The A* algorithm in video games

Introduction

The A* algorithm (A star) is one of the most widely used methods in the video game industry for finding optimal paths in obstacle scenarios. It is an improvement over algorithms like Dijkstra and seeks efficiency by combining the best of uniform cost search and heuristic search.

How does A* work?

A* is based on exploring the nodes of a map, determining the shortest path from a starting point to a destination. To do this, evaluate each node with the function:

$f(n)=g(n)+h(n)f(n) = g(n) + h(n)$

Where:

g(n): Represents the actual cost of the path from the start to the current node.

h(n): It is a heuristic estimate of the remaining cost to the destination.

f(n): This is the sum of both values and determines the priority with which each node will be processed.

Application in Video Games

A* is mainly used in the artificial intelligence of NPCs (non-playable characters) to find the best route without colliding with obstacles. Its application is key in strategy, role-playing and adventure games where characters must move efficiently in complex environments.

Advantages and Disadvantages

Advantages:

It finds the shortest path optimally if the heuristics are well defined.

It adapts well to maps with complex structures and multiple obstacles.

It can be modified to suit different needs, such as avoiding enemies or preferring certain terrains.

Disadvantages:

On very large maps, it can become expensive in terms of memory and processing.

Its performance depends largely on the heuristics used.

Conclusion

The A* algorithm is a powerful tool for finding paths in video games, providing efficient solutions in most cases. Its ability to balance accuracy and speed makes it the preferred choice in most modern video game engines.