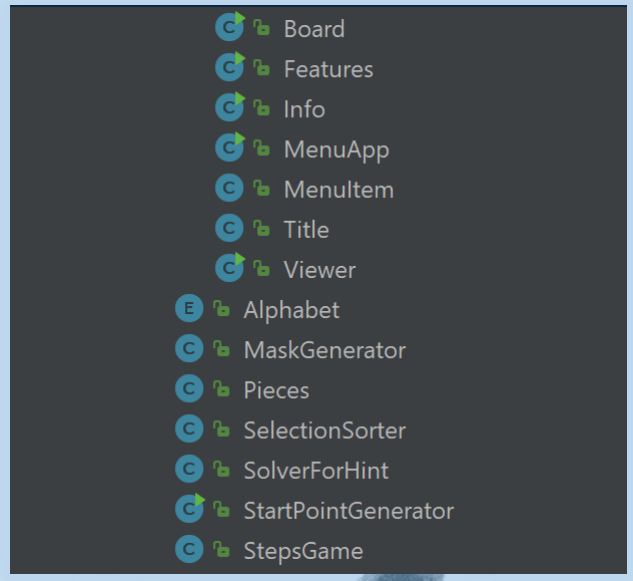
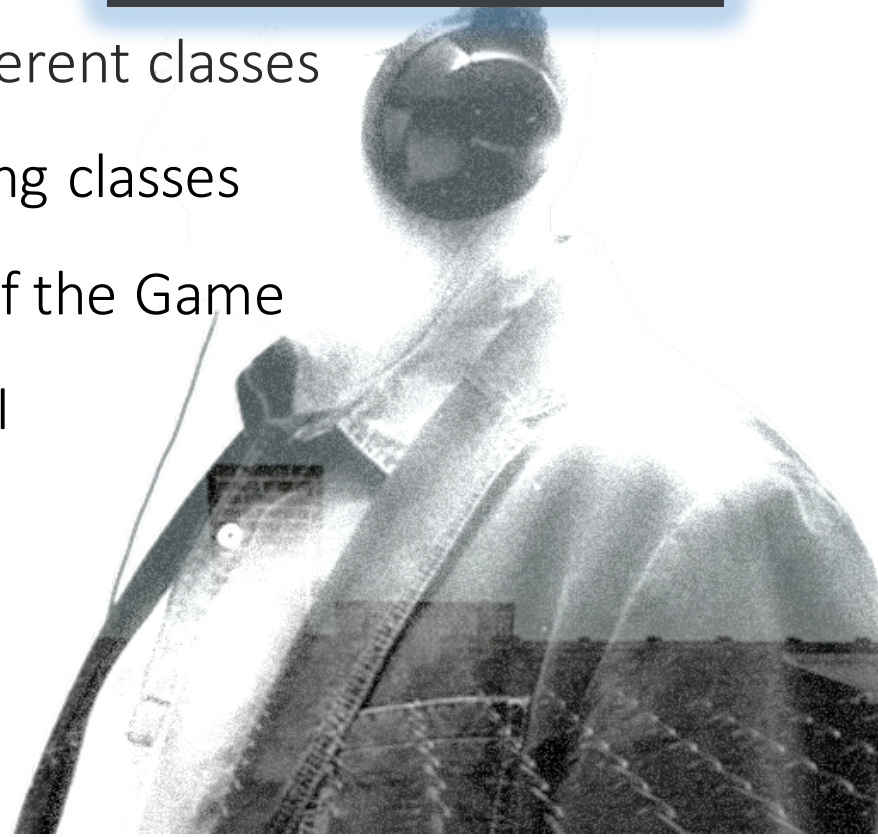
DESIGN

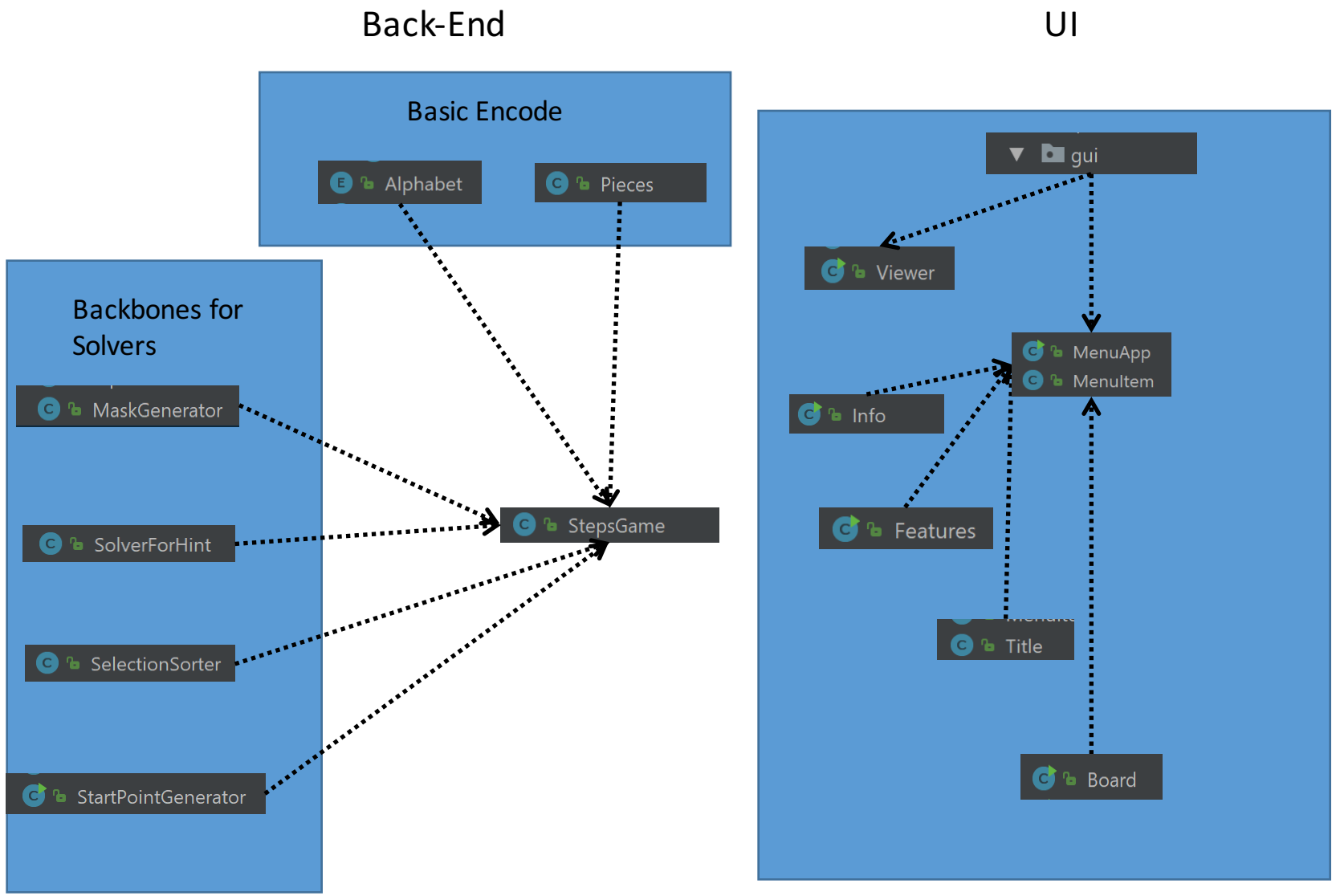
- ✓ Designing skeleton
- ✓ Building basic classes:

  basic tool methods in different classes
- ✓ Class StepGame: Combining classes

  and implement features of the Game
- ✓ Class Board: implement UI



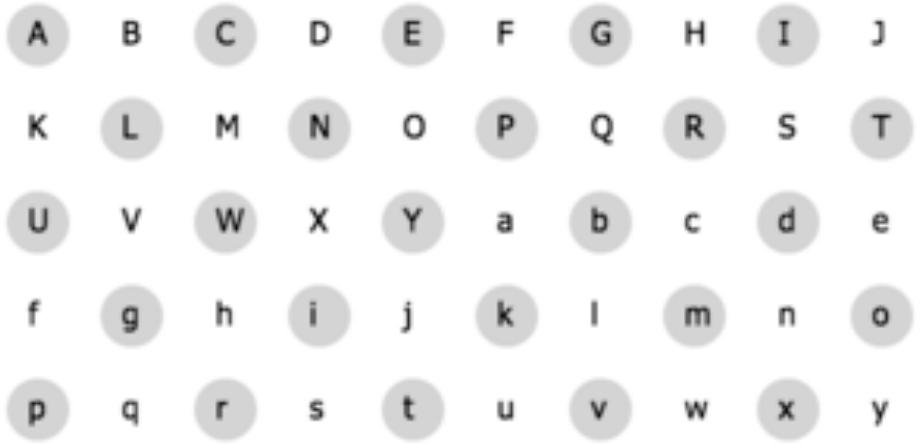




DIAGRAM

Designed by Xiangyi Luo

Encoding Board



- The positions on the board
- A to Y ; a to y
- Encoded as 0 to 49
- Pegs can be detected

Encoding Pieces

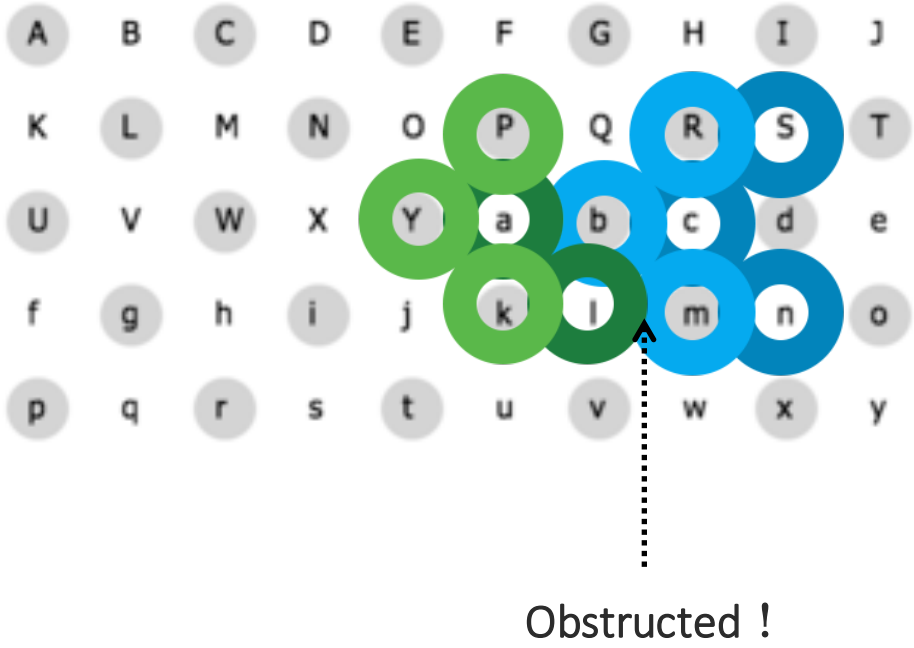
A string contains:
Three Chars

1 The shape
2 The rotation
3 The position
(on the board)

Checking Validity

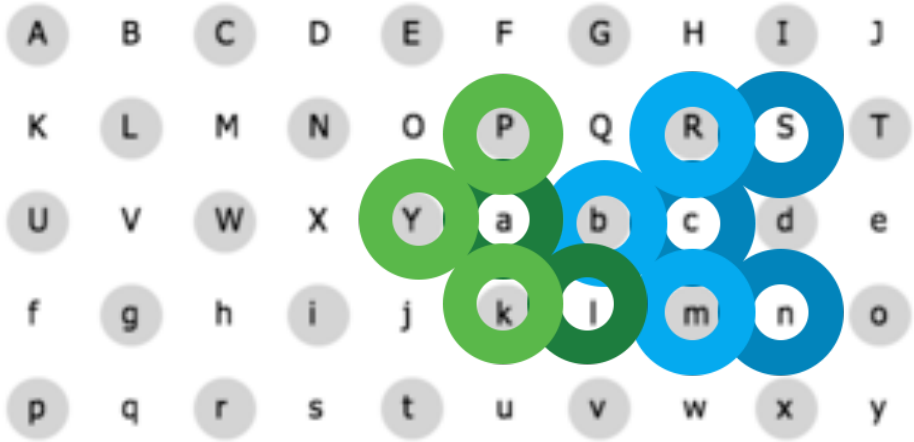
- The piece is in the board range;
- At most eight pieces are on the board;
- Each shape should be used at most once;

Checking Obstruction



- Obstruction:
- If a bottom ring is placed after a top ring, says obstructed.

