AI for games

Week 2

Games AI

Structure

Welcome to the module

- Book:
  - Mat Buckland. Programming game AI by example
- Other books of interest (in library):
  - AI for Game Developers
    David Bourg and Glenn Seeman
    O'Reilly

Module Structure

- Seven weeks on Game AI – David
- One week with no new material—assignment work (next slide)
- Four weeks on AI techniques that can be applied to games – Joe
- Revision

Beat my ‘bot

- A game for you to write an AI for.
- Not assessed.
- Essay that discusses this task.
- Playoffs in week 8.
- Then write a proposal for an addition to the AI.

AI and Games AI

- Traditional AI is hard to define.
- Generally four types of definition:
  - Think like a human
  - Act like a human
  - Think rationally
  - Act rationally
- The Turing test

AI and Games AI

- But Games AI and mainstream AI are not the same thing.
- Many things Game AI does is just ordinary programming.
  - But it does borrow heavily from mainstream AI.

Definition of games AI

- Game AI has an easier definition:
- AI is all the stuff the AI programmer does.
- Simple, and with a minimum of navel-gazing.

AI and Games AI

- Note two slightly different situations:
  - Direct control of a character, in much the same way as a human controls a single character. (E.g. First-person shooter, flight simulator, etc)
  - Low-level control of a character that has been given commands by a human or human-equivalent AI. (E.g. strategy games, god games)

What does the AI programmer do?

- Pathfinding
- Terrain analysis
- Decision trees
- Minimax
- Scripting
- Agents
- Behaviours

What does the AI programmer do?

- Flocking
- Crowd simulation
- Personality
- Teamwork
- Planning
- Resource management
- Artificial stupidity

What does the AI programmer do?

- Weapon selection
- Aiming (and missing)
- Target prioritisation
- Cooperation with humans
- Oddly:
  - Camera control
  - Animation control
  - Physics

What does the AI programmer do?

- Schwab “AI Game Programming” has a list of the things game AI does in various genres.
- Note the vague distinction between
  - Techniques
  - Applications

Importance of AI

- We want all games to offer something new.
- Is just a new storyline enough?
  - Probably not.
  - We want the gameplay to be new.
  - But what is gameplay?

Importance of AI

- Game play is all about the decisions that a player has to make.
- And therefore, for many games, the decisions the AI has to make.
- So if the AI programmer does not have to do anything new, this is a warning that the player might not have to.
- AI alone can make something new out of a well-used genre.

Quotes

- *“The AI of this game makes it one of the most tedious and annoying games I've played in awhile.” ["Bill" 2002 Soldiers of Anarchy Review]*
- *“The enemies rush at you, and do nothing else. In the day and age where AI’s in FPSes are taking cover, leap-frogging down hallways to advance with allies, flanking you and more, this is certainly sub-par.” [McGuire 2002 Hitman 2 Review]*

Quotes

- *“...the main problem with the artificial intelligence is that when you have, say three enemies in front of you, they should be able to work as a team to make life harder for you...”* [*Soldier of Fortune II review*]

Quotes

- *“An AI system that can win without resorting to underhanded tactics is always appreciated and not as common as most people think. Stardock's AI programmers deserve a big pat on the back for this one.”* [*Galactic Civilisations II review*]

- *“I was genuinely impressed with the AI in Undying. … This approach to different styles of combat makes it feel like you're actually fighting a variety of different creatures rather than just the same AI wrapped in a different skin.” [Clive Barkers Undying review]*

What are the open problems?

- Realism
- Personality
- “Human-level AI”
- Reduced cheating
- Planning
- Prediction
- Teamwork
- Cooperation
- Adaptation

Be careful

- Gamers often claim to want features that never actually sell.
  - E.g. open-ended gameplay
- A learning AI is a possible example.
  - Do players really want a program that they can never master?

Golden age of AI?

- [Woodcock 2000 *Game AI: The State of the Industry*] reported that in 2000, developers were devoting around 25% of CPU time to AI.
- Probably more, now.
  - Plus CPU power increasing rapidly.
  - Plus CPU has less to do (graphics cards do more).

Golden age of game AI?

- …… still waiting.
- Why?

Golden age of game AI?

- …… still waiting.
- Why?
  - Tried and tested methods work, but can't do anything radically new.
  - Takes a LOT of extra code to make small improvements.
  - The extra code is not reusable.
    - Why?

Golden age of game AI?

- What about new techniques, like neural networks, fuzzy logic, etc?
  - Sure, and why not put a small, green pixie in every computer?
- Basically, these techniques are not up to anything real yet.
  - Except as a selling point.
  - But only if the standard AI can do their job for them.

Golden age of game AI?

