Design Overview for Commander Chess – Cờ Tư Lệnh

Name: **Nguyễn Đức Mạnh**
Student ID: 105547489 – SWH02701

Summary of Program

My program is a chess-like game called "Cờ Tư Lệnh" or Commander Chess. I choose this game because it implements well the concepts and ideas of Object-Oriented Programming.

Another aspect is that this is a chess game made by Vietnamese – writer Nguyen Quy Hai. This game simulates mordern war and how our past soldiers fought at the warzone. Therefore, the game's rules are much more complicated than the original Chess so it will be more challenging.

I expect my game to be played by 2 players (no AI or Bot yet) and take turns.

Required Roles

Describe each of the classes, interfaces, and any enumerations you will create. Use a different table to describe each role you will have, using the following table templates.

GamePieces <<Abstract>>

Responsibility	Type Details	Notes
Assign name for piece	PieceName Name {get;} <<abstract>>	Assign name for each piece in board's initialization
Assign color for piece	Player Side {get;} <<abstract>>	Assign which side does the piece belong to
Assign piece's point	Int Point {get;} <<abstract>>	The lose/win rule does need points to be tracked
Check if the piece has moved yet	Bool HasMovedYet {get; set;} <<abstract>>	Some move required piece to not move before
Get all possible move in that turn	IEnumerable<Move> GetMoves (Position from, Board board, Direction direction) <<abstract>>	Use this to check the possible or illegal move later on
Check the possible moves	IEnumerable<Position> MoveInDirectionsLimited(Position from, Board board, int maxSteps, params Direction[] directions)	The maximum steps do affect the possible move. Just move here, NOT CAPTURE

PieceName -> GamePieces

Value	Notes

Commander	Tư lệnh – 100 point
Infantry	Bộ binh – 10 point
Tank	Xe tăng – 20 point
Militia	Dân quân – 10 point
Engineer	Công binh – 10 point
Artillery	Pháo binh – 30 point
AAG	Cao xạ - 10 point
AAM	Tên lửa phòng không – 20 point
AF	Máy bay – 40 point
Navy	Hải quân – 80 point
HQ	Sở chỉ huy – 10 point

Player

Responsibility	Type Details	Notes
Determine the Opponent	Player Opponent(this Player player)	If player is Red => return Blue and so on

Player Enum

Value	Notes
None	
Blue	
Red	

Board

Responsibility	Type Details	Notes
Initialize the board to WPF	Board Initialize(): static	If player is Red => return Blue and so on
Put the piece to board	GamePieces this[int row, int column]	Use to initialize pieces
Put the piece using Position	GamePieces this[Position pos]	Set using Position objects
Check if piece is inside the board	Bool InsideBoard(Position pos): static	
Check if that position is empty	Bool EmptyPosition(Position pos)	
Set piece's coordination	Void InitializePieces()	
Create 2D array to place pieces	readonly GamePieces[,] pieces = new GamePieces[12, 11]	

Position

Responsibility	Type Details	Notes

Check if that position is in "Ocean"	Bool OceanPosition(int row, int column)	Some pieces' moves don't allow to be on Ocean
Compare values and not instances	Bool Equals(object obj) => obj: bool	
using Position in hash collections	Int GetHashCode(): bool	
Get Row value	Int Row {get;}	
Get Column value	Int Column {get;}	
Return if 2 pieces have the same position	Bool operator ==(Position left, Position right)	
Ensure consistency with the above method	Bool operator !=(Position left, Position right)	
Use in Direction calculation	Position operator +(Position p, Direction d)	