Checking Obstruction

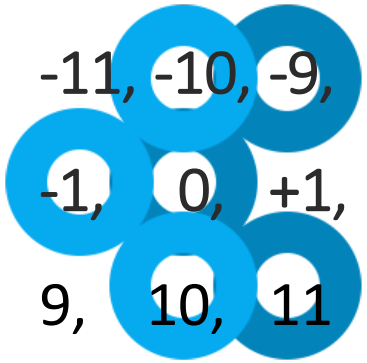


Obstructed！

- How to detect obstruction?
- If a peg position has been located
- Then the adjacent non-peg positions are not allowed to be located at the next move

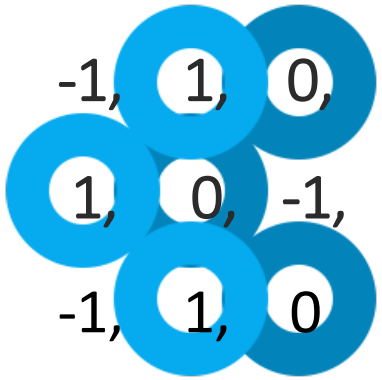
Checking Obstruction

```
/*Reflect the relationship of the 9 grids*/
private final static int[][] grid3x3 = {
        {-11, -10, -9},
        {-1, 0, +1},
        {+9, +10, +11}
};
```



- Firstly, think about represent pieces in 3x3 grids.(Get idea from lecture code in Class Boggle)

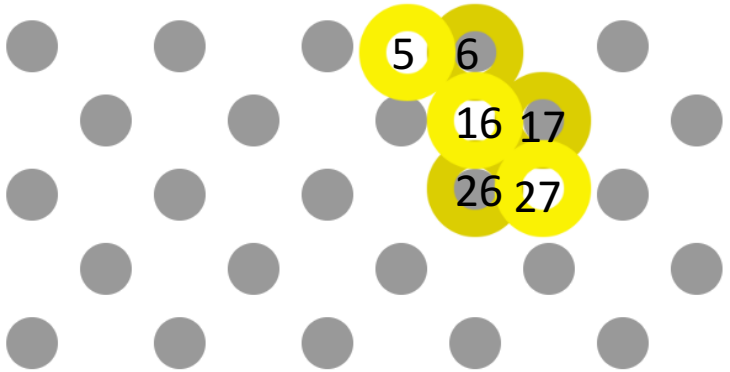
Checking Obstruction



- Secondly,
- 1 for top ring
- 0 for bottom ring
- -1 for nothing

Checking Obstruction

Example:
Placement: GGQ
Next piece: DFO

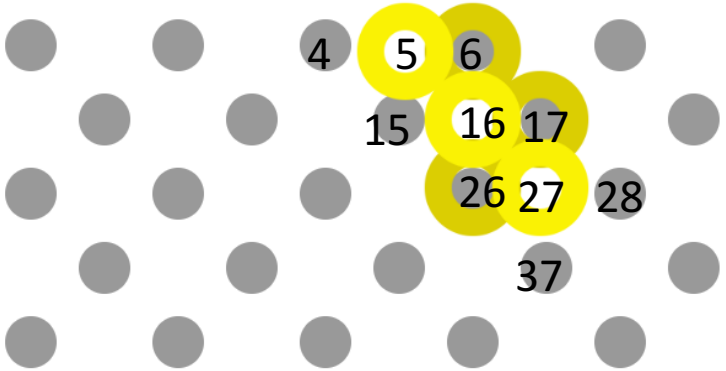


In this example used positions are:
[16, 17, 5, 6, 26, 27]

- Thirdly,
- Recording all the positions the given placement has used.
- Store in a HashSet

Checking Obstruction

Example:
Placement: GGQ
Next piece: DFO



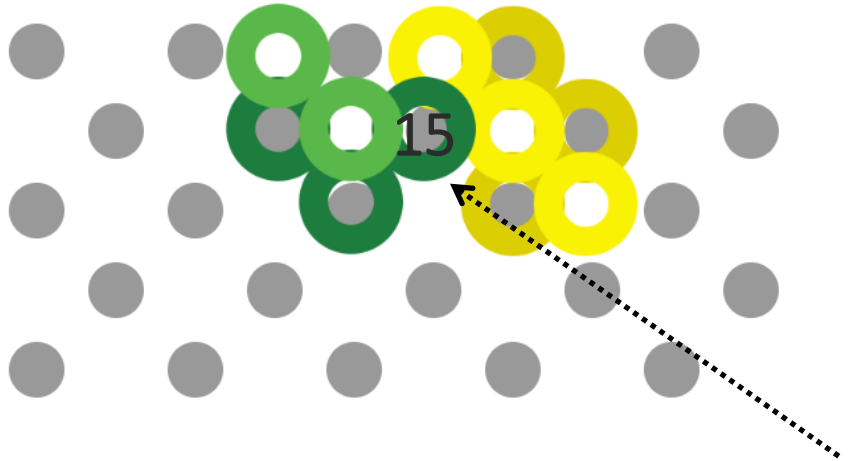
In this example used positions :
[16, 17, 5, 6, 26, 27]

Then we can compute the positions which cannot be used at next move:
[16, 17, 4, 5, 37, 6, 26, 27, 28, 15]

- According to the algorithm mentioned :
- If a peg position has been located
- Then the adjacent non-peg positions are not allowed to be located at the next move

Checking Obstruction

Example:
Placement: GGQ
Next piece: DFO



In this example used positions :
[16, 17, 5, 6, 26, 27]

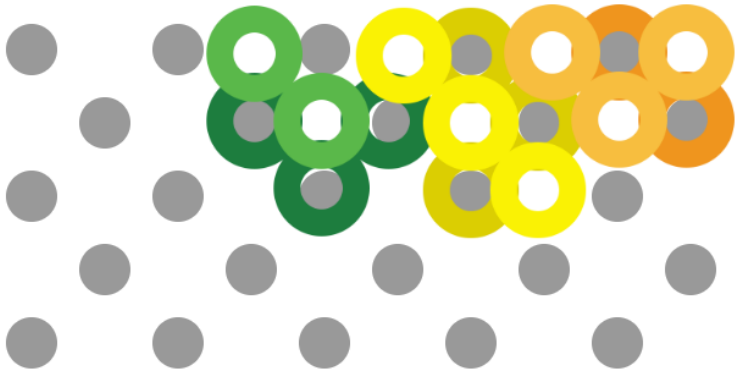
Then we can compute the positions which cannot be used at next move:
[16, 17, 4, 5, 37, 6, 26, 27, 28, 15]

Now check positions the DFO will take:
[3, 24, 13, 14, 15]
The pieces is going to use 15 which is not allowed.

