Rubik's Cube AI

CS 664

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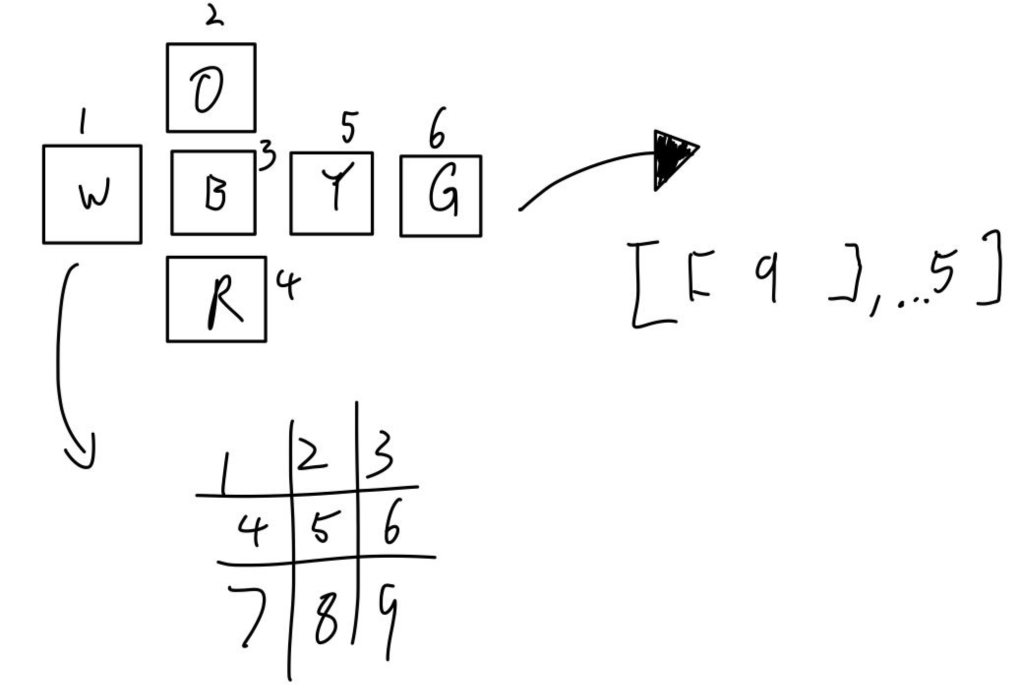
3D array to store Cube information

String [6][9][1];

Inside the array there are 6 cubes, each cube contains 9 pace for each spot of a 3x3 Rubik's Cube.

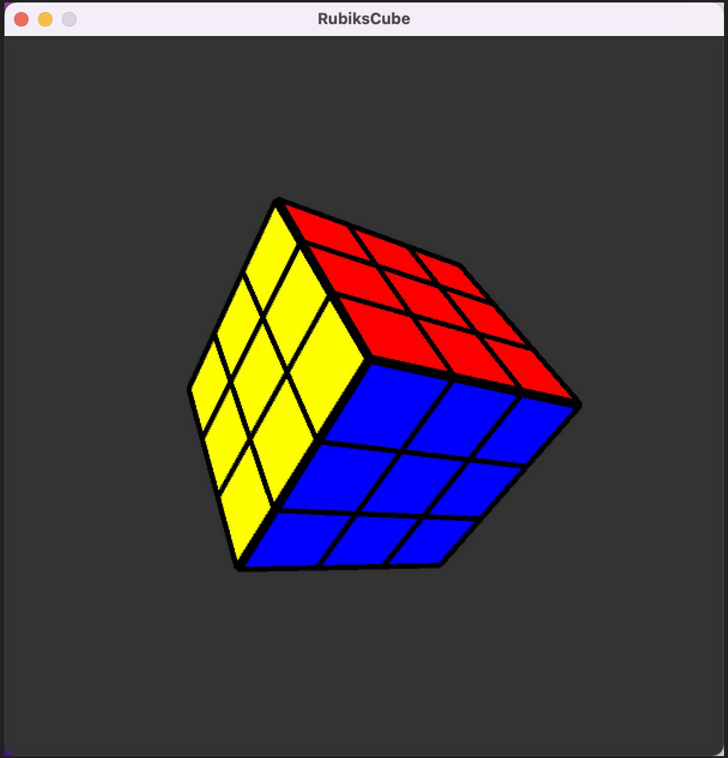
Inside the each space it has one string to represent the color of the cube.



Try to develop a 3D visualized rubik's cube

Before Everything start I try to develop a visualized cube, using processing.

