

Clever Duckies

Simulation of Duck Behaviour Using Flocking and Finite State Machines

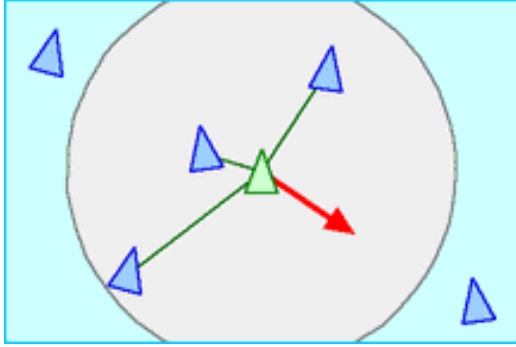
Emma Broman



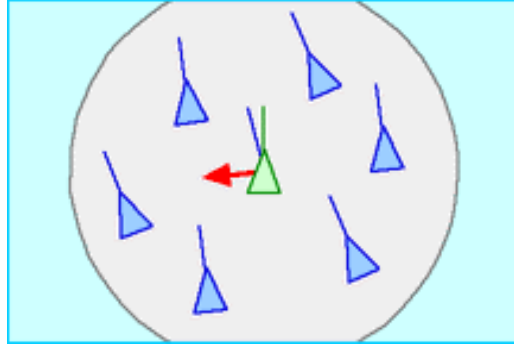
Agenda

- Flocking
- Finite State Machine (FSM)
- **Demo**
- Implementation
- Discussion
- Questions