Hence, the notObstruct method return *false !*

Reordering

Example:
Placement: DFOGGQEDI
Objective: DFOGGQEDIBAkFHnHCiAALCAg



Reordering

Example:
Placement: DFOGGQEDI
Objective: DFOGGQEDIBAkFHnHCiAALCAg

In this case,
We get four different orders for one objective:

[DFOGGQEDIBAkHCiFHnAALCAg,
DFOGGQEDIBAkFHnHCiAALCAg,
DFOGGQEDIBAkHCiAALCAgFHn,
DFOGGQEDIBAkHCiAALFHnCAg]

MaskGenerator

```java
public static ArrayList<String> maskGenerator1(char first){
    //All the positions where a piece of placement which starts in A, C, D, F, G, H can be placed on
    char[] ACDFGH1 = {'L', 'N', 'P', 'R', 'W', 'Y', 'b', 'd', 'g', 'i', 'k', 'm'};
    char[] ACDFGH2 = {'M', 'O', 'Q', 'S', 'V', 'X', 'a', 'c', 'h', 'j', 'l', 'n'};
    ArrayList<String> newArr = new ArrayList<>();
    //different possible states for one single mask
    char[] second1 = {'A','B','C','D'};  char[] second2 = {'E','F','G','H'};
    //connect the type of mask, state of mask and position of mask when the state of mask is in {'A','B','C','D'}
    for (int i = 0; i < 4; i++){
        for (int j = 0; j < ACDFGH1.length; j++){
            newArr.add(String.valueOf(first)+String.valueOf(second1[i])+String.valueOf(ACDFGH1[j]));
        }
    }
    //connect the type of mask, state of mask and position of mask when the state of mask is in {'E','F','G','H'}
    for (int i = 0; i < 4; i++){
        for (int j = 0; j < ACDFGH2.length; j++){
            newArr.add(String.valueOf(first)+String.valueOf(second2[i])+String.valueOf(ACDFGH2[j]));
        }
    }
    return newArr;
}
```

A, B, C…H

Getting Solution (unordered)

MaskGenerator

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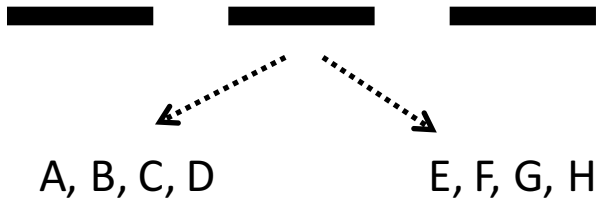

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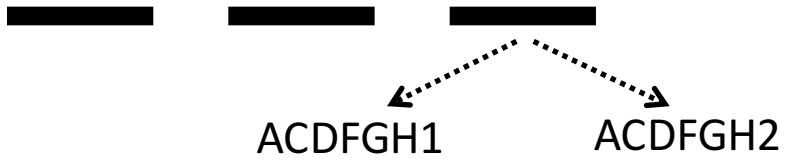
```



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        }
    }
    return newArr;
}
```

Map

Key : type of mask Value : possible positions correspond to mask in the key

Getting Solution (unordered)

Algorithm

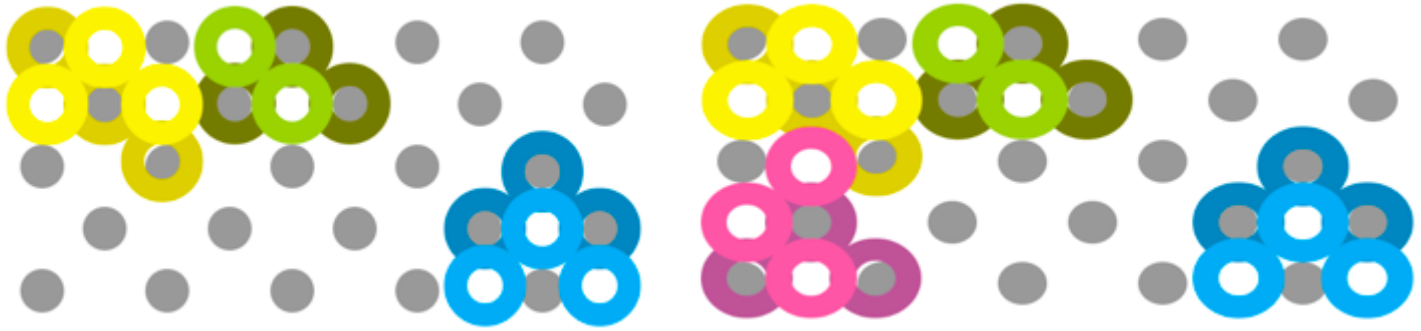
1. Delete all the states of existing masks on the board.

2. Append the remaining masks with different states on the board, judge whether it is valid by FUNCTION notObstruct and isPlacementSequenceValid. If it is valid, link the candidate to the original placement and add them into a ArrayList. Otherwise, abandon the states.

3. Do it recursively.

Designed by Xiangyi Luo

Getting Solution (unordered)