In the end I decided to move on to complete the AI first

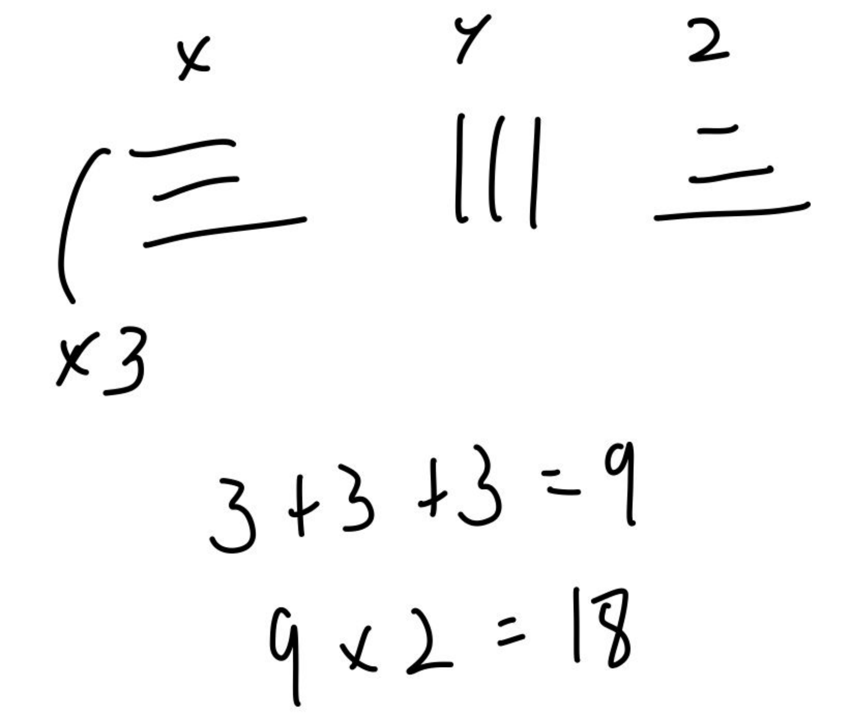


Rubik’s Cubes fundamental movement logic

There are 3 axis, each axis has three layer to move, each layer has two ways to move (left/right)

When one face has moved, they other face has to move too, because its a cube, those spaces are not just individual spots that can move everywhere by a self.

Make sure it has the correct movement logic, (HARD!!!)

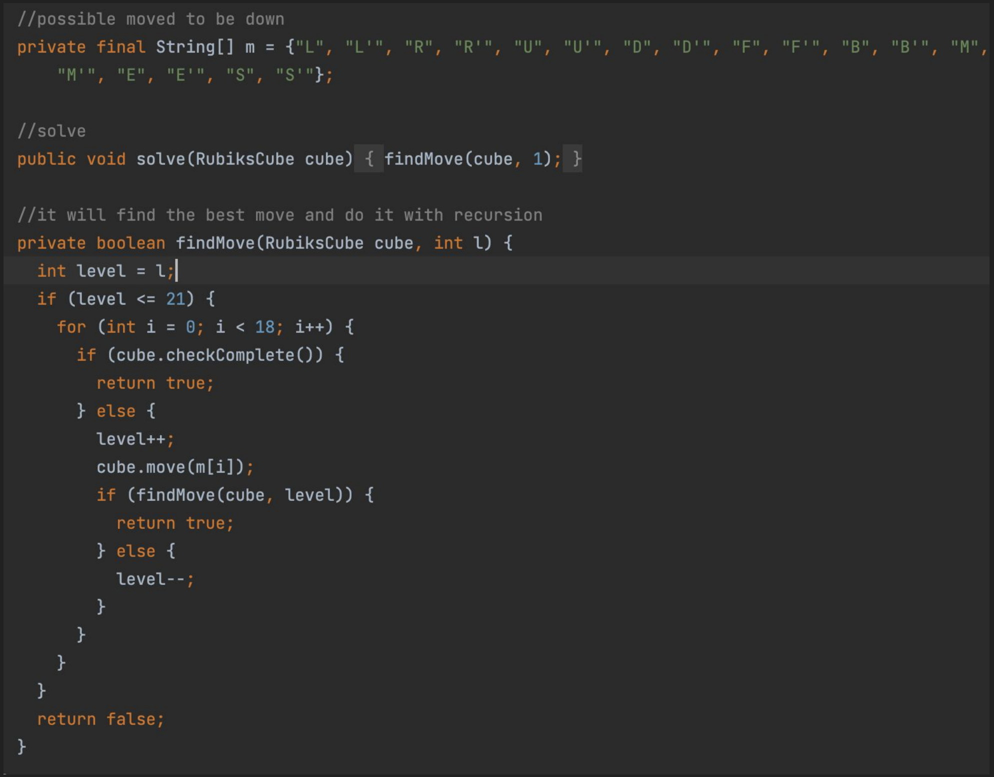


AI without Human knowledge

I have developed a brutal force algorithm, it will try to find a combination of 21 moves to solve the rubik's cube.