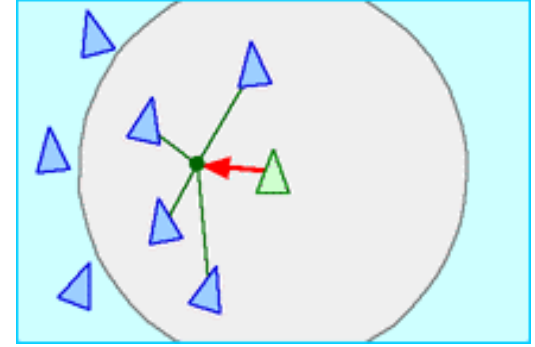
Boid Flocking



Separation



Alignment

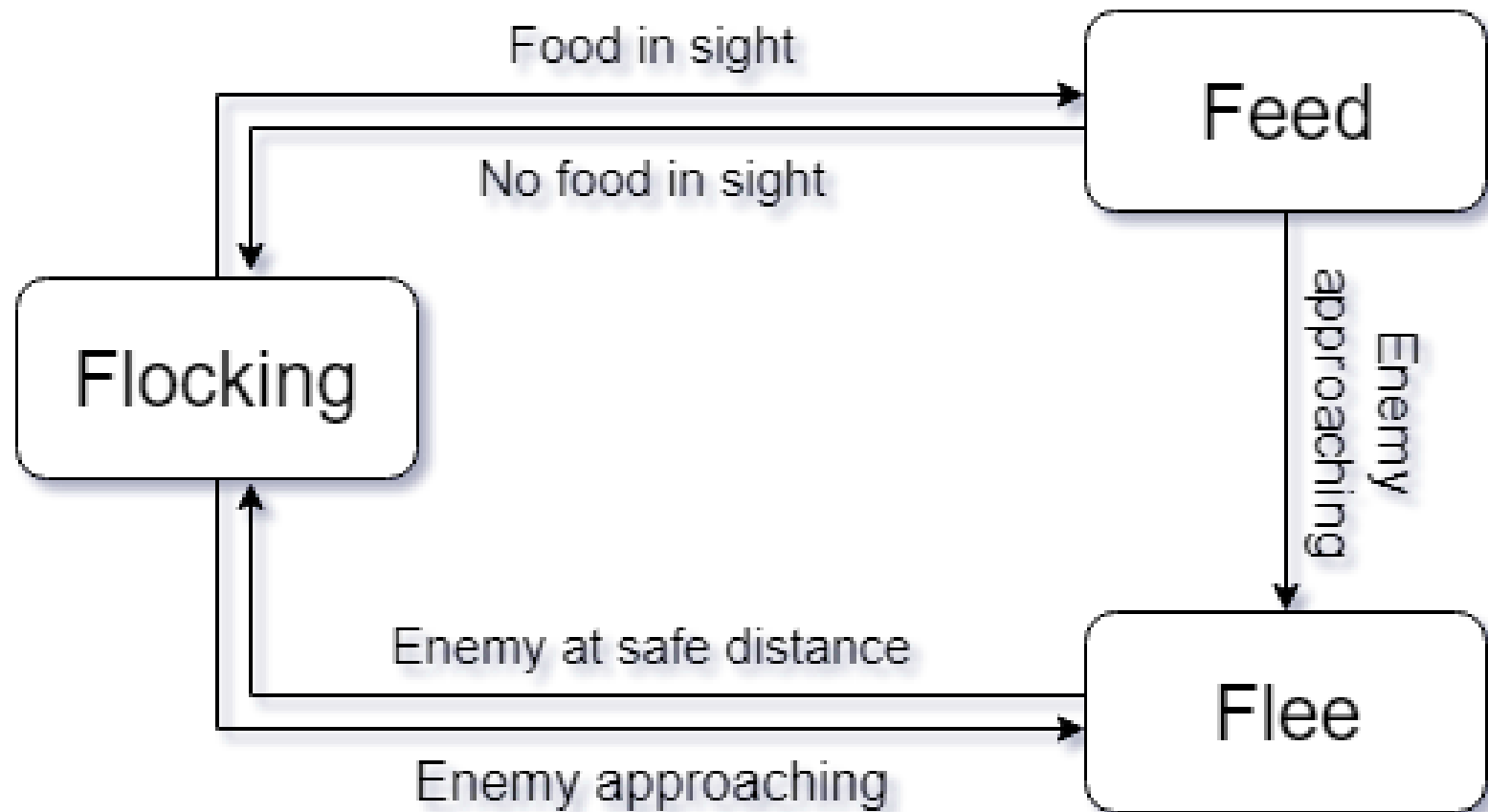


Cohesion

Source: Craig Reynolds, (2001). "Boids Algorithm" <https://www.red3d.com/cwr/boids/>

Finite State Machines (FSM)

- Describe behaviour using states
- Agents can be in exactly one state at the time
- Suitable for simple behaviours - few states and actions



Demo!



(Unity)



Implementation

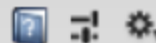
- Flocking
 - Find neighbors - using collision
 - for each neighbor:
 - compute cohesion, separation and alignment contributions
 - $\text{boid.velocity} += k * \text{cohesion} + l * \text{separation} + m * \text{alignment}$

Implementation

- FSM:
 - States Transitions + Actions
 - Actions
 - Decisions true/false
 - Transitions Decision + False State + True state
- Pluggable machine, using ScriptableObjects in Unity



Flock



Open

Script

State

▼ Actions

Size

1

Element 0

FlockAction (FlockAction)

▼ Transitions

Size

2

▼ Element 0

Decision

FeedDecision (FoodDecision)

True State

Feed (State)

False State

RemainState (State)

▼ Element 1

Decision

FleeDecision (FleeDecision)

True State

Flee (State)

False State

RemainState (State)

Scene Gizmo Color



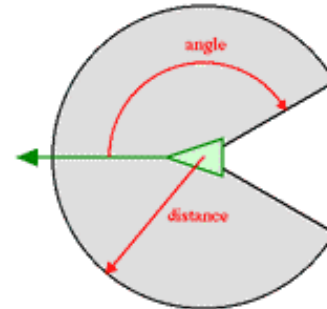
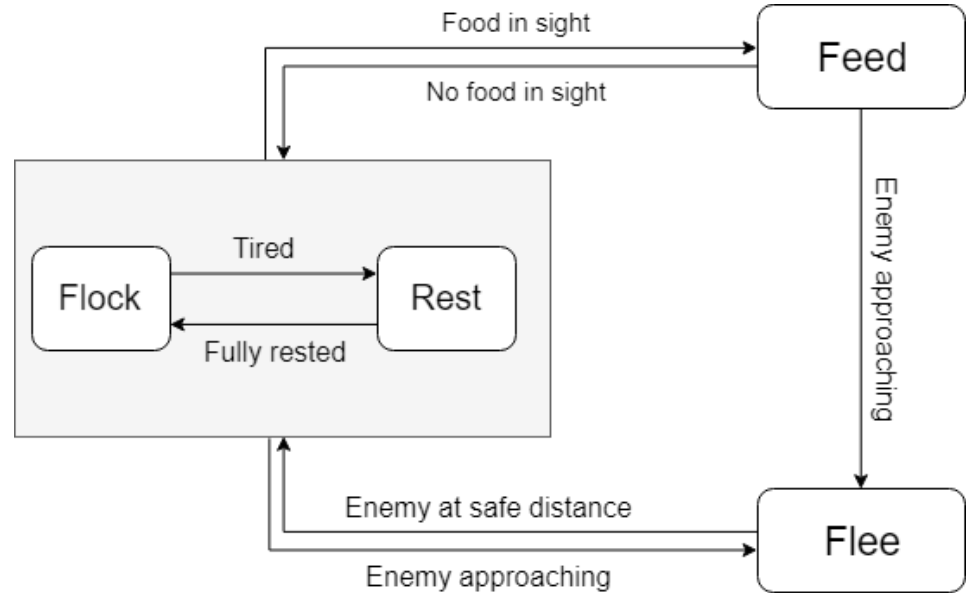
Discussion

- Why FSM?
 - Why not behaviour trees...?
 - Advantages/Disadvantages?
- Limitations?
 - Complexity of FSM can escalate quickly

Future Work

Hierarchical FSM for more complex behaviour

Make neighborhood angle dependent (cannot “see” behind itself)



Other improvements

- Pathfinding, better collision with edges
- Introduce some randomness
- FSM on Flock or Individual level?
- Learning? E.g. “How do I get the most food?”
- Game-ify!



Questions?