- Some good news:
  - Newer consoles have more processing muscle for non-graphics stuff. (Hmmm.)
  - Lots of books, articles and discussions about game AI.
    - But mostly just bring the weak-end AI up to scratch.

Golden age of game AI?

- One important driver/inhibitor:
  - Multiplayer gaming.
  - People now can see the fun of facing a real, crafty opponent.
- But…
  - Why play offline?

A “typical” AI structure

- Hahahahaha!
- To make things a bit easier, we will work with the concept of a first-person shooter.
- What does the AI have to do?

Behaviours

- This is the low-level stuff
  - Move, turn, aim.
  - Much the same as the button-presses of a human player.
- Then more complex behaviours, like follow, lead pursuit, lag pursuit, rendezvous, run through, stop at.
- Note that higher level will use lower level.

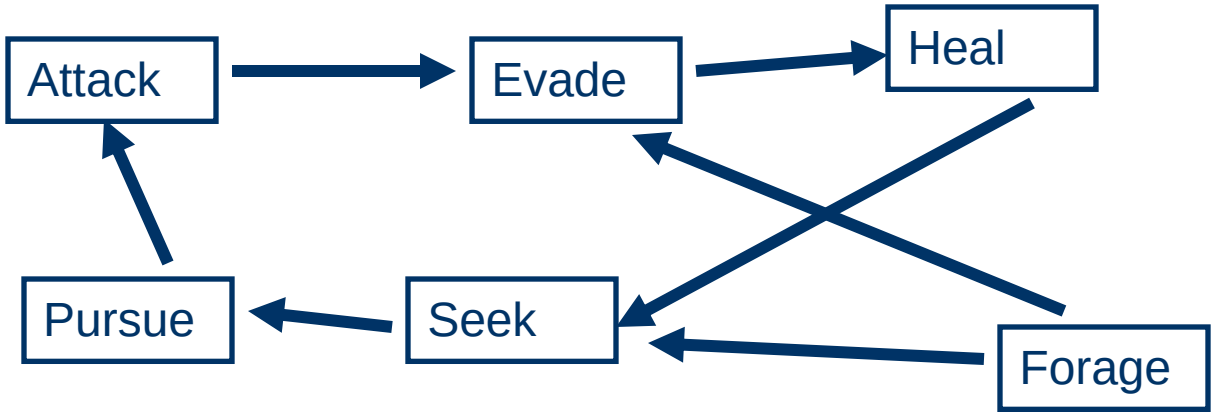
Pathfinding

- Finding path from A to B.
- A is “here”.
- B is weapon, enemy, strategic point.

- Coupled with terrain analysis.
  - Where is a good place to be?

Finite State Machine

- What is my current priority?
  - Attack, run away, hide, get weapon, etc.
  - Personality



Weapon selection

- Miniature “expert system”, or just a load of IF statements.
- Elements of “personality”.

Tactical reasoning

- Direct attack?
- Outflank?
- Teamwork?
- Prioritise opponent?
  - Closely related to weapon selection and the FSM. (Which direction is the dependency?)
  - Expert system.

Aiming

- Not really traditional AI.
- Deliberate stupidity.

Putting it together

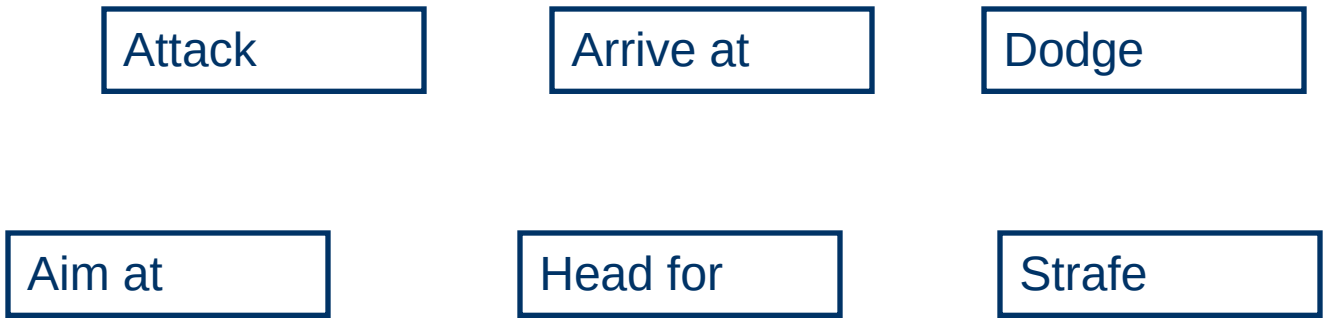
- The techniques are pretty well-known, but arranging them varies a lot.
- We are going to go for a pretty general-purpose approach.
  - But dedicated for a particular game.