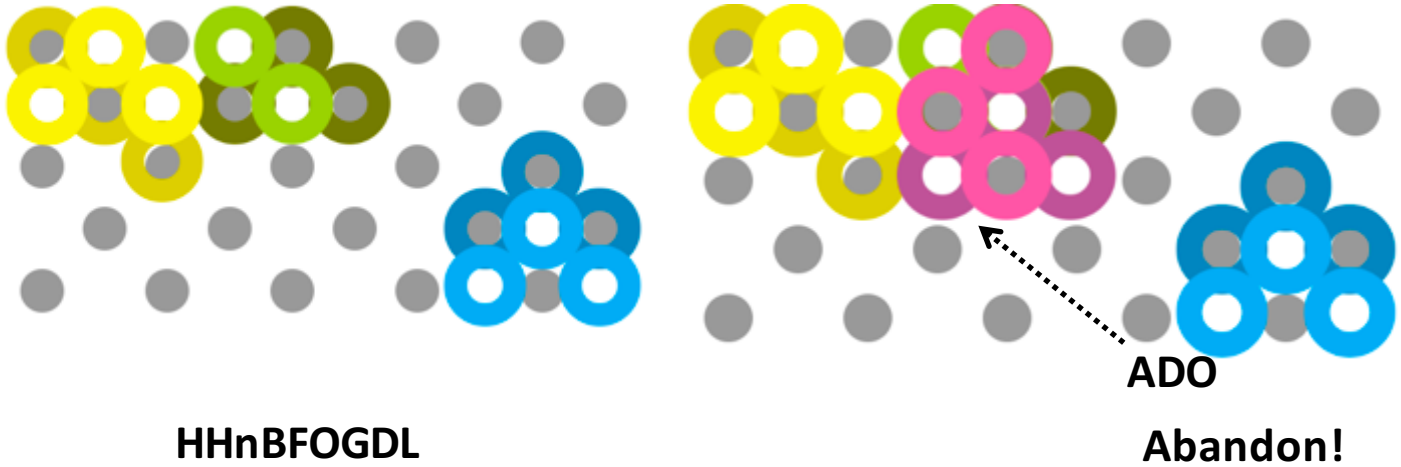


HHnBFOGDL

ADg

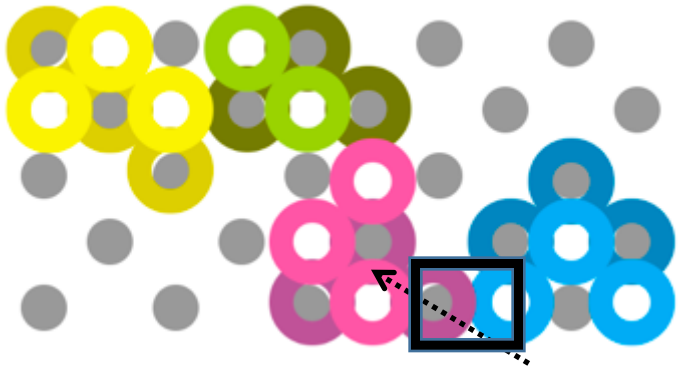
HHnBFOGDLADg

Getting Solution (unordered)



Getting Solution (unordered)

HHnBFOGDL



ADk

Abandon!

Getting Solution (unordered)

Test on computer in N109
Around 1 min

Test on computer in N114
Around 1 min 20s

Test on own Mbp
Around 1 min 40s

Getting Solution (unordered)

Why was it slow?

We make comparisons with another group:
FUNCTION - isPlacementSequenceValid
Ours: 8ms to tell a piece placement is invalid
Theirs: 15ms
Ours: 24ms to tell a piece placement is valid
Theirs: 8ms

Improvement

Improve the efficiency of FUNCTION
notObstruct and isPlacementSequenceValid !!

Getting Solution (unordered)

Game Menu

Designed by Xiangyi Luo

Game Features

Pop-up animation

Fantastic Effects

Designed by Xiangyi Luo

Author Info

Author information

Acknowledgement

Designed by Xiangyi Luo

Timer

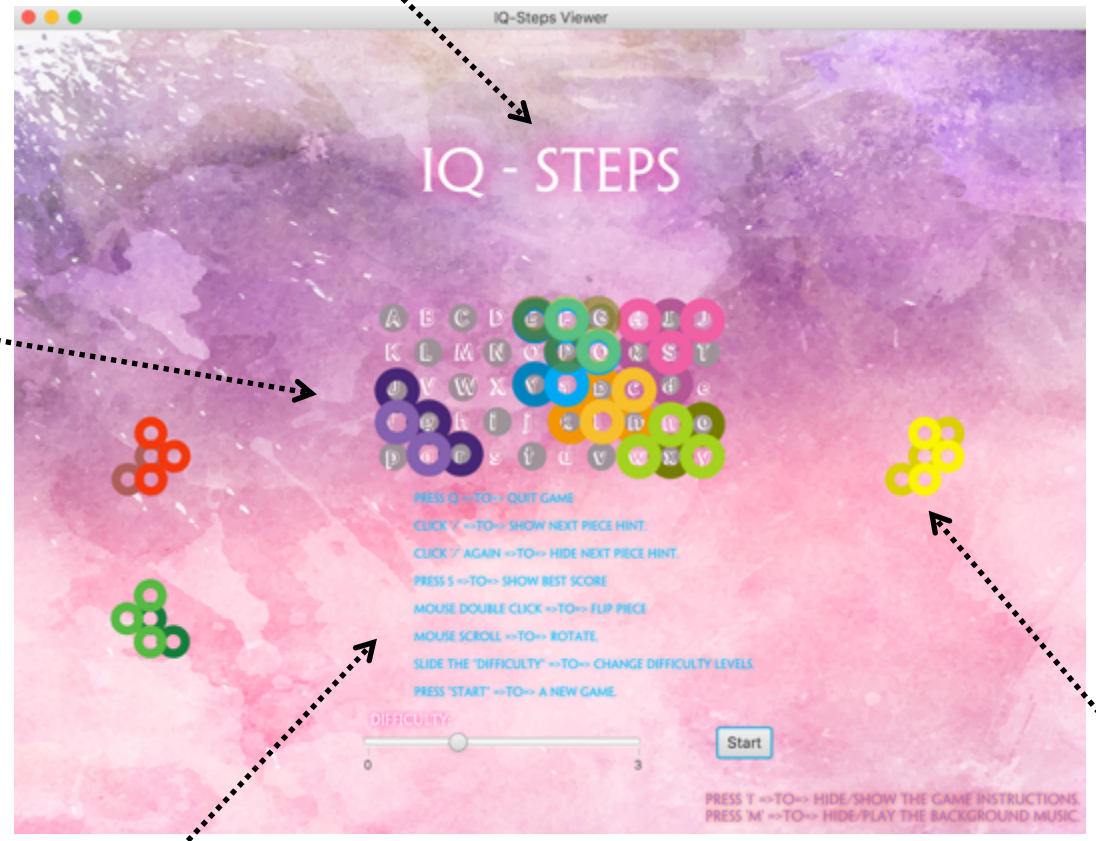
Clear Instruction for new user

Designed by Xiangyi Luo

Game Starting

Game Process

Font, Color, Shadow Effects…



Starting pieces

- Double click -> Flip
- Scrolling -> Rotate
- Draggable pieces
- Event handler
- Keyboard handler

