

HUNT Project: Canid Hunting Behavior

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HUNT: Heterogeneous Unmanned Networked Teams

- Future Naval Combat Operations and Systems will entail small expeditionary forces which must monitor and protect large and complex areas continuously
- The purpose of HUNT is to push the state-of-the-art in complex, time-critical mission planning and execution for large numbers of heterogeneous vehicles collaborating with warfighters
- Sophisticated cooperation among intelligent biological organisms will offer critical insight and solution templates for many hard engineering problems

Prototypical Progression of a Hunt

- Prototypical progression through foraging states shown to the right
- Hunt begins with wolves searching for prey
- Once prey is discovered the wolves transition to approach
- Transition to attack group when prey begins running
- Transition to attack individual when a weak individual is discovered
- Transition to capture when the prey is close enough to make contact
- Capture ends in a kill for successful hunts

Implementing Wolf Behavior

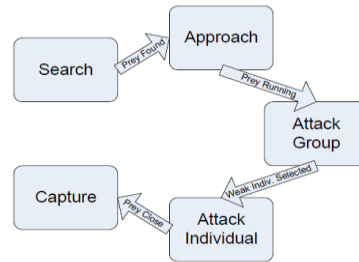
- Software implementation was accomplished through a set of releasers (stimuli) and a weighted roulette wheel of probabilities
- The presence or absence of stimuli make a transition possible (we say they release that transition)
- The set of releasers and the transitions they facilitate are shown in the table to the right

Finite State Automata

- The foraging states and transitions are represented by states and triggers in the Finite State Automata (FSA) shown below
- The FSA is a fully connected graph, however the only transitions possible are those with the necessary releasers present

Results

- Experiments were run for 4 scenarios:
 - 1 wolf, 1 elk (stop)
 - 1 wolf, 1 elk (run away)
 - 1 wolf, 3 elk (run away)
 - 2 wolf, 3 elk (run away)
- Each scenario was run 20 times and the progression of the wolf through the foraging states was recorded for each run
- The tabulated values show a high fidelity to the original observed probabilities
- Differences between probabilities in each scenario show that the wolves behavior reacted to prey behavior



List of Releasers and Transitions	
Releaser	Transitions possible
Prey Found	S → A, G, I
Prey Lost	A, G, I, C → S
Multiple Prey	S, A, I, C → G
Prey Running	A → G, I
Prey Stopped	G, I → A; A, I → C
Weak Individual Identified	G → I
Prey Close	G, I → C

