Game AI Programming (IS53049A)
Coursework 2: Game AI Tech Demo

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Deadline: 4pm, Friday 20th January 2017

In this coursework you will explore an area of game AI in greater depth by designing and implementing your own AI tech demo system in Unity and C#. This should consist of a Unity scene which demonstrates the use of one or more game AI techniques relevant to agent movement and behaviour or content generation. It should go significantly beyond the implementation covered in the lab exercises. You may build on your AI framework from the labs or start completely afresh. You need to provide **written and video documentation** of your demo (see submission details).

Importantly:

- Your scene needs to **demonstrate your work** when you press play. It should contain content which utilises the underlying techniques, i.e. agents that take actions, or display generated content.
- Your implementation should **not be too specific** to this scene, so that one could reuse your code in a similar but distinct context, i.e. to control a similar agent or generate similar content.
- Technique(s) can be taken from the **game AI literature** (see sources below) and do not have to be novel.
- The implementation should **be your own**. Declare any third party code/libraries you used in source code comments AND your written submission.

Scope

It is important that you scope your submission appropriately. You should implement at least one game AI technique that is distinct from those covered in the labs. To gain a pass, this could be a simple demo of a single technique. An excellent demo will fulfil at least one of the following criteria: combine two techniques, implement refinements beyond the basic technique, demonstrate a technique exceptionally well.

However, you are only expected to demonstrate one or two techniques, and you should **not** attempt to developing a complete game or an AI code library.

Some example topics are listed below. To ensure an appropriate scope, you should discuss your plans for your submission with the module leader in the lab sessions BEFORE the end of autumn term.

Submission

Please submit via learn.gold a text file containing a URL for a online git repository, e.g. hosted on the department gitlab. This can be the same repository you submitted for coursework 1. The repository should contain:

- The source code for your tech demo.
- A README.md file providing documentation for the demo, comprising:
  - Written documentation (approx. 1000 words), giving specific details of the techniques used, what the demo does, and how to use it.
  - Video documentation, in the form of a link to an online video (at least 1 minute) that demonstrates the demo's typical range of behaviour. The video can be hosted publicly (e.g. YouTube, Vimeo) or on private webspace (e.g. Dropbox).

Example Topics

The following topics would make suitable tech demos. This list is **not exhaustive** and you are encourage to read the lecture notes and other sources for inspiration, and to follow your own interests!

- Generation of a waypoint network from a scene.
- Pathfinding with predefined navmeshes (**not** Unity's built in system)
- Grid-based pathfinding using jump-point search.
- Pathfinding with a known variation on A*.
- Steering behaviours.
- Other reactive movement techniques, e.g. velocity obstacles, context behaviours.
- Simple behaviour trees.
- Simple hierarchical FSMs (advanced).
- A 2D dungeon generator, using tiles or partitioning.
- A cellular automata based level generator.
- A landscape generator, using a Perlin-noise heightmap with some simple terrain types/features.
- A evolutionary PCG system (advanced).

Reusing AI systems built-in to Unity or from the Unity asset store is acceptable, providing the focus of your demo is **another distinct AI technique**.

Assessment Criteria

Technical implementation (30%). The use of appropriate programming techniques to realise your AI tech demo. The submitted Unity project should run. Source code should be appropriately structured and commented.

Understanding of game AI (40%). The implemented techniques should be non-trivial and demonstrate some understanding of concepts/theory relevant to game AI. Marks will be gained for technical complexity of the AI, generality of the implemented techniques, and appropriateness for use in game development.

Behaviour & performance (20%). The actual behaviour demonstrated by your submission (either agent behaviour or content) will be assessed in terms of efficiency, complexity, diversity, and potential interest to players or designers.

Presentation (10%). The standard of presentation of your work, in the written and video documentation.

An excellent demo will fulfil at least one of the following criteria: combine two approaches, implement refinements beyond the basic technique, demonstrate a technique exceptionally well.

Sources

- AiGameDev.com free features, **aigamedev.com**
- Buckland, Programming Game AI by Example, Worldware, 2005.
- Millington & Funge, Artificial Intelligence for Games (2nd edition), Morgan Kaufmann 2009.
- Rabin (ed.), Game AI Pro, 2013.
- Rabin (ed.), AI Wisdom series.
- Red Blob Games, **www.redblobgames.com**
- Togelius et al., Procedural Content Generation in Games, **pcgbook.com**