"/" for next step hint

"S" for Scoreboard

"Q" for Quit

Draggable & Flippable Pieces

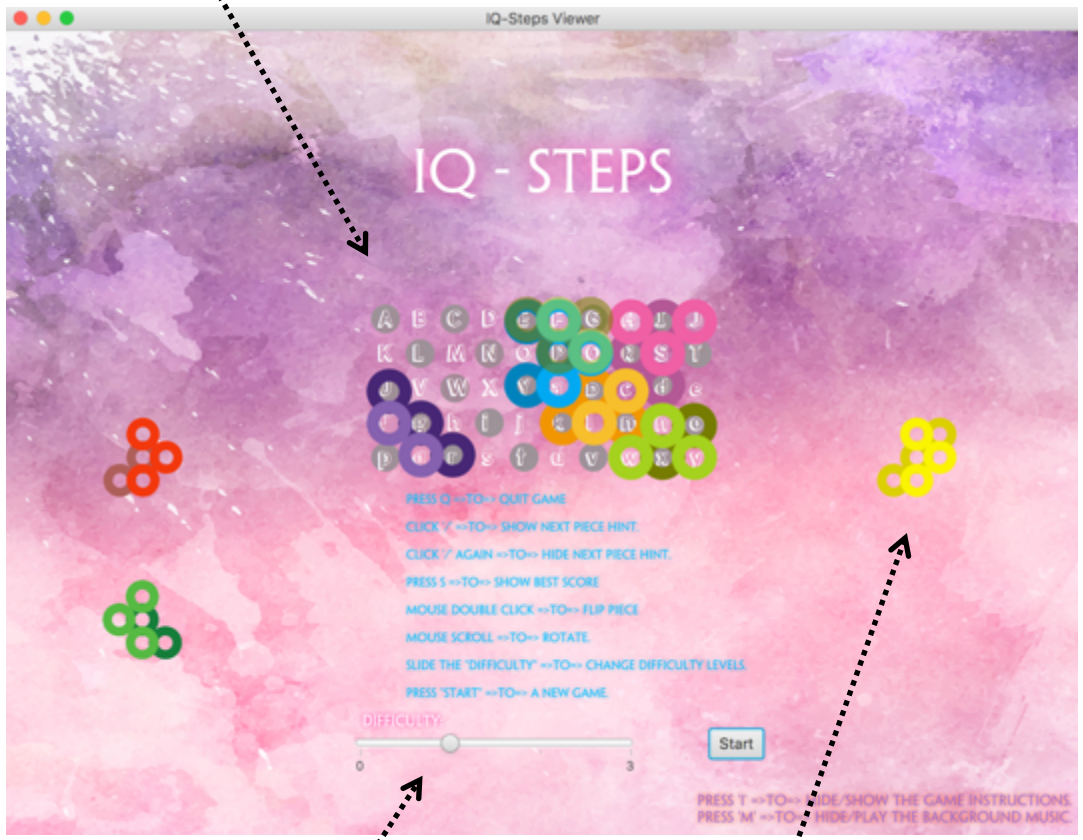
"M" for BGM

"I" for Player Instructions

Designed by Xiangyi Luo

Game Process

Font, Color & Shadow Effects



Difficulty switcher

Operation music:

snap/flip/rotate/error/grid/win

- SnapToHome:

  reload image at home
- SnapToGrid:

  traversal trough all

  pegs / blank pegs.
- Reload image for snap
- Sound effects
- Constraints:
  1. Board
  2. Grid (peg/blank peg)
  3. Obstruction
  4. Bottom/Top Layer
  5. Completion

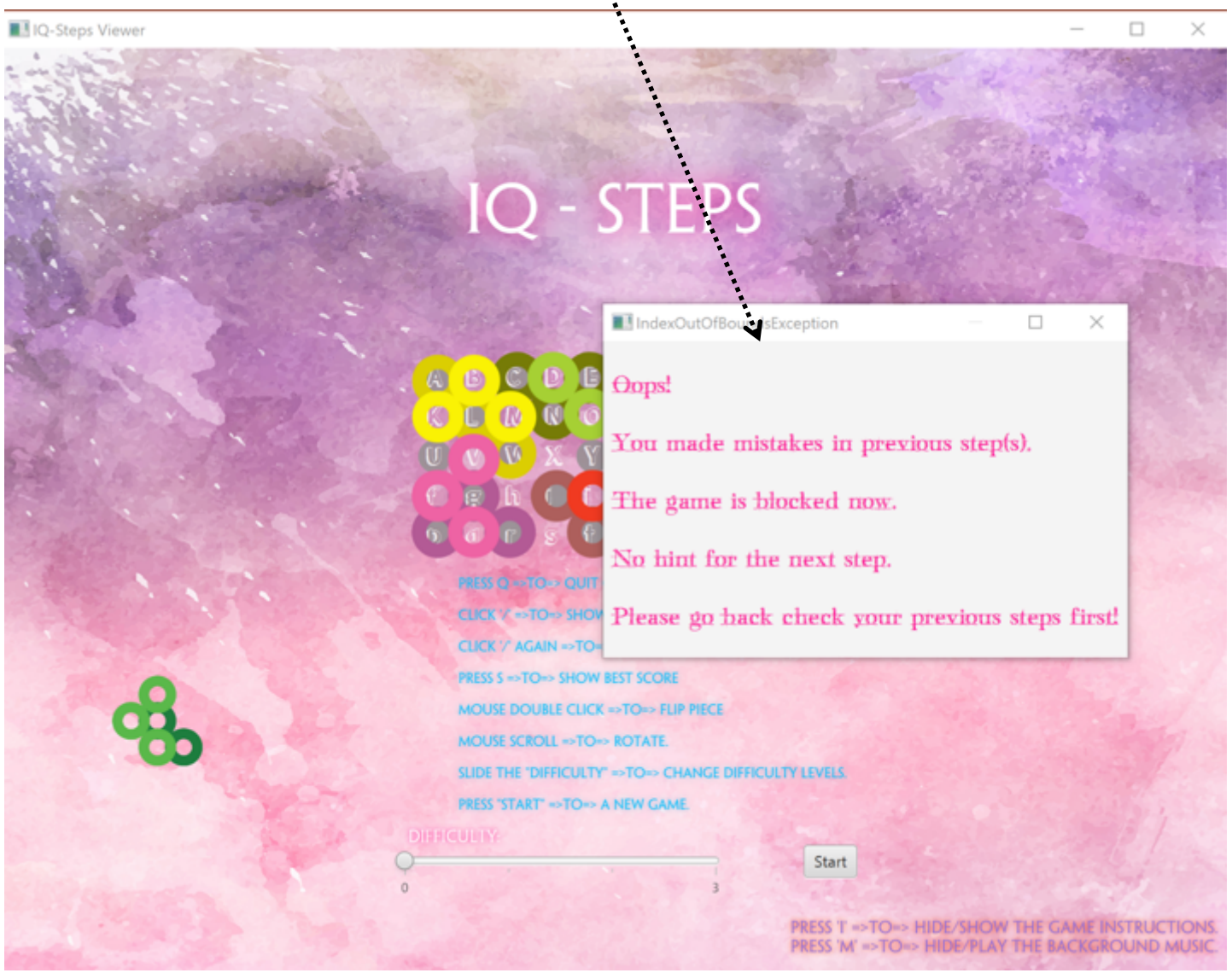
Designed by Xiangyi Luo

Press “/” and get semitransparent hint (not available if the last move was wrong)

Game Hint

Designed by Xiangyi Luo

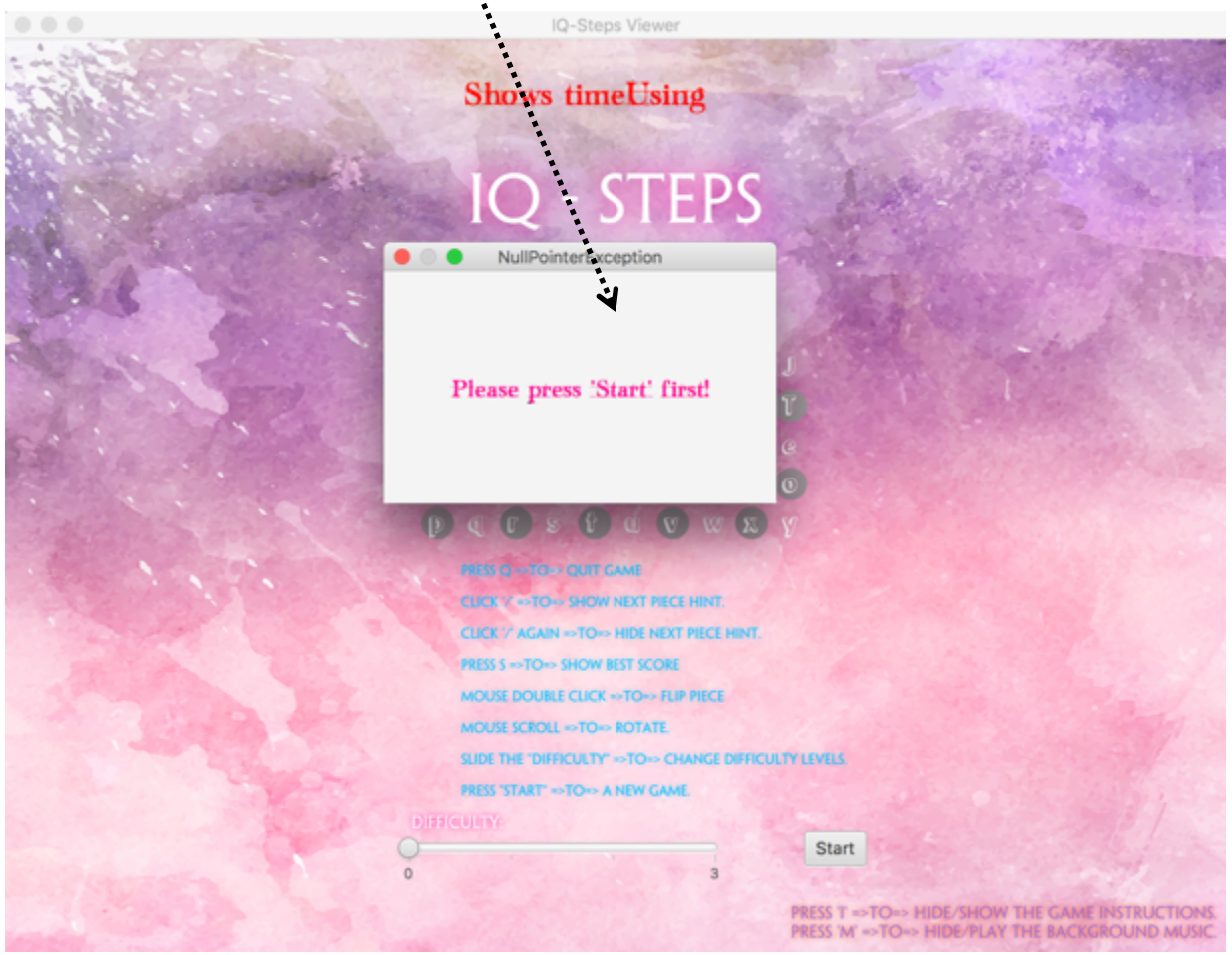
Exception window if Player make mistake in previous step.



Designed by Xiangyi Luo

Handling Exception

Exception window if Player pressed "/" before starting game.



Handling Exception

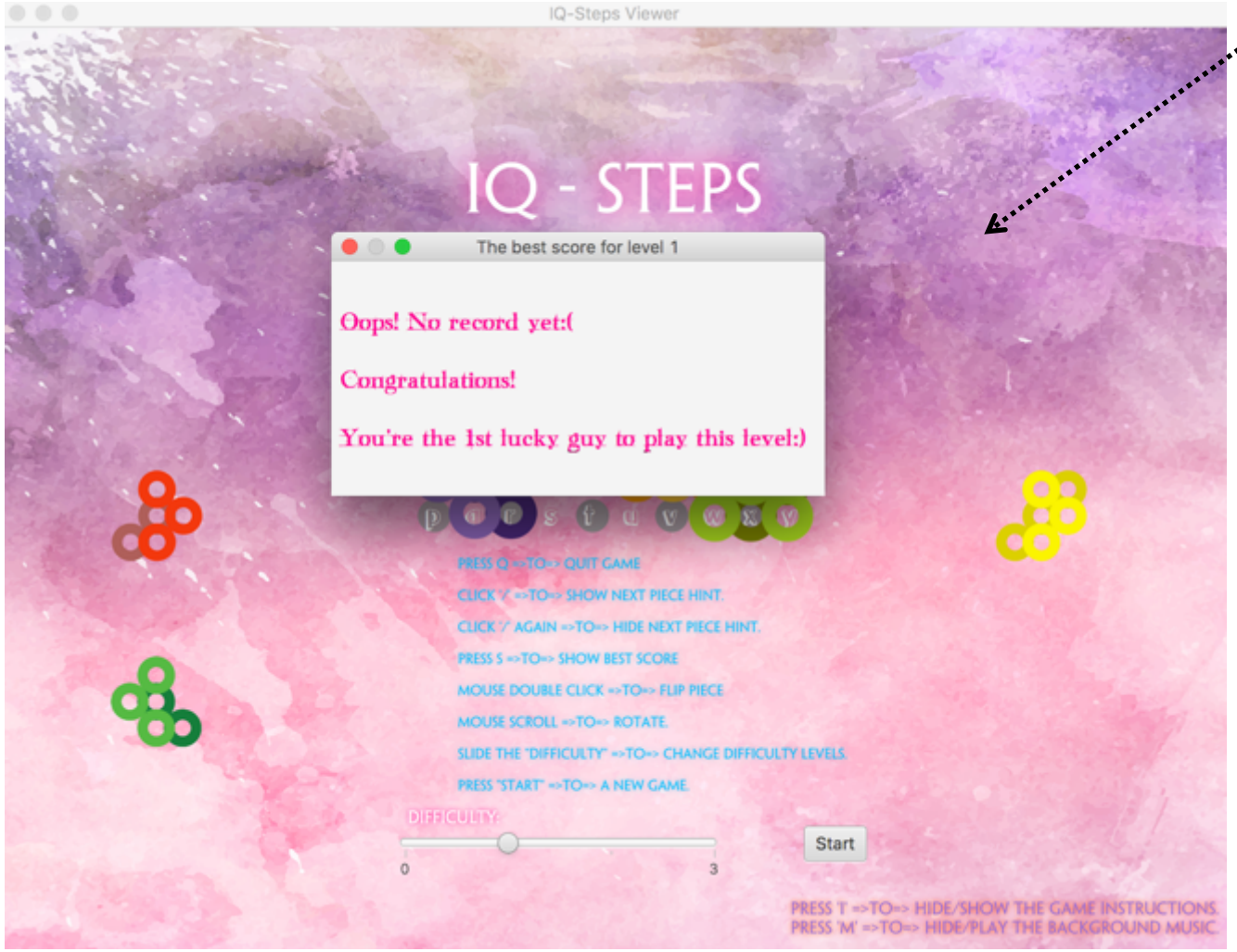
Designed by Xiangyi Luo

Best Score

Designed by Xiangyi Luo

ScoreBoard Exception

If no record exists



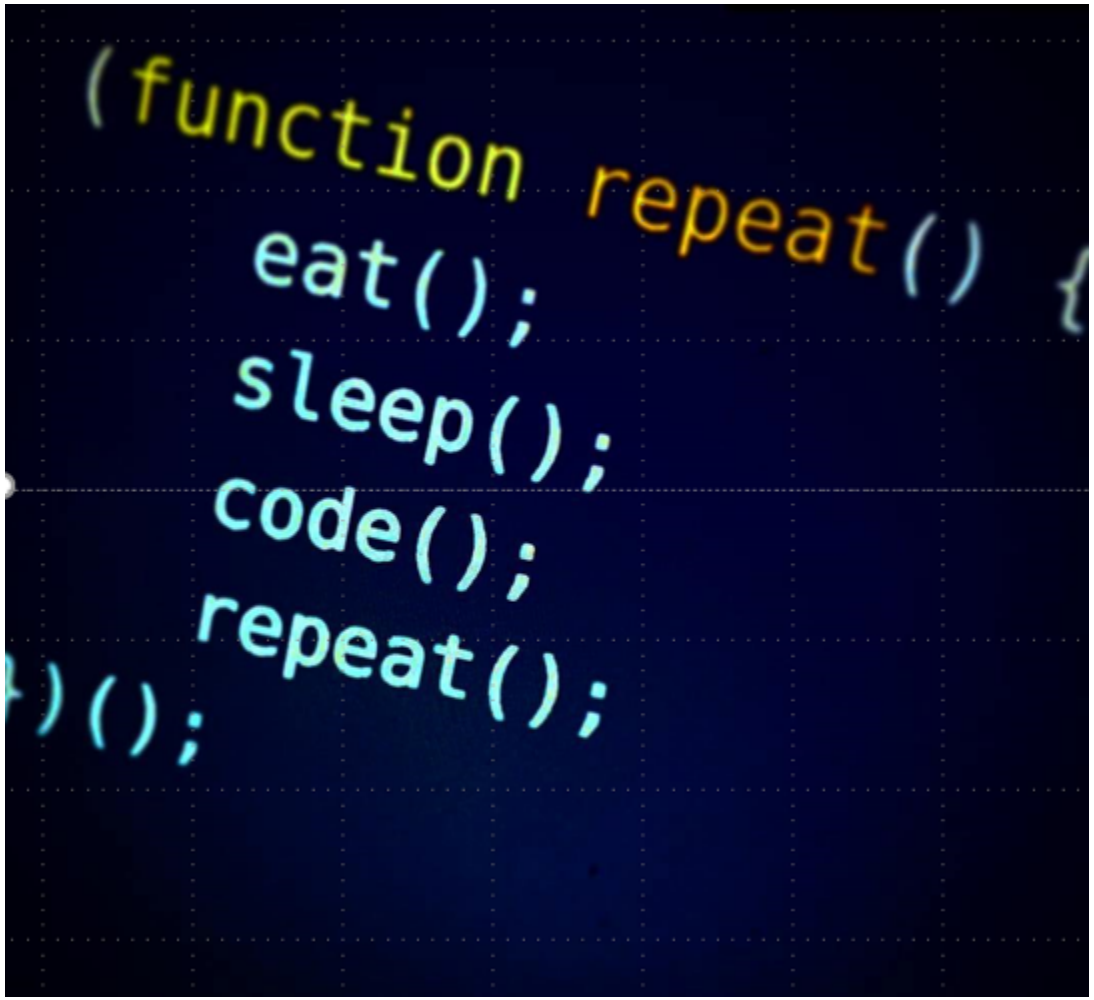
Designed by Xiangyi Luo

Game Complete

Automatic Scoreboard

Instructions after Completion!

Designed by Xiangyi Luo



Finally,
Lots of coding,
debugging,
and
testing!

More Fun

About Scoreboard

Automatically record the used time and will store the best score ever for each level.

About UI

Artistic;
Background;
Pop-up animation;
Background music;
Sound effects;
Fantastic Font & Shadow;
Inner message window;
Exception handling
……

About Cooperation

As designers, we communicated with each other and share ideas!