# Technisch Uitwerkingsplan


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# Inhoud

# Code structure

## UML Diagram

Class Diagram
UI Activity Diagram
Game Activity Diagram

## Introduction

Our plan is to make a multiplayer tetris game, in which the way you play on your own field influences the other person's experience. Initially, the structure we had set up for creating our game had a few aspects that could be improved by making use of design patterns, which we will go over in this document.

Currently we have the following aspects:

- Block
  A block is the original shape that all tetris tiles are made of.
- Tile
  A tile is the complete shape of the 4 blocks melded together.
- Tile Manager
  The tile manager is used to keep track of the entire field and the blocks contained within it and is separate for each user, just like the field is. It also checks whether the player tile can move down, left and right or can be rotated.
- Controller
  The controller defines the keybindings of each player, so we can edit these before the game starts.

## Plan of action

For creating our Retris game, we decided we'd like to make use of Unity. The reason we'd like to use Unity is because it is free and adds to a fast prototyping workflow.

In Unity, we'll be making use of the features Monobehaviour and Time.

# Re-design code structure

## UML Diagram

Class Diagram
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## Introduction

### Singleton Pattern

The first Design Pattern we'd like to incorporate in our game is the Singleton Pattern. We'd like to implement our Tile Generator as a Singleton, because the Tile Generator only has a single instance and only has to exist from the moment the start menu is over.

### Object Pooling

Another Design Pattern we could use in our game is the Object Pooling Pattern. Since our Tiles can be reused multiple times amongst the different users, we don't have to destroy every tile and then remake it, we can simply reuse them from a Tile pool that we save in the Tile Generator.

## Plan of action

For object pooling we will implement the following class, which will coincidentally also be making use of the singleton pattern.

- Tile Generator
  The tile generator creates tiles for the tile manager to add to the field once a tile has reached the bottom of the playing field. This way, both users get the same tiles and the game stays fair. This also means less Tiles have to be constructed, because each tile is reused by the amount of people in the multiplayer game.

## Priority

For our project, the order in priority is as followed.

### 1. Creation and keeping track of blocks

The number one priority for our game is that it is possible to create a tile (consisting of blocks) and that the tile is saved within a grid that we have created, which we can check to add commands such as moving left and right or rotating the tile.

## 2. Movement and controller for player tile

Once our grid is up and running we can add our player tile and generate controls, so we may move the tile left and right and rotate it as we please.

## 3. Clearing a row once it is filled

As the player can now control the tiles, it is crucial that once a row is filled with blocks, the blocks are deleted and the rest of the field is moved down a block.

## 4. Adding multiplayer functionality

Once tetris works as it was intended, we shall add multiplayer functionality, making it possible to add players and have multiple fields depending on the amount of players added.

## 5. Adding multiplayer interactions

When the entire game is functional with multiplayer functionality, we may add interactions between the players. For example, special blocks may spawn that influence the experience of other players, such as increase the movement speed of their tiles or block their rotations.

## 6. Adding a menu and end-game screen

The final addition is to add UI for starting the game and a nice overview of how you did at the end of the game.

# Work division

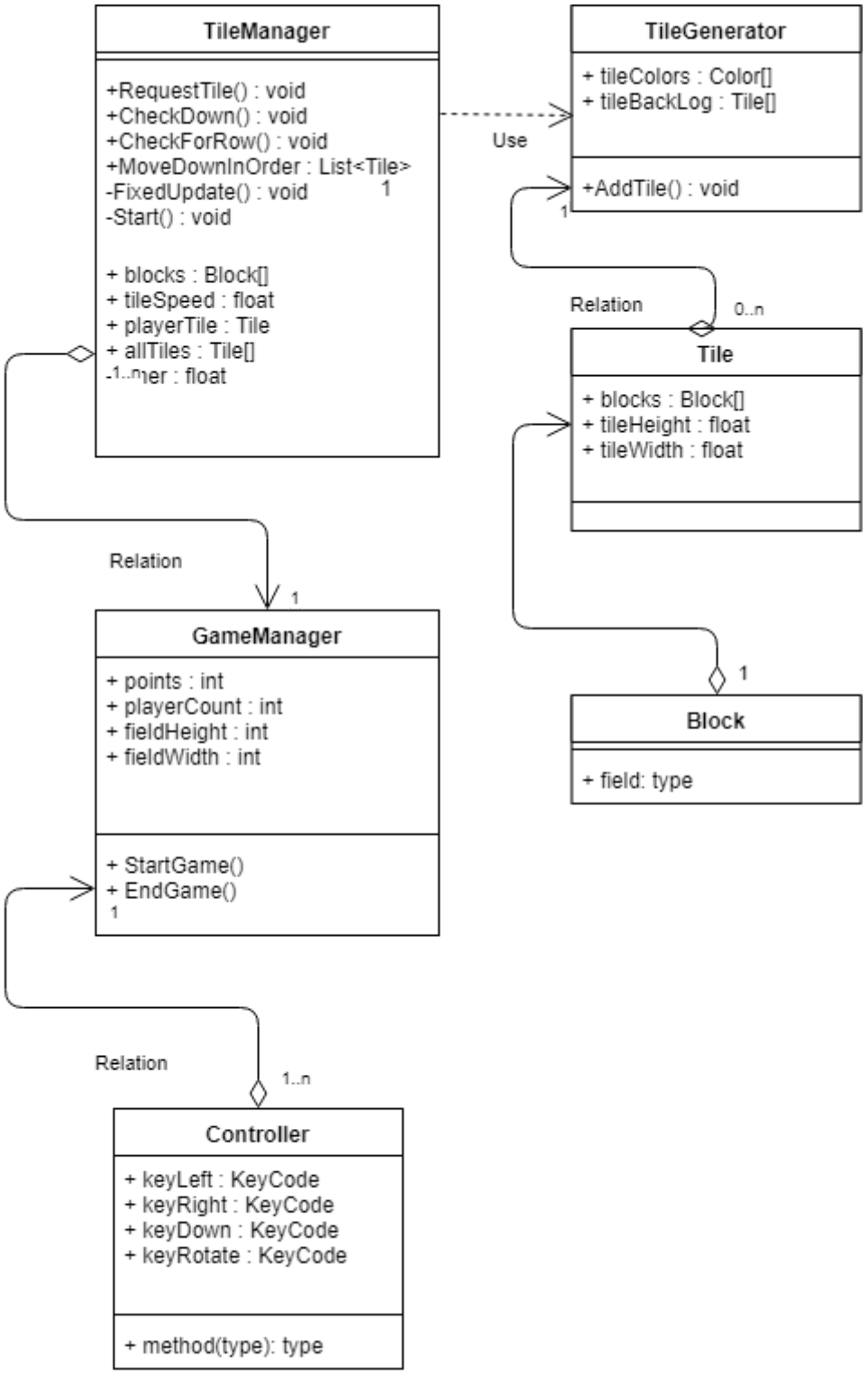
We decided to split the work into two parts at the start of the project. The User Interface and the gameplay. The gameplay consisted of creation and keeping track of blocks, movement and controller for player tile, adding multiplayer functionality and interactions, and the User Interface consisted of selecting the amount of users, the keys to control the player tile with and the size of the field.

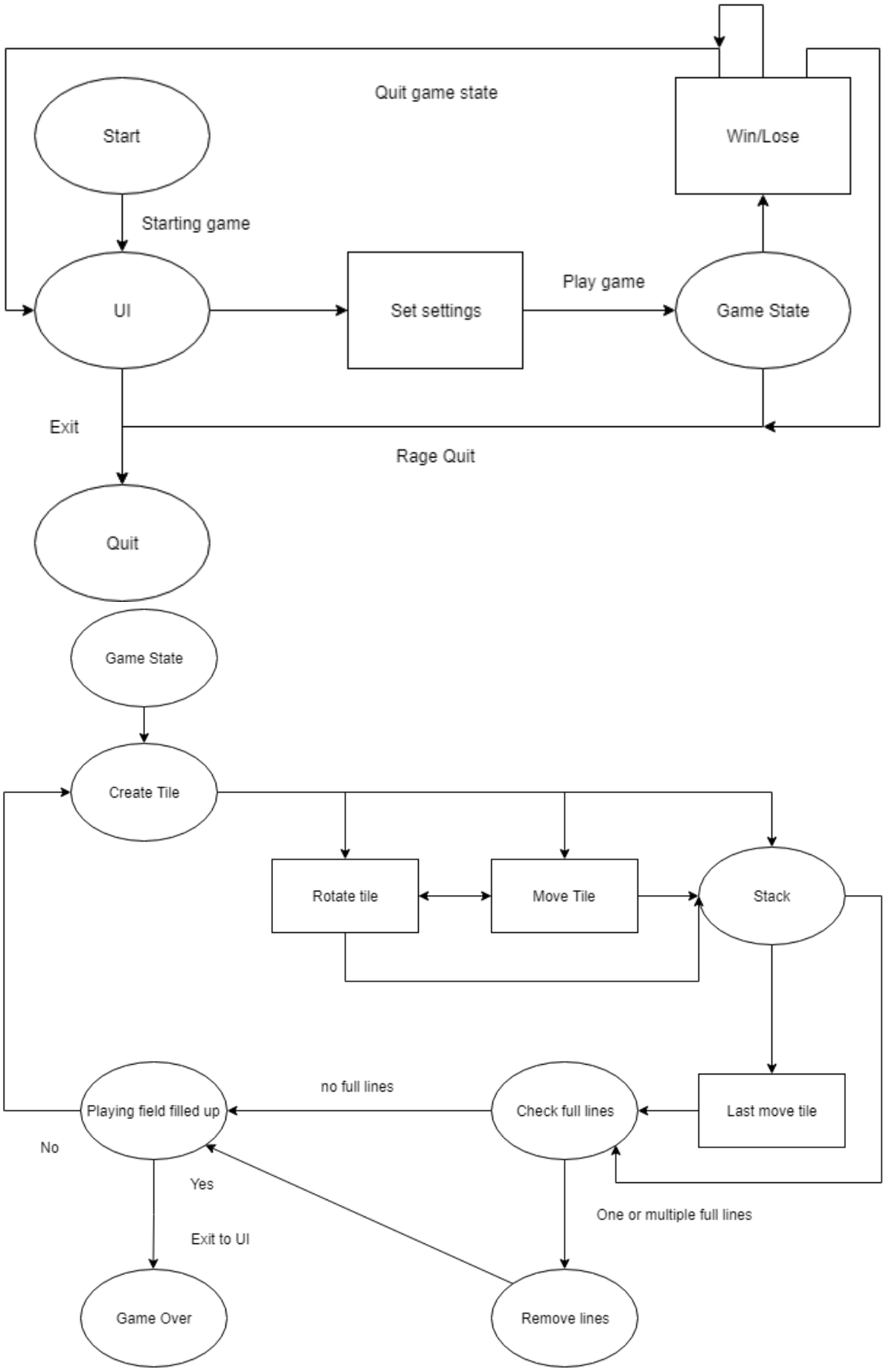
The reason we split the work this way is because Bas had some experience with designing and was adamant about having a good UI. Daniel mostly wanted to improve on his Unity developing skills.

During the work on the User Interface, it became quite clear that Unity’s UI system is inadequate.

For the gameplay, there were quite a few complications that arose during the development. The first issue was that keeping track of movement and rotation on a 1-dimensional array proved quite difficult. Another difficulty was when multiple players were added and somehow the original functionality seemed to break. In the end, Bas decided to join forces and debug the entire script together, and we managed to find the solution. We had some problems with ghosting on the keyboard, which was caused by the use of Fixed Update for input, instead of Update.

# Attachments


TileManager
+RequestTile() : void
+CheckDown() : void
+CheckForRow() : void
+MoveDownInOrder : List<Tile>
-FixedUpdate() : void
-Start() : void
+ blocks : Block[]
+ tileSpeed : float
+ playerTile : Tile
+ allTiles : Tile[]
-1..ner : float
1
Use
TileGenerator
+ tileColors : Color[]
+ tileBackLog : Tile[]
+AddTile() : void
1
Relation
0..n
Tile
+ blocks : Block[]
+ tileHeight : float
+ tileWidth : float
1
Block
+ field: type
Relation
1
GameManager
+ points : int
+ playerCount : int
+ fieldHeight : int
+ fieldWidth : int
+ StartGame()
+ EndGame()
1
Relation
1..n
Controller
+ keyLeft : KeyCode
+ keyRight : KeyCode
+ keyDown : KeyCode
+ keyRotate : KeyCode
+ method(type): type


Quit game state
Start
Win/Lose
Starting game
UI
Set settings
Play game
Game State
Exit
Rage Quit
Quit
Game State
Create Tile
Rotate tile
Move Tile
Stack
Last move tile
Check full lines
no full lines
Playing field filled up
No
Yes
Exit to UI
One or multiple full lines
Game Over
Remove lines