Raven Notes 2

CSCI 321

Based on *Programming Game AI by Example*, Buckland

November 30, 2017

Planning

- Involves more than one step at a time.
- *Simple soccer* planning was absorbed in the logic:
  - "Move to support position"
    - not a goal in itself
    - part of an underlying plan
- *Raven* requires plans:
  - None of these is a simple action by itself:
    - Get health
    - Get weapon
    - Attack target

Hierarchical planning

- Buy sword
    - Get gold
        - Plan path to goldmine
        - Follow path
            - Follow edge #1
            - Follow edge #2
            - Follow edge #3
        - Pick up nugget
    - Go to smithy

Use an abstract class that can be either a simple or a composite goal.

Raven Goal Interface

Similar to State interface

- Activate
  - can be called more than once to replan
- Process. Returns one of
  - inactive
  - active
  - completed
  - failed
- Terminate
- HandleMessage
- AddSubgoal

Raven Goals

Composite goals	Atomic Goals
Goal_Think	Goal_Wander
Goal_GetItem	Goal_SeekToPosition
Goal_MoveToPosition	Goal_TraverseEdge
Goal_FollowPath	Goal_DodgeSideToSide
Goal_AttackTarget	
Goal_Explore	
Goal_HuntTarget	

Atomic Steering Behavior Goals

- Goal_Wander
- Goal_SeekToPosition
- Goal_TraverseEdge
  - upon activation checks for special edge behavior:
    - open door
    - swim
    - *etc.*
  - uses **seek** for most edges, **arrive** for last edge
  - monitors to check for stuck bot

Goal_FollowPath

- Iterate through edges.
- Edge type determines subgoal:
    - Goal_TraverseEdge
    - Goal_NegotiateDoor
    - Goal_Jump
    - Goal_Swim
    - *etc.*

Goal_MoveToPosition

- Activate:
  - RequestPathToTarget (sent to Path Planner)
  - SeekToPosition
- HandleMessage:
  - FollowPath (received from Path Planner)

Goal_AttackTarget

- If target gone:
    - Add subgoal: hunt target
- If target is shootable:
    - If room:
        - Add subgoal: dodge side to side
    - else:
        - Add subgoal: seek to target position
- Alternatives:
    - move to best range for best weapon
    - move to sniping position
- Weapon system is completely separate
    - constantly selects best weapon, aims, shoots
    - regardless of other goals

Goal_Think

- Top level goal
- Decides between:
    - Explore
        - pick a random point and follow path there
    - Get Health
    - Get Weapon
        - Rocket Launcher
        - Shotgun
        - Railgun
    - Attack Target
- Uses four feature functions (all scaled 0-1):
    - Health
    - Distance to item
    - Individual weapon strength
    - Total weapon strength

Calculate Desirability and Choose Best

$$\begin{aligned}
Desirability(Health) &= k\left(\frac{1 - Health}{DistToHealth}\right)\\
Desirability(Weapon) &= k\left(\frac{Health(1 - WeaponStrength)}{DistToWeapon}\right)\\
Desirability_2(Weapon) &= k\left(\frac{Health(1 - WeaponStrength)}{DistToWeapon^2}\right)\\
Desirability(Attack) &= k(TotalWeaponStrength)(Health)\\
Desirability(Explore) &= 0.05
\end{aligned}$$

Using Empathy

- You observe a player low on health break off a battle and run
- You run your Goal_Think algorithm on the player's data
- The player's best option is to find health
- You plan a path to the health to intercept the player

Personalities

- Desirability scores can be weighted.
- Conservative player weighs health and weapons heavier than attack
- Aggressive player weighs attack heavier
- In a full RTS game you could:
  - Create opponent that favors exploration and research
  - Create opponent that favors massive armies quickly
  - Create opponent that favors city defenses

State Memory

- Use a goal stack to resume interrupted goals.
- Goal FollowPath could be interrupted by DefendAgainstAttacker and then resumed.
- Goal FollowPath interrupted by NegotiateDoor and then resumed.

Command Queuing

- Used in modern RTS games
- Can click many waypoints, Bot navigates to each in turn
- Can establish patrols by making waypoints into a loop
- Can queue multiple commands of any sort:
    - Build a barracks *and then*
    - Move to this spot *and then*
    - Build a turret
- Only change needed is adding subgoals to the back of the queue instead of the front.