Class Diagram for the Jigsaw Puzzle

Learn to create a class diagram for the jigsaw puzzle using the bottom-up approach.

We'll cover the following

In this lesson, we'll identify and design the classes, abstract classes, and interfaces based on the requirements that we have previously gathered from the interviewer in our jigsaw puzzle.

Components of a jigsaw puzzle

As mentioned earlier, we should design the jigsaw puzzle using a bottom-up approach.

Side

The `Side` class represents the shape of our jigsaw piece and whether it contains an indentation, extrusion, or flat edge. The UML representation of the class is shown below:

The class diagram of the Side class

R2: Jigsaw Puzzle

R2: All pieces will have four sides that can either have an indentation, an extrusion, or a flat edge.

Piece

The `Piece` class contains an array of sides of size four. It will also be used to identify middle pieces, corner pieces, and edge pieces. The class representation of the `Piece` class is provided below:

The class diagram of the Piece class

R2, and R3: Jigsaw Puzzle

R2: All pieces will have four sides that can either have an indentation, an extrusion, or a flat edge.

R3: There are four corner pieces, some edge pieces, and the remaining ones are middle pieces. A corner piece has two flat sides, an edge piece only has one flat side, and a middle piece is one that does not have any flat edge.

Puzzle

The `Puzzle` class represents the board of our jigsaw game. Since our board is a rectangle, it will be represented by a 2-D array. There will be a 1-D array to represent the unused free pieces yet to be inserted into the puzzle board. It will also have the `insertPiece()` function to insert the piece into the board, which will first ensure that the piece being inserted is unique from its counterparts and only then place the piece in the specified row and column.

> **Note:** Since the puzzle board does not have the functionality of rotating pieces yet, all pieces need to be unique to fit into the board and solve the puzzle.

This class is represented below:

The class diagram of the Puzzle class

R1, and R4: Jigsaw Puzzle

R1: Our board will be in the shape of a rectangle.

R4: All pieces will be unique, so only one piece will fit with only one other piece.

Puzzle solver

The `PuzzleSolver` class is responsible for solving an unsolved jigsaw puzzle board using its `matchPieces()` function. The visual representation of this class is given below:

The class diagram of the PuzzleSolver class

R5: Jigsaw Puzzle

R5: Two pieces fit together by the curvature of the indentation on one piece matching up to the curvature of the extrusion on another.

Edge enumeration

The `Edge` enum describes the various edges present in a jigsaw puzzle piece. It is represented using the class diagram given below:

The class diagram of the Edge enum

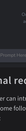
Relationship between the classes

Now, we'll discuss the relationships between the classes we have defined above in our jigsaw puzzle.

Association

The class diagram has the following association relationships:

- The `Puzzle` has a one-way association with `PuzzleSolver`.



The association relationship between classes

Composition

The class diagram has the following composition relationships:

- The `Puzzle` class is composed of the `Piece` class, which is composed of the `Side` class.

The composition relationship between classes

Class diagram for the jigsaw puzzle

Here's the complete class diagram for our jigsaw puzzle:

The class diagram of the jigsaw puzzle

Design pattern

In the jigsaw puzzle, there is only one instance of the puzzle board. Therefore, we use the Singleton design pattern to ensure that only one instance for the board is created using a special creation method, and this instance has a global point of access.

AI-powered trainer

At this stage, everything should be clear. If you encounter any confusion or ambiguity, feel free to utilize the interactive AI-enabled widget below to seek clarification. This tool is designed to assist you in strengthening your understanding of the concepts.

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20 Prompts Remaining

Prompt AI Widget

Our tool is designed to help you to understand concepts and ask any follow up questions. Ask a question to get started.

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Additional requirements

The interviewer can introduce some additional requirements in the jigsaw puzzle, or they can ask some follow-up questions. Let's see some examples of additional requirements: