For the decision-making part of this assessment, the AI makes use of a finite state machine in order to decide which pickup the car should go towards. Above all else, fuel is incredibly important, run out and the AI becomes incredibly slow, and it becomes more difficult to reach any more passengers. Therefore, if the AI is about to run out of fuel, the car will prioritise getting more fuel above anything else. If the AI has sufficient fuel, it then decides if it should go towards the speed boost or the passenger. This is based off a calculation, which describes the length between the car and each pickup. The AI then compares these lengths and goes towards whichever is closest.

The advantages of this state machine are that the AI is very unlikely to run out of fuel as it will always prioritise picking up fuel when it is running out. Furthermore, by choosing to pick up a passenger or speed boost if its close enough and it has enough fuel means that the AI appears to be logically realistic. The disadvantages are that if the fuel spawns far away from the AI, the AI will end up just picking up fuel repeatedly for a long period of time. In addition to this if the speed boost keeps spawning near the AI, there is a chance the AI will never pickup a passenger and vice versa.

If I were to improve this AI, I would use a behaviour tree instead of a finite state machine. Behaviour trees allow for more complex decision making as they allow for use of sequences and selectors, which are nodes that check if multiple conditions are true or false. If one node in a sequence is false, the whole sequence returns false and if a condition in the selector returns true, the whole selector returns true. I would implement a sequence node for choosing between the speed boost and passenger pickups, which would allow the AI to check against multiple conditions and create more complex decision making.

The conditions the AI could check could be if the current speed is under/over an amount, how many passengers has the AI picked up so far as well as the currently implemented distance check. As well as this, I would implement a selector to check if the AI should pick up fuel, with conditions such as how much fuel does the AI currently have, how close is the fuel and how far away is the passenger and speed boost. I would use a sequence for passengers and speed boosts and a selector for fuel as it’s important that if any of the conditions for needing fuel are true, that the AI goes towards fuel. Whereas with passengers and speed boosts, if the sequence returns false, the AI will just go towards the other pickup.

Diagram, schematic

Description automatically generated