Ex1 - TankGame

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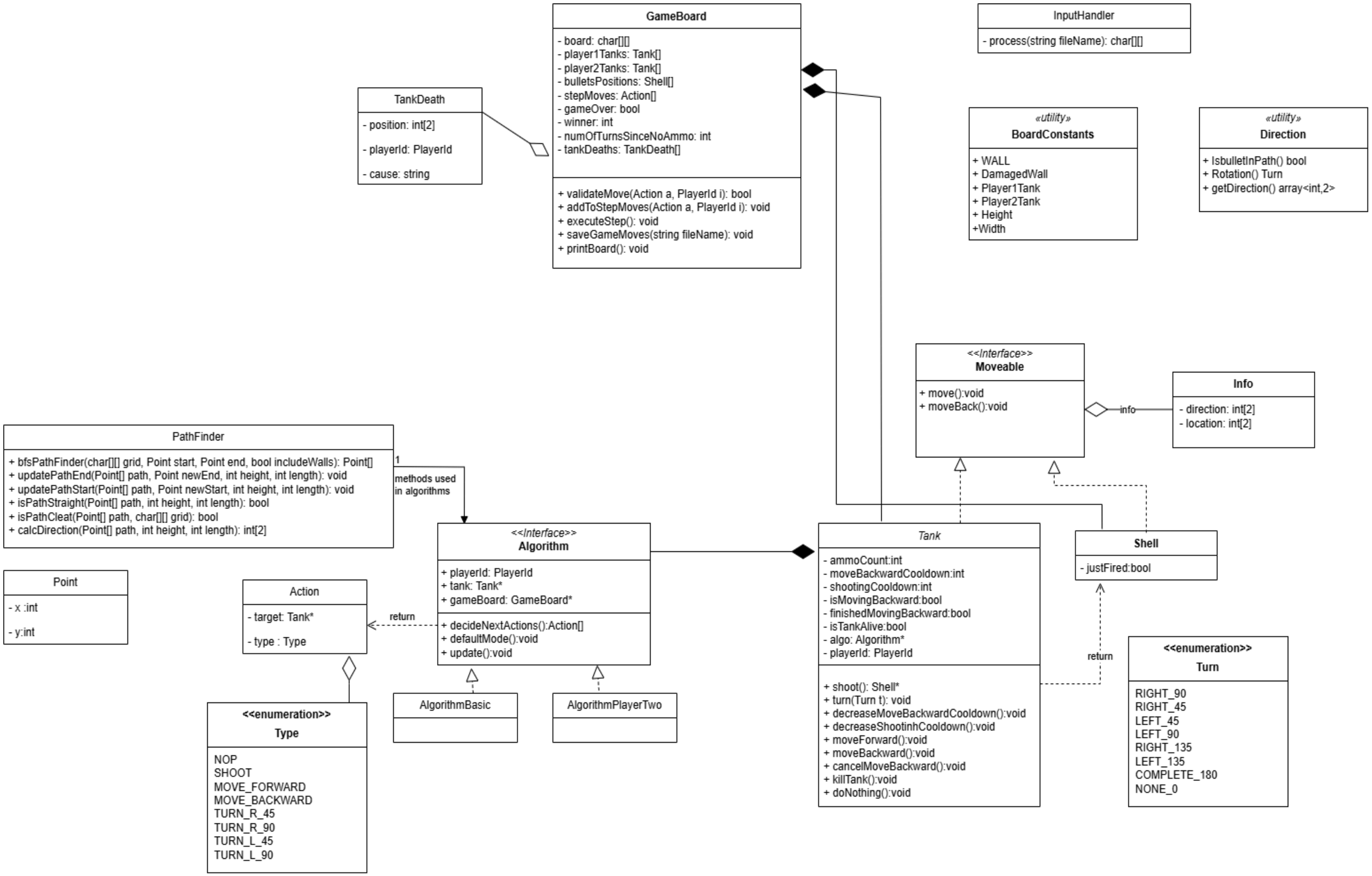
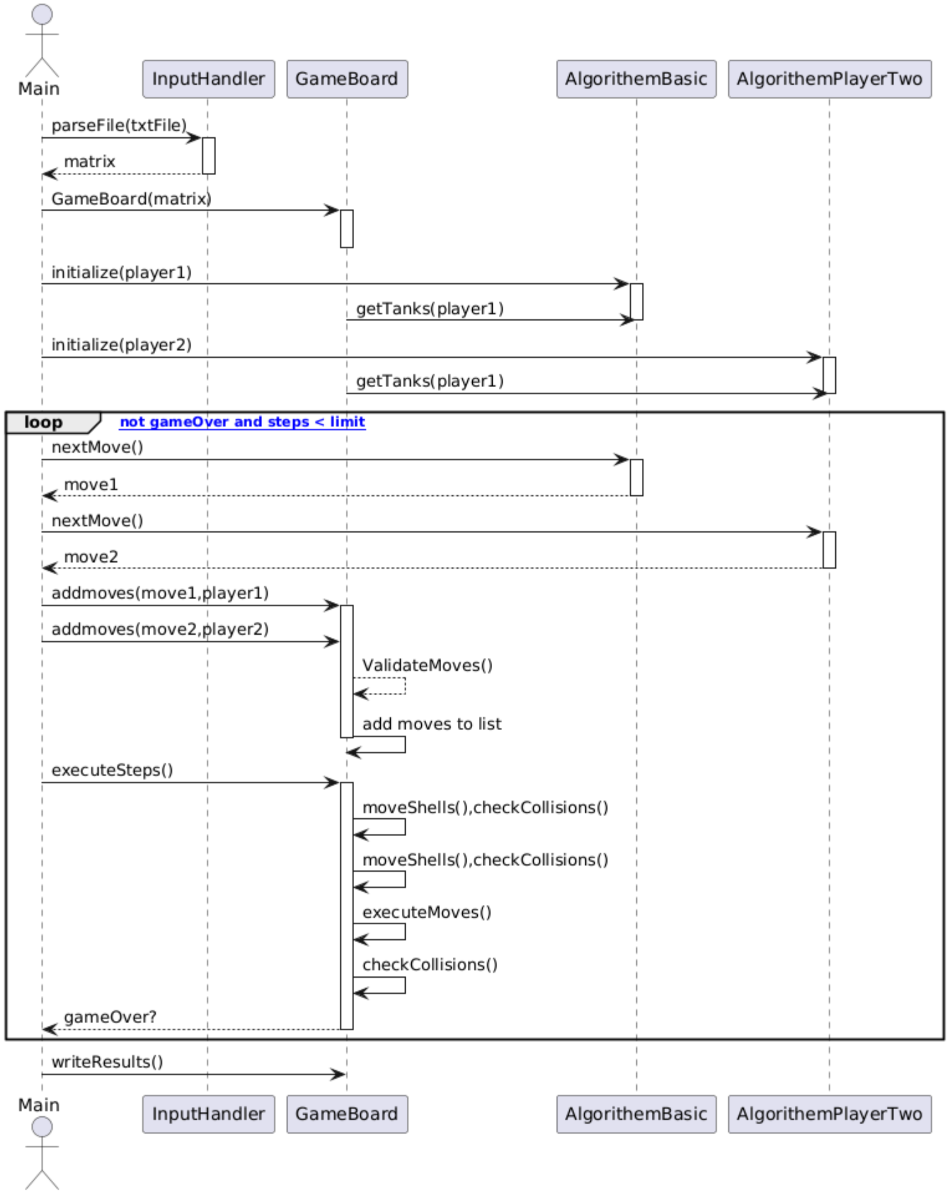
1. Class Diagram:



