

Gebze Technical University
Department of Computer Engineering
CSE 241/505
Object Oriented Programming
Fall 2021
Homework # 5 Bonus
Due date Dec 17th 2021

In this bonus part of HW 5, you will add some functions to your base class to make it smarter. Add the following functions to the base class **BoardGame2D**.

- **nextMoves** is a pure virtual function that returns a vector of string objects that contains all possible legal moves for the current board. For example, if the lower right corner of the 8 Puzzle board is empty, then this function will return {"LEFT", "UP"}.
- **playAutoSmart** is a final function. It plays the game until it is over. It prints the board between the moves after some pause. Before playing each time, this function calls **nextMoves**, evaluates each of the boards after these moves and chooses the best one. Note that to evaluate the board, you will have to call this function recursively until it hits an end of game move. Use the virtual function **endGame** to test the end of the game. If the recursion becomes too deep, then you may have to stop it after some recursion depth to prevent any out of memory problems, in this case choose your move by looking at **boardScore** function results.

The function **playAutoSmart** uses the idea of polymorphism by calling virtual and pure virtual functions for games that it had never seen. In other words, it includes very generic but sophisticated artificial intelligence code yet it does not know what game it is playing.

Derive the following extra concrete class from the base class

- **EightPuzzle** class will play the https://en.wikipedia.org/wiki/15_puzzle_game_for_a_4x4_board.

Write your driver function that shows that your solution is the best solution is possible for all the games.

Write a report about your intelligent function algorithm. You should submit a PDF file as your report.

Notes:

- All the notes for HW5 is valid for this homework
- This is a bonus 30 points for HW5. We will not grade your bonus homework if your grade is less than 80 for HW5.
- Submit all source code, PDF report and result text files.