GameTurn

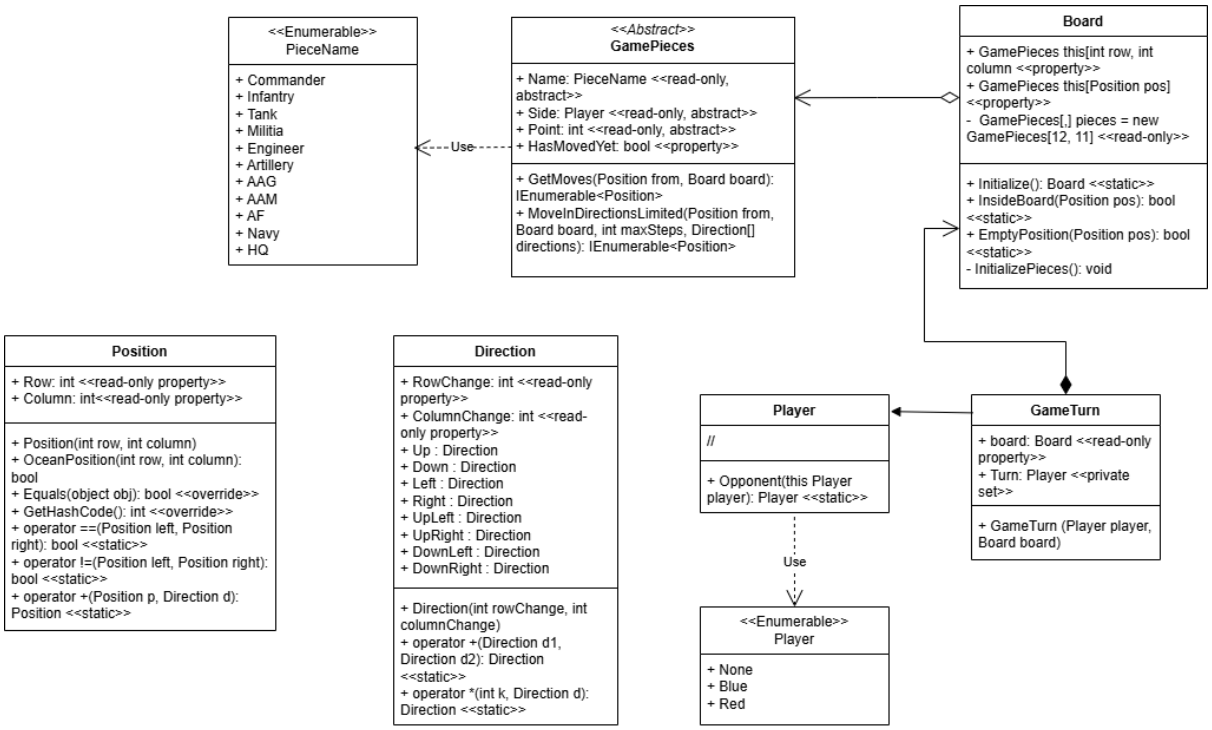
Responsibility	Type Details	Notes
Get board after initialized	Board board {get;}	
Control the turn of the game	Player Turn {get; private set;}	Other classes could read and get the value but only the GameTurn class can set this property

Direction

Responsibility	Type Details	Notes
Piece moves forward	Direction Up = new Direction(1, 0)	
Piece moves backward	Direction Down = new Direction(-1, 0)	
Piece moves left	Direction Left = new Direction(0, -1)	
Piece moves right	Direction Right = new Direction(0, 1)	
Piece moves northwest	Direction UpLeft = new Direction(1, -1)	
Piece moves northeast	Direction UpRight = new Direction(-1, 1)	
Piece moves southwest	Direction DownLeft = new Direction(-1, -1)	
Piece moves southeast	Direction DownRight = new Direction(1, 1)	

Detect row's value changed	Int RowChange {get;}	
Detect column's value changed	Int ColumnChange {get;}	
Move 1 position at a time	Direction operator +(Direction d1, Direction d2)	
Move more than 2 positions	Direction operator *(int k, Direction d)	For sliding pieces (like Tank)

Class Diagram



Sequence Diagram

Provide a sequence diagram showing how your proposed classes will interact to achieve a specific piece of functionality in your program.

HD Design Patterns

Here are 4 initial design patterns that I will use in my program:
1. Command Pattern: Encapsulate each move into an object.
2. Memento Pattern: Save and restore the board => allows players to redo their moves if needed.
3. Observer Pattern: Notify when game state changes.

4. Factory Method Pattern: To create pieces by grouping them with their side (blue or red) instead of hardcoding.

HD Additional/complex features

- First of all I think the rules and how the pieces move in the Commander Chess are already challenging because of its complexity and strategies. So to implement all of them and make them works together is quite hard.
- Secondly, I use mentioned design patterns to implement important features of a chess-like game (redo moves,…) to make my program run smoothly.