Task 3 – Design and Implement a State Machine for an NPC

Task 4 – Design and Implement a Decision Tree for an NPC

Task 5 – Write an A.I. Game Strategy Report

Behaviour trees are a popular AI technique used in many games to model the behaviour of NPC characters. Halo 2 was one of the first mainstream game to use behaviour trees and they started to become more popular after a detailed description of how they were used in Halo 2 was released. Ultimately, it is a tree of predefined node types aimed to represent how “something” behaves. Each node returns either Success, Failure or Running. One of their main advantages is that they are easy to understand and can be created using a visual editor.

* **Composites,** which are branch nodes that contain child behaviours. Composite Behaviours are nodes that contain one or more children and dictate how they are run and when to stop. Two common types of composites are a selector and sequence. A **Selector** is a node that returns success if one of its child nodes returns success without executing its remaining child behaviours. If a child returns failure, then it executes the next child behaviour. If all child behaviours return failure, then the selector returns failure. Acts as an ‘OR’. A **Sequence** is a node that returns success if all its child nodes return success. If a child returned failure, then it would return failure and not execute the remaining child behaviours. All child behaviours must be a success for the sequence to return success. Acts as an ‘AND’.
* **Actions,** which are Leaf nodes in the tree. An Action behaviour is a behaviour that “does” something (e.g. move forward or perform this animation), generally always return success.
* **Conditions,** which are also Leaf nodes in the tree. A Condition Behaviour is a behaviour that “asks” something (e.g. is health empty or can see enemy), returns success or failure.

https://opsive.com/support/documentation/behavior-designer/what-is-a-behavior-tree/

https://www.gamedeveloper.com/programming/behavior-trees-for-ai-how-they-work

<https://blog.zhaytam.com/2020/01/07/behavior-trees-introduction/>

https://en.wikipedia.org/wiki/Behavior\_tree\_(artificial\_intelligence,\_robotics\_and\_control)