Design Snakes and Ladders

Snakes and ladders is an ancient Indian board game that's regarded today as a worldwide classic. It requires two or more players and takes place on a board with numbered, gridded squares. Throughout the board, there are snakes and ladders which connect different squares. Players roll a die and navigate the board. Landing on a ladder advances a player to a square further up the board, while landing on a snake means they have to go back to a previous square.

The aim of the game is to reach the final square.

Problem requirements

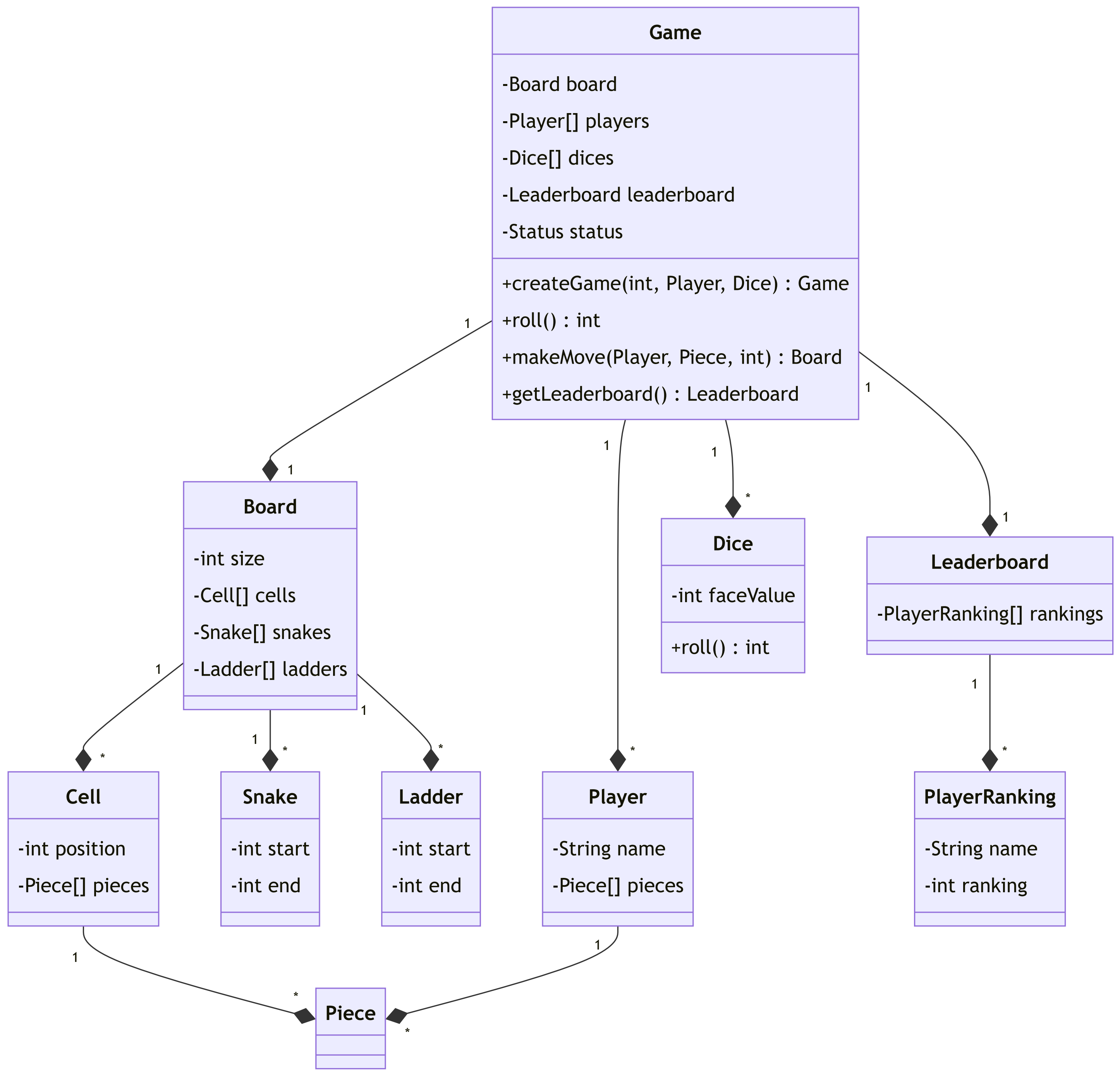
- A game can be between multiple players.
- A game will only have human players
- Each player can have multiple pieces
- A board can be of any varying size decided by the client
- A board will different types of cells