Structure

- Start with simple behaviours.

Structure

- Build on these to make more complex behaviours.

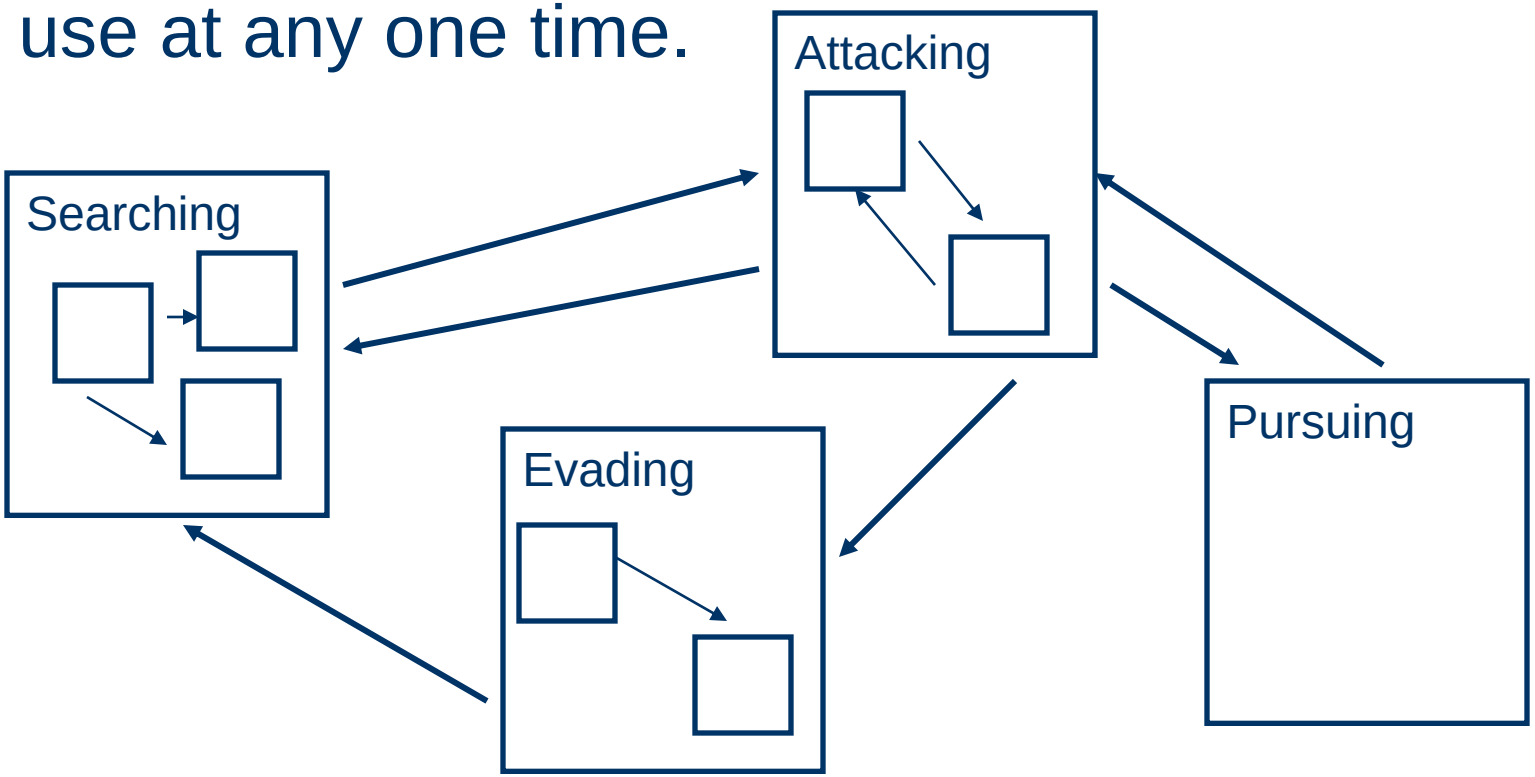


Structure

- Add some pathfinding

Structure

- Build an FSM to decide what behaviour to use at any one time.



Structure

- Enhance the FSM
  - Planning.
  - More subtle states and substates.
  - Tinker the parameters.
  - Add terrain reasoning.
  - Add anticipation.

Interface with GOB

- Go for a model-view-controller approach.
- The AI is a controller.
  - But sometimes has input to the view.
- Can be interchanged with a HCI controller.
  - But some elements cheat.
  - E.g. aiming.

Summary

- AI and games AI are not quite the same thing.
- AI programmer does many bitty things.
- AI is important, and we could have a golden age of game AI, but it's not happening.
- Typical structure:
  - Behaviours
  - Pathfinding
  - FSM
  - Enhancements