2. High Level design:



3. Main loop explanation:
    a. Our main function only runs the main loop with no other logic implemented there.
    b. During start up with initialization we get the matrix from InputHandler. This class handles the loading.
    c. We pass the matrix and initialize the GameBoard.
    d. After this we initialize each algorithm and assign it a player, the algorithm pulls the player tanks from the GameBoard.
    e. Each turn the main asks each algorithm for his next and passes them to the GameBoard
    f. The GameBoard validates the moves and adds only valid steps.
    g. The main loop then asks the GameBoard to perform the step.
    h. The GameBoard moves the shells 2 times, after each time checks for collisions, and later performs the moves.
    i. We repeat the loop until the game is over or a step limit is reached.
    j. At the end we output the moves, the tank deaths and the winner to a txt file.
4. A few sidenotes:
    a. We handle collisions by setting up special characters in the GameBoard.
    b. All the special characters and normal are stored in BoardConstants.h
    c. Our GameBoard later loops through the board and handles each collision by its case.
    d. We could have handled each collision right as they go but this will make handling complex collisions harder.
    e. The only collision we handle as they go are “step overs” , a case where 2 game characters (shells or tanks) will move in the opposite direction and are next to each other and will hop over each other.
5. Class organization:
    a. We created a utility class called direction to help the algorithms with rotation and bullet paths.
    b. We created a class MoveAble that tanks and shells inherit from that handles the move logic to keep it in a single place.
    c. We focused on giving each class a unique purpose and direction:
        1) The GameBoard - handles all the game logic, from moving the pieces to handling collisions.
        2) The algorithms - We have 2 each implementing an interface called algorithm that handles how our main loop interacts with them
        3) The tank - Handles shooting, performing back moves and state (alive or dead).
        4) The shell - a small class to indicate a shell.
        5) InputHandler - handler the gameBoard loading.

6. Alternatives:

a. We could have added a new class Called GameEngine that will handle the loop, and the main function will only initialize the file

7. The Algorithms:
    a. AlgorithemPlayerTwo:
        1) Find the shortest clear path to the enemy tank without destroying any walls.
        2) If none exists, find the shortest path that does require breaking walls.
        3) After each move by either tank, recompute the chosen path.
        4) If a straight line (with or without walls) opens between you and the enemy, rotate to face them and fire.
        5) When an incoming shell along your current heading is ≤ 3 steps away, attempt to dodge by:
            a) Stepping forward if it removes you from its trajectory, or
            b) Rotating to a safe angle and then stepping forward.
        6) If no path exists at all (even with wall destruction), enter panic mode: fire continuously to empty your magazine and end the game as quickly as possible.
    b. The Basic:
        1) Will try to run away if in danger
        2) Shoot if in site of an enemy
        3) Turn to be able to shoot if possible
        4) Move along the x axis closer to the enemy else.

8. Our testing methodology:
    a. Automatic testing - we created a few unit testing for special cases to check the game board performs as expected, they each give it a board and a set of moves for each player and them and see what will happen.
    b. We basically let a tank move by how we wanted it to move and so it will die and then we compare why,how it died and the winner to the expected .
    c. Running examples- We wrote and tested examples to check how the algorithm works, and looked at what he does at each step.