

DESIGNING 2D PUZZLE GAME TITLED "IMPRESA" USING SEQUENTIAL STRUCTURE ON PC PLATFORM Rinaldi Revivo¹, Jeanny Pragantha,² Darius Andana Haris³

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ABSTRACT

Impresa is a 2D singleplayer game with a puzzle genre using a mouse. This game will be made using Unity as the game engine and C# as the programming language. The design of this game will be made using Aseprite. The goal of this game is to complete stages by moving from the starting point to ending point and completing the stage requirements. Player moves by inputting element variants. This game has 5 difficulty levels with 10 stages each. Score in this game is based on how many elements are used for each stage. Each stage of this game can be played multiple times and the score taken is the completion with the fewest elements used.

Keywords: Aseprite, C#, Impresa, Puzzle, Unity

1. INTRODUCTION

Human activities every day are tied to technology. Technology has many benefits, one of which is to eliminate the boredom felt by humans. One of the technologies developed to overcome boredom is the field of games. Video games are complex activities that are made with learning objectives that are not only intended to entertain but are also expected to broaden knowledge[1].

Video games have a lot of genres. One of the game genres that continues to grow is the puzzle genre game. Puzzle games are games that can really motivate you and have a strong appeal. Puzzle games are a very effective medium for improving cognitive, motoric, social skills, training hand-eye coordination, logic, patience and broadening knowledge[2].

Each puzzle game has a different play style so the controls used have a lot of variety. One of the controls used can be seen in a game called LightBot. LightBot is a game based on coding where players will learn sequencing, overloading, procedures, recursive loops and conditionals[3].

2. RESEARCH METHOD

Video games serve as an engaging form of entertainment meticulously crafted through defined stages and processes. The design of a game requires a template as a foundation, yet such templates often lack standardization.

Design Methodology

This research leverages the methods laid out in "Game Design Second Edition 2004" by Bob Bates, thereby determines the scope of the game to be made.

High Concept

High concept is a brief specification of the game being designed. High Concept is used to determine the rough design of the game to be made. The game design that will be designed is in the form of:

1. Game Title : Impresa
2. Genre : Puzzle
3. Language : English
4. Target players : All ages
5. Number of players : One
6. Display : 2D
7. Game Engine : Unity
8. Programming language : C#
9. Control : Mouse

Gameplay

This stage focuses on how players will interact with the game and how the game will unfold. There are several sub-stages within gameplay, namely:

- 1 Control Design
Control design describes the tools