) to train model
• Trained on GPU-enabled custom built Deep Learning box
Reality Is Not CSI
• Cell counts accurate to within +/- 10% of manual count
• The lower the cell count the wider the margin of error
• We are counting LIVE cells in motion w/only 30% FOV
• Some problems w/objects of similar size, shape and movement
• Some problems w/camera noise on edge of image
Respiratory Forecasts
RESPIRATORY FORECASTS

https://habscope.gcoos.org/forecasts
December 2018

https://habscope.gcoos.org/forecasts
November 2018

https://habscope.gcoos.org/forecasts
November 2018 on a bad day

https://habscope.gcoos.org/forecasts
• Adding multiple species to HABscope model list
• Operationalizing Every Beach Every Day forecasting tool
• Version 2 likely will use Lugol’s fixed cells at 100x for better resolution
ACKNOWLEDGEMENTS

• NASA for the Research Opportunities in Space and Earth Sciences grant
• NOAA scientists and technicians
• Florida Fish and Wildlife Conservation Commission
• Pinellas County staff
• All of our wonderful HABscope volunteers

THANK YOU