Development of an autonomous agent for the game
DIG DUG ™

Report

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Developed Source Code

📁 **student.py**

Establishes connection between the agent and the server, initializes the Search Problem and the Search Tree
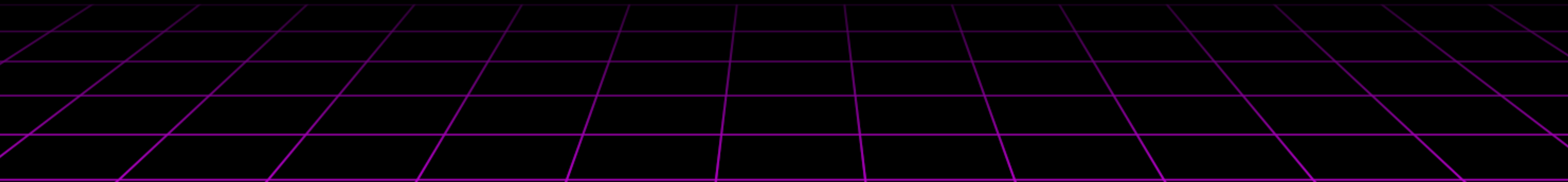
📁 **moveDigDug.py**

Represents the main logic behind the agent's actions and pathfinding (heuristic calculation, conditions to avoid collisions - with enemies, fire or rocks - find and chase the closest enemy)
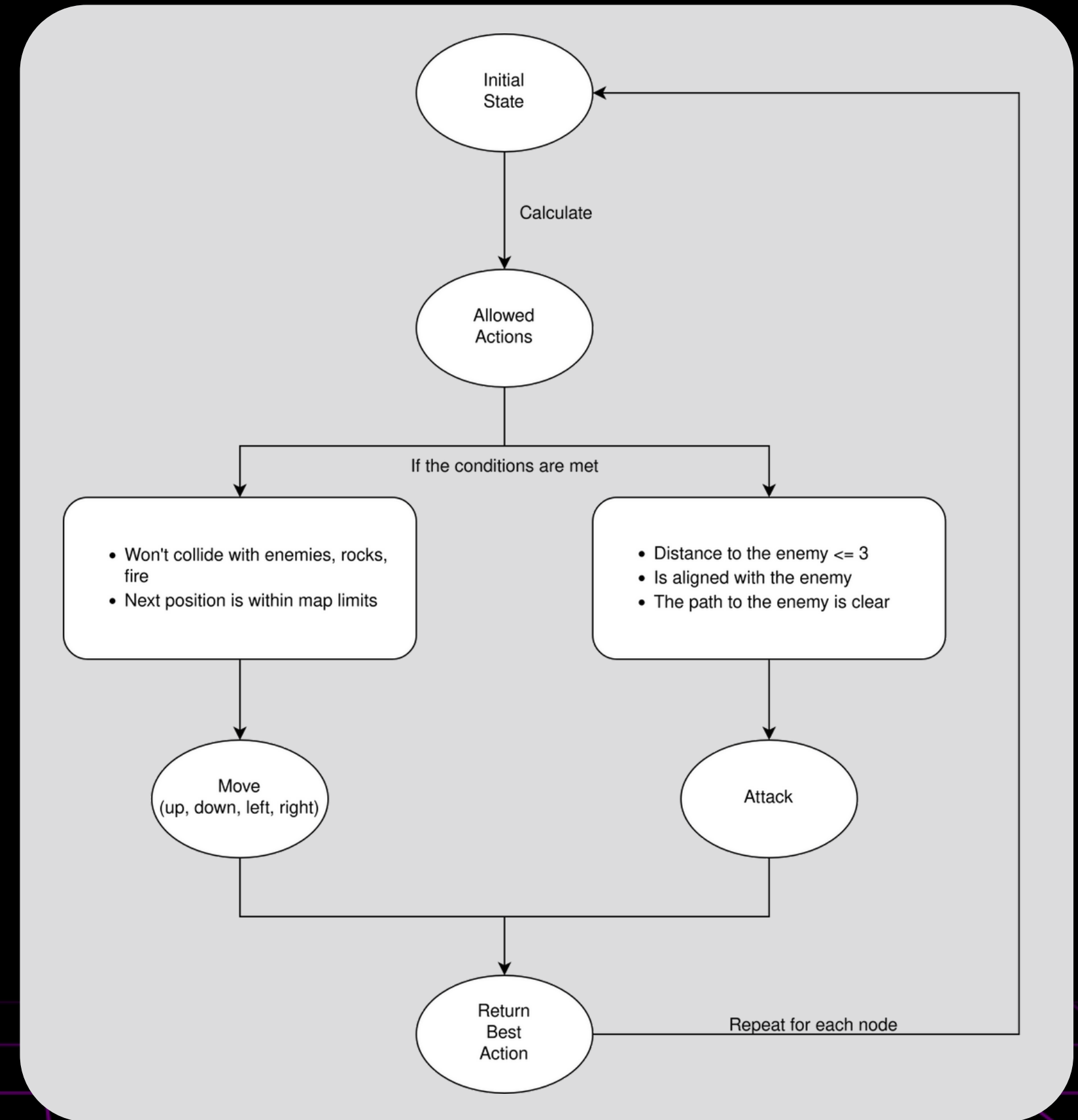
📁 **tree_search.py**

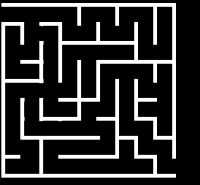Is responsible of searching and obtaining the best path

Algorithm

The diagram illustrates a streamlined rendition of the algorithm employed to determine the optimal action for a given state.

This procedure is executed for each expanded node within the search tree.

Pathfinding

While bypassing traditional pathfinding algorithms, the agent dynamically maneuvers through the map. The decision-making process can be succinctly summarized as follows:

- <u>Objective:</u> pursuit the closest enemy while considering obstacles and other specific conditions
- <u>Heuristic-Based Approach</u>: a heuristic function that primarily calculates the distance to the closest enemy to estimate the cost of reaching the goal
- <u>Action Generation</u>: the agent generates a set of possible actions based on its current state, including moving and shooting
- <u>Goal Satisfaction</u>: the agent evaluates if its current state satisfies the goal condition, which involves being close to the enemy and aligned with it, while selecting an action that maximizes the heuristic value
- <u>Decision-Making</u>: the agent selects the action that maximizes the heuristic value, aiming to move closer to the closest enemy, considering conditions like shooting or avoiding deadends

Enemies

There are two distinct enemy types, Pookas and Fygars, each one exhibiting unique characteristics, necessitating varied approaches when engaging with them.

Pooka

When dealing with the nearest Pooka in traverse mode, the algorithm calculates the Euclidean distance to it and avoids moving to positions within a radius of 1 around the Pooka.

Fygar

For Fygars, the primary concern lies in the fire they emit. In this scenario, the direction in which the enemy is facing assists in identifying the next three cells that could potentially be targeted by its attack, allowing Dig Dug to strategically avoid them.

Observations

One of the significant challenges we encountered was the adaptation of Digdug to contend with more intelligent adversaries who actively maneuver to approach Digdug.
Another issue we faced concerning Fygar enemies pertained to the unpredictability of their fire locations, mainly for lack of thorough testing of specific cases.

Contributions:
Afonso Leal - 40 %
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