- There can be a normal cell and cells with snakes and ladders
- Position of snakes and ladders is random and decided at the start of the game
- The number of snakes and ladders is random and also decided at the start of the game
- The size of snakes and ladders is also random and decided at the start of the game
- A player will move on the basis of a dice
- A player will enter the game only if they get a 1 or maximum face value of the dice
- A player will win if they reach the last cell
- The game will end when all players expect one reach the last cell
- For each game maintain a leaderboard which has the rankings of each player

Entities and their attributes

- Game
  - Board
  - Players
  - Dices
  - Leaderboard
  - Status
- Board
  - Dimensions
  - Cells
  - Snakes
  - Ladders
- Cell
  - Position
  - Pieces
  - Type?
- Snakes/Ladders
  - Start
  - End
- Player
  - Name
  - Pieces
- Leaderboard
  - Players
  - Rankings

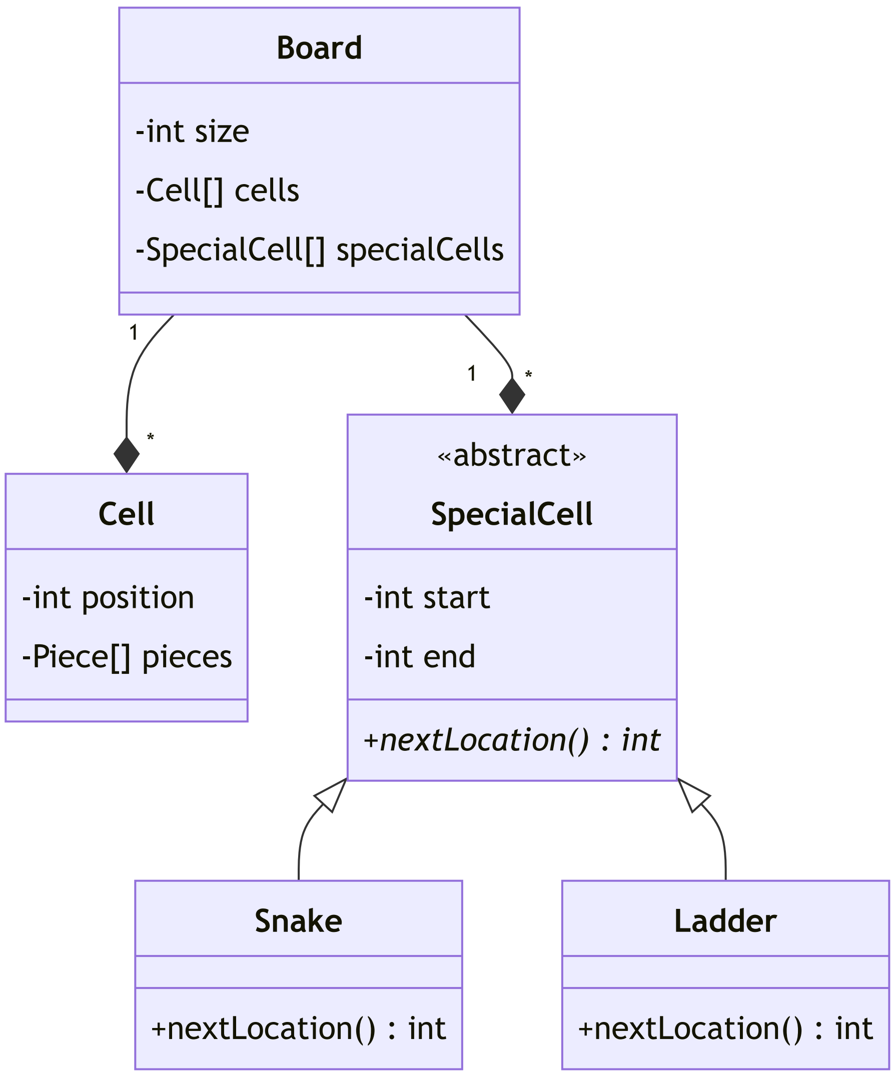
Initial Design



Problems with the initial design

- No common interface for Snake and Ladder which leads to OCP violation in Board class.

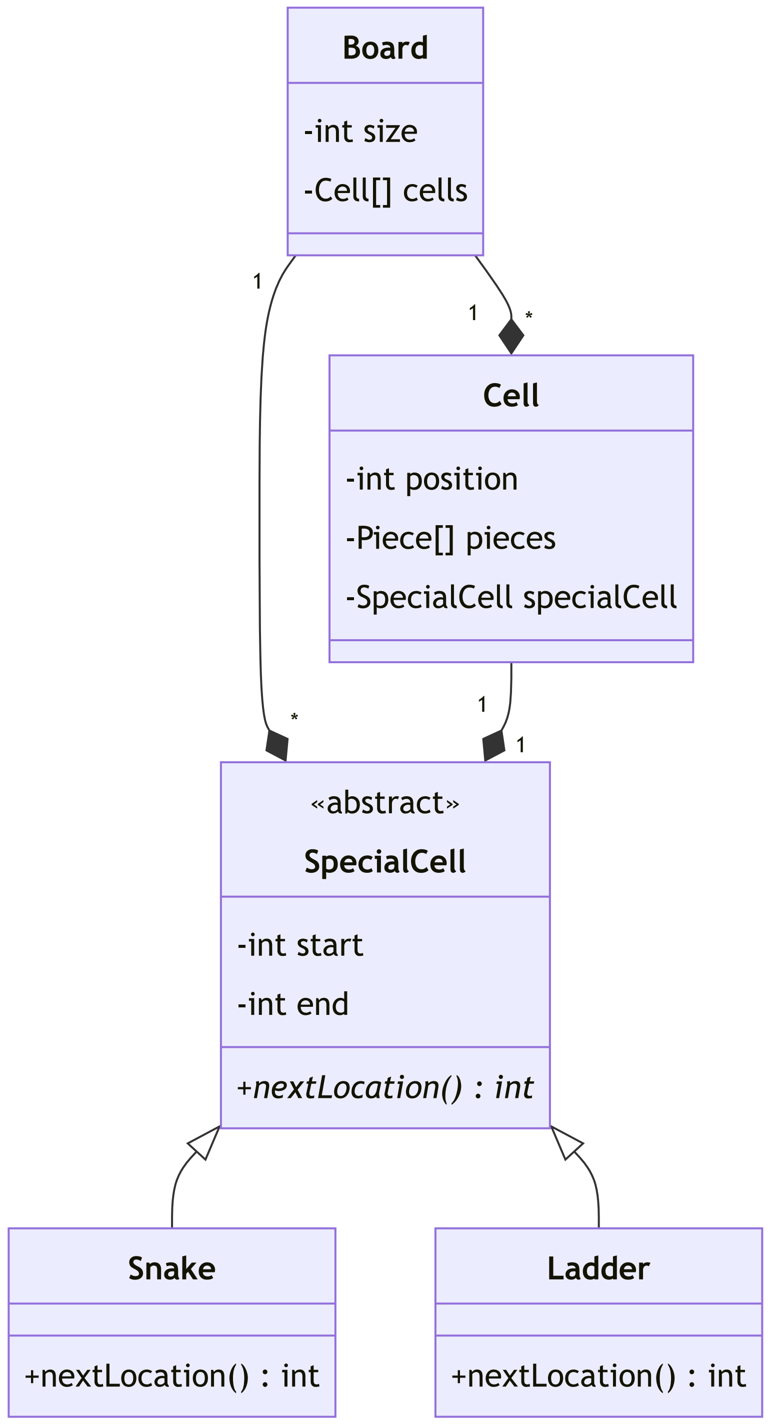
Adding a new parent class for Snake and Ladder



Problems

- Identifying if the cell has a snake or a ladder is not trivial. The client has to iterate over the list of special cells and check if the cell is present in the list.

