**Level 5: AI Game Programming**

Labs 1 What is the best algorithm?

RECORD ALL THAT YOU DO IN YOUR LAB LOGBOOK (HARDCOPY ‘OR’ WORD FILE).

*NB: The tasks in this lab are similar to some of the tasks in your assignment, of course, the topics will be different. Therefore, it is a good idea to practice your skills before doing the real assignment.*

**Task 1: AI in games**

AI is everywhere. Conduct a literature survey to determine how different AI techniques can be used in games.

**Task 2: Which methods?**

As you know, the best code means nothing if a wrong algorithm/method is implemented. Therefore, before we move to actually write any code, there are some exercises to be done.

Imagine you have a new job in an advanced games company developing a state-of-the-art intelligent game in which non-player characters (NPCs) have *learning* and *emergent* behaviours.

Your team leader thinks highly of you as a programmer who already did the AI Game Programming unit at Bournemouth University. Therefore, he asks you to lead a group of coders to develop a piece of software to be integrated into the main game. The software will create learning and emergent behaviours for the NPCs.

As this is a state-of-the-art game, you are told that it needs state-of-the-art nondeterministic methods, for example, ANNs, and genetic algorithms, generative AI, to generate such behaviours. That means you need to conduct a literature survey to find out what are the best methods/algorithms to be used in the game.

You task at this stage is to:

* Conduct a literature survey (e.g. IEEE or ACM publications or other respectable sources) to find out what are the existing methods.
* Pick one method and determine the advantages and disadvantages of the method.
* Note that you ‘don’t’ need to understand all the details in the paper or mathematical details at this stage. You only need to find out only the information you need to make the decision.

**Advice on literature survey**

**Step 1: Define Your Scope**

* **Understand Your Task:** You're exploring AI methods suitable for generating learning and emergent behaviours in NPCs. This means focusing on techniques that allow NPCs to adapt to situations, learn from experience, and exhibit unpredictable actions.
* **Keywords:** Compile a list of relevant keywords to guide your search. Examples:
  + "Artificial intelligence in games"
  + "Non-deterministic AI methods"
  + "Emergent behaviour in games"
  + "Learning AI agents"
  + "Genetic algorithms for game AI"
  + "Neural networks in game development"

**Step 2: Select Your Sources**

* **Reputable Sources:** Stick to academic databases and journals known for their quality and reliability. Some excellent starting points include:
  + IEEE Xplore
  + ACM Digital Library
  + ScienceDirect
  + Google Scholar (You can search all above databases plus others)
* **Game AI Publications:** Consider journals and conferences specifically dedicated to game AI research.
* **Websites:** Make sure that the sites you use are reliable and contains correct information.

**Step 3: Conduct Your Search**

* **Database Queries:** Use your keywords to craft effective search queries in your chosen databases. Experiment with different combinations and Boolean operators (AND, OR, NOT) to refine your results.
* **Example:** ("genetic algorithms" OR "neural networks") AND ("emergent behaviours" OR "learning") AND ("game AI" OR "game development")

**Step 4: Evaluate and Select Papers**

* **Relevance:** Carefully read the abstracts and introductions of the search results to determine their relevance to your task.
* **Quality:** Prioritise papers published in reputable journals or conferences. Look for citations and the authors' affiliations to gauge the research's quality.
* **Recency:** Focus on recent publications to ensure you're exploring the latest advancements in the field.
* **Example:** A paper titled "Deep Reinforcement Learning for Character Control in Action Games" published in the *IEEE Transactions on Games* is likely relevant.

**Step 5: Analyse and Document**

* **Method Focus:** Once you've selected a few promising papers, read deeper into your chosen method. Understand its core principles, applications in games, and potential challenges.
* **Advantages and Disadvantages:** Identify the strengths and weaknesses of your chosen method. Consider factors like computational cost, complexity, and suitability for different game genres.
* **Documentation:** Keep detailed notes on your findings.
* **Example: Genetic Algorithms**
* **Advantages:** Can discover creative solutions, adaptable to dynamic environments, good for evolving NPC behaviours.
* **Disadvantages:** Can be computationally expensive, may require significant tuning, and results can be unpredictable.

**Remember:**

* You don't need to understand every intricate detail of the research papers. Focus on grasping the core concepts and their potential applications in game AI.
* The goal is to demonstrate your ability to conduct a literature survey, critically evaluate research, and make informed decisions about AI methods for game development.

Now, go and explore the fascinating world of AI research!