ADROC: Approaching Divers Using Monocular Vision

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Diver Approach Enables U-HRI

- Most underwater human-robot interaction (U-HRI) methods require close proximity.
- Approaching a diver requires an estimate of diver's relative position and distance from the AUV.









Biological Priors Allow Distance Estimation

- Is it possible to estimate relative diver position without stereo vision, sonar, or expensive localization sensors?
- Using biological priors, calculate a ratio between current diver distance and the ideal distance.

•No need for actual distance!

PD from Bounding Box



PD from Body Pose

$$b = \frac{\sqrt{(x_l - x_r)^2 (y_l - y_r)^2}}{w_{image}} \times \frac{1}{target_ratio}$$

$$target_ratio = 0.17$$



Trial #4 Distance: 9M, Angle: 90





Evaluation and Results

- In 162 trials, ADROC succeeded **81.5 %** of the time.
- Success rate falls as initial distance rises.



Experiment	Success	Avg. Time
Exp. #1 (clear pool)	88.9%	25s
Exp. #2 (cloudy pool)	66.7%	28s
Distance	Success	Avg. Time
3 meters	92.6%	21s
6 meters	83.3%	28s
9 meters	68.5%	29s
Angle	Success	Avg. Time
0°	77.8%	22s
45°	83.3%	24s
90°	83.3%	33s
Overall	81.5%	26s





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tinyurl.com/irv-adroc

For more information on ADROC's design and implementation.