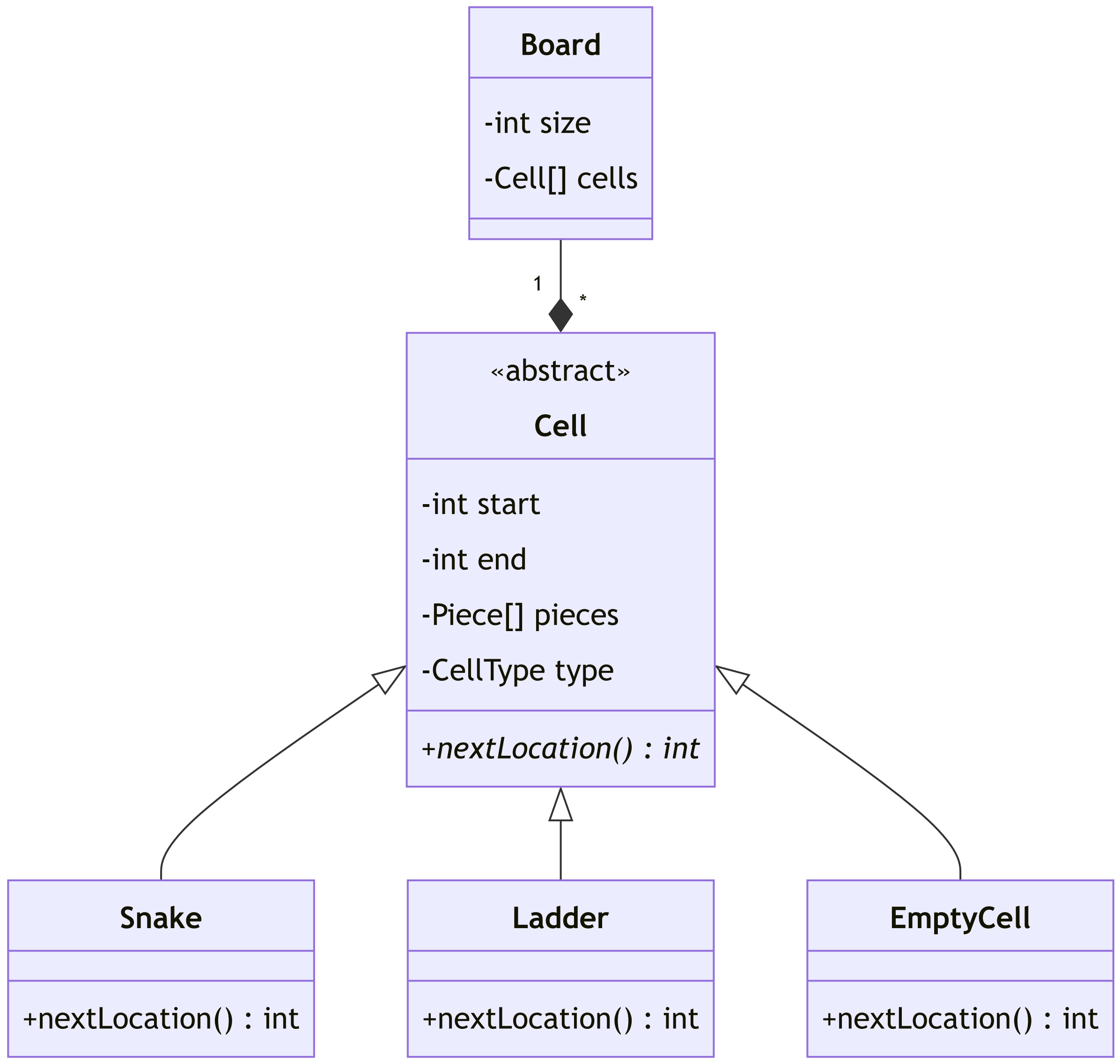
Optimizing the design - Composing cell with special cell



Problems

- ~~Identifying if the cell has a snake or a ladder is not trivial. The client has to iterate over the list of special cells and check if the cell is present in the list.~~
- Null checks are required to check if the cell has a special cell or not.

Optimizing the design - Bringing cell and special cell in the same hierarchy


Board
-int size
-Cell[] cells
1
*
«abstract»
Cell
-int start
-int end
-Piece[] pieces
-CellType type
+nextLocation() : int
Snake
+nextLocation() : int
Ladder
+nextLocation() : int
EmptyCell
+nextLocation() : int