It did not end well, its taking too long to find a result when I shuffle too much.

(Fundamental movement logic has bug at that time I did not realize)



```java
//possible moved to be down
private final String[] m = {"L", "L'", "R", "R'", "U", "U'", "D", "D'", "F", "F'", "B", "B'", "M",
    "M'", "E", "E'", "S", "S'"};

//solve
public void solve(RubiksCube cube) { findMove(cube, 1); }

//it will find the best move and do it with recursion
private boolean findMove(RubiksCube cube, int l) {
  int level = l;
  if (level <= 21) {
    for (int i = 0; i < 18; i++) {
      if (cube.checkComplete()) {
        return true;
      } else {
        level++;
        cube.move(m[i]);
        if (findMove(cube, level)) {
          return true;
        } else {
          level--;
        }
      }
    }
  }
  return false;
}
```

AI with Human knowledge

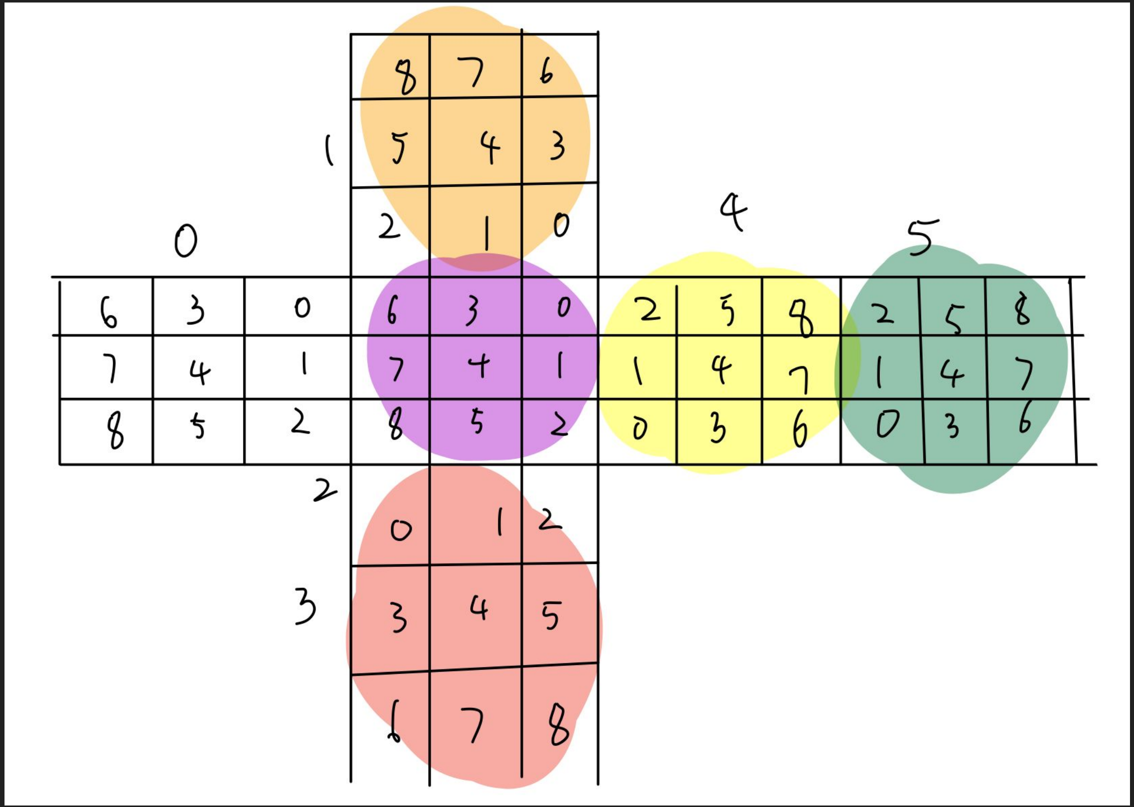
Solve the base first which is at array 5,

Then solve the middle layer

Then solve the top layer

Then solve the side corner

Complete the cube



Quick Demo