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CX 4230

Killer Whale Hunting Strategies

Conceptual Model

Task

- Reproduce killer whale hunting behavior
- Hunting behavior tied with communication behavior
- **Mammals → Be Quiet, Fish → Chatter**

Killer Whales (Orcas)

- Move towards nearest prey with probability inversely proportional to distance
- Limited detection range = 10 units
- If no nearby prey, killer whale moves towards other orcas
- Moves randomly otherwise if no other orcas and no fish
- Four options for attacking with varying probabilities of success:

Action	Success %	Success % (w/ chatter)	Success % (w/ chatter, seal)
Action 0 (Chatter)	0.0001	0.0001	0.0001
Action 1	25.0	50.0	5.0
Action 2	25.0	80.0	5.0
Action 3	25.0	25.0	5.0

Prey: Seals and Fish

- Move randomly when unbothered
- Actively moves away from nearby orcas
- Limited detection range = 5 units
- Attacks on **seals** *less* successful in presence of noise
- Attacks on **fish** *more* successful in presence of noise

Environment

- Mostly uniform as far as action success is concerned
- Some obstacles (e.g., ice floes, beach shallows)
- Both orcas and prey must go around obstacles

Implementation

Learning Setup

- Training instances: Tuples of actions
- Labels: 1 for successful attack, -1 for failed attack
- Learning model: Naïve Bayes

Naïve Bayes

- Naive because it assumes features are mutually independent
- Based on Bayes' theorem
- Produces a MLE for each label given an instance

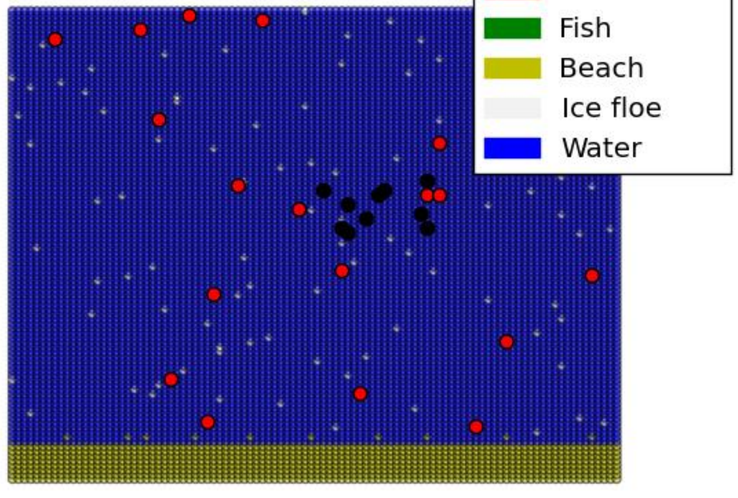
Learning Cycle

- For first 25 attacks, uniformly choose actions at random
- Train on a feature set of 25 previous action tuples
- Choose next action according to belief probabilities

Action Preferences

- MLE of last attack action × all possible actions
- MLE of all combinations of actions
- Next action chosen from distribution base on above

Snazzy Visuals

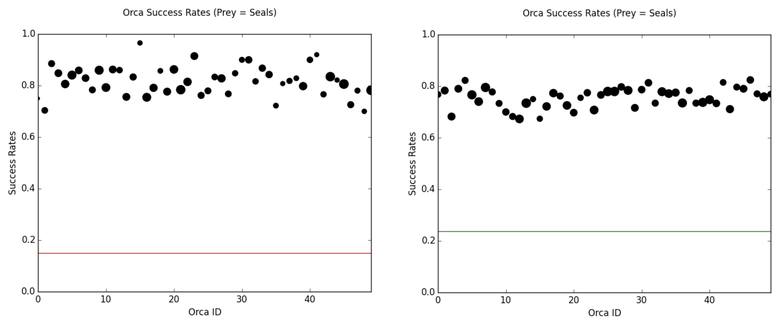


Results

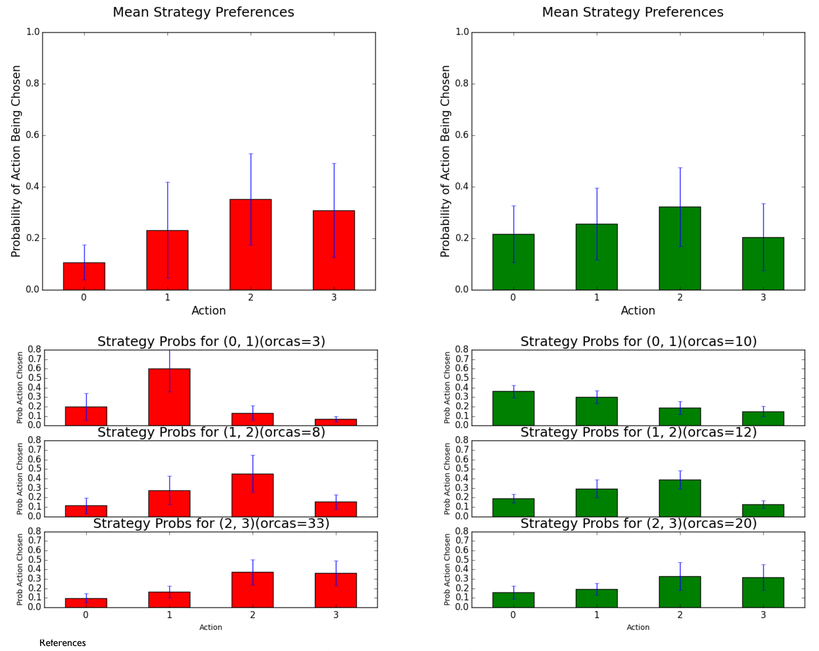
Seals

Fish

Baselines



Strategies



References

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