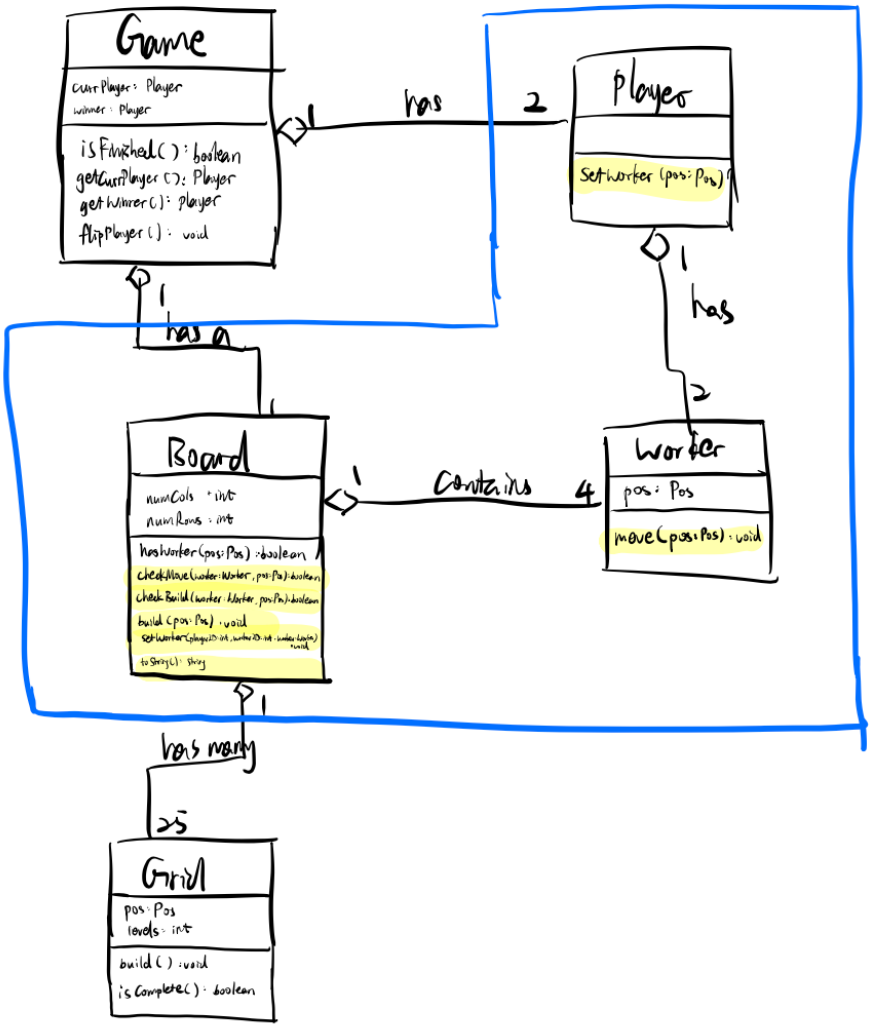
Task 3: Justification

1. Player’s interaction with the game and possible actions

The player can interact with the game in the following ways:
(1) Set the initial position of his/her workers at the beginning of the game
(2) Move his/her workers
(3) Build using his/her workers
(4) check the current board situation



The above actions are implemented and explained in Object Model as below:
(1) When setting the initial position for the worker:

- the Player class call method setWorker(Pos pos) to initialize and set the position of the worker

- the Board class call setWorker(int playerId, int workerId, Worker worker)
  to add the worker that is initialized by the player to the board

(2) When a player wants to move his/her worker:

- the Board class call checkMove(Worker worker, Pos pos)
  to check if the move to do is a valid move;

- If the move is valid, the corresponding Worker class call move(Pos pos)
  to update the position of the worker

(3) When a player wants to build using one of his/her workers:

- the Board class call checkBuild(Worker worker, Pos pos)
  to check if that build is a valid build
- the Board class call build(Pos pos),
  which further invoke build() at the corresponding Grid class
  to actually perform the build and update the grid tower levels

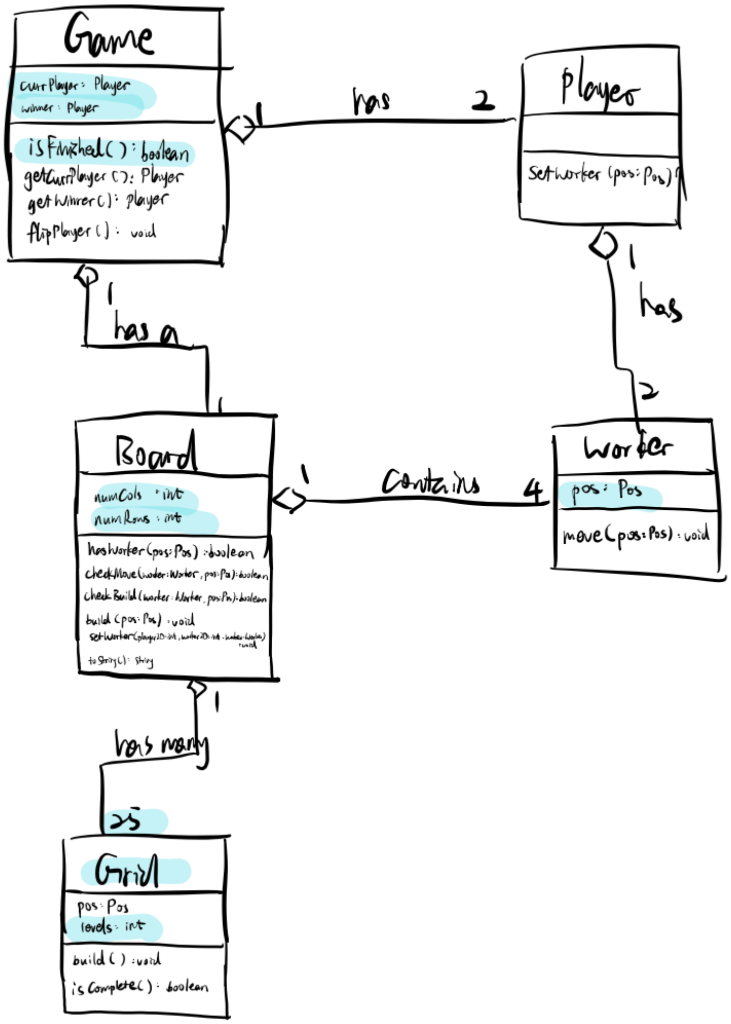
(4) When a player wants to check the current board situation:

The Board class has a override toString() method that prints the current board (with the grid's levels and workers' positions for both players in a human-readable way)

2. What state does the game need to store and where are they stored?

The worker's positions, the tower levels (we can think of the Dome of the tower as level 4 of the tower) of each grid on the board, and who is the next player needs to be stored.

Also, if the game is still going or has ended, and who is the winner if the game has ended also need to be stored.



As shown in the Object Model,
- Worker class store the current position **pos: Pos** of the worker.
- The tower levels of each grid are stored as **levels: int** in the Grid class.
- Each grid on the board is stored as a 2-D Grid array in the Board class.
- The next player is stored as **currPlayer: Player** in the Game class.

- The game status (if is finished) can be accessed by **isFinished(): boolean** function in the Game class.
- The winner of the game (if the game has finished) is stored as **winner: Player** in the Game class. This is set when the **isFinished()** function is called.

3. How does the game determine a valid build? How does the game perform the build?

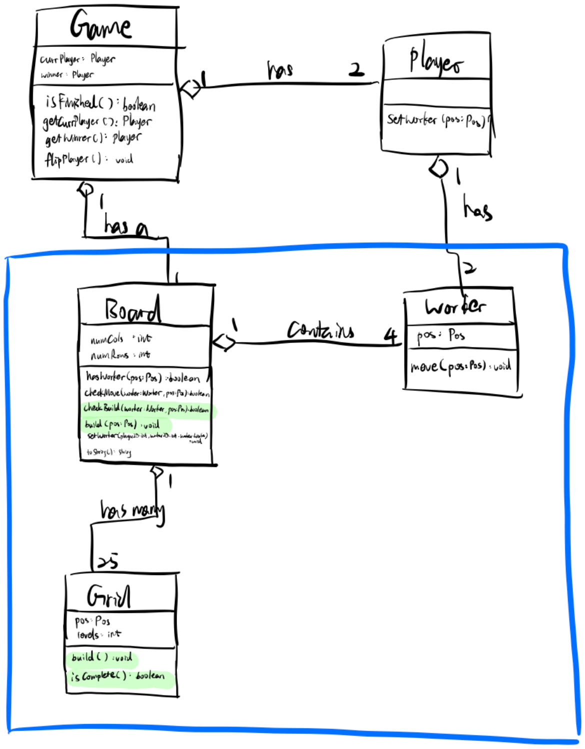
When a player wants to perform a build, the game has the following operations:

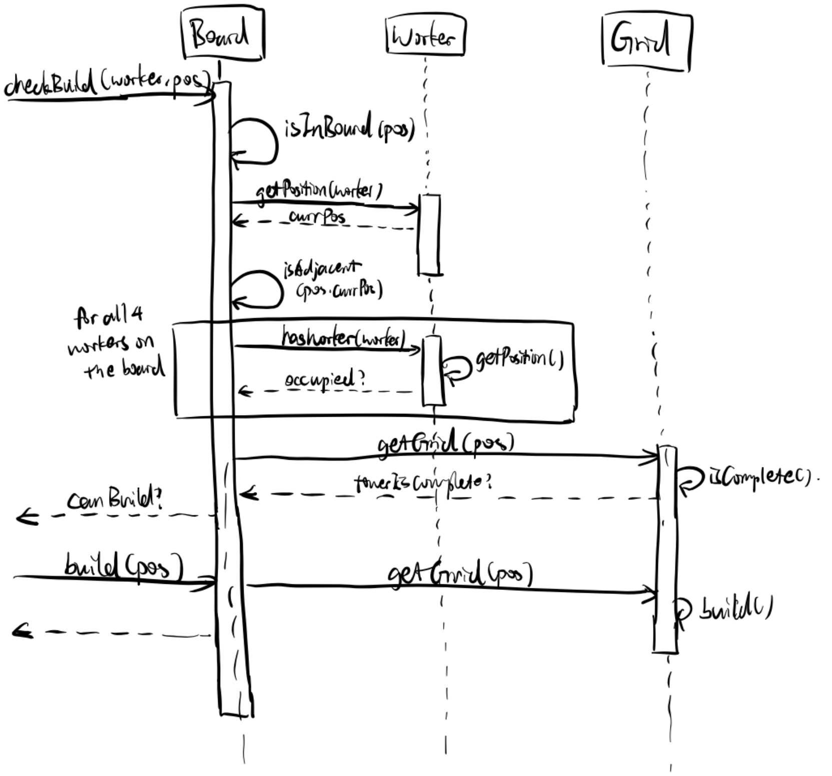
- first, the worker that the player wants to perform the build, and the position of the build is get from the player via IO;
- next, the Board class calls checkBuild(Worker worker, Pos pos) to check if the build is valid
- inside the checkBuild() function,
    - the Board calls isInBound(Pos pos) to check if the position is inside the board
    - the Worker calls getPosition() to get the current position of the worker
    - the Board calls isAdjacent() to check if the build position is adjacent to the worker position
    - the Board calls hasWorker() to check if the position is already occupied by another worker
        - inside hasWorker(), all 4 workers stored in the board calls its getPosition() function to check if they are occupying the target position
    - the Board calls getGrid(Pos pos) to get the corresponding grid of the target position
    - the grid calls isComplete() to check if the tower of the grid can be further built (if contains a doom)

  If all of the above checks succeed, the checkboard() returns true
- then, the Board calls build() function to actually build the block

  Inside the build() function,
    - the Board calls getGrid(Pos pos) again to get the grid of the target position
    - The grid calls build() to finish the building operation

The corresponding Interaction diagram and Object Model diagram is shown below:


Game
currPlayer : Player
winner : Player
isFinished() : boolean
getCurrPlayer(): Player
getWinner(): player
flipPlayer() : void
1
has
2
Player
SetWorker(pos: Pos)
1
has
2
1
has a
1
Board
numCols : int
numRows : int
hasWorker(pos: Pos) : boolean
checkMove(worker: Worker, pos: Pos): boolean
checkBuild(worker: Worker, pos: Pos): boolean
build(pos: Pos) : void
setWorker(playerID: int, workerID: int, worker: Worker) : void
toString(): String
1
Contains
4
Worker
pos : Pos
move(pos: Pos) : void
1
has many
25
Grid
pos : Pos
levels : int
build() : void
isComplete() : boolean


Board
Worker
Grid
checkBuild(worker, pos)
isInBound(pos)
getPosition(worker)
currPos
isAdjacent (pos, currPos)
for all 4 workers on the board
hasWorker(worker)
getPosition()
occupied?
getGrid(pos)
isComplete().
towerIsComplete?
can Build?
build(pos)
getGrid(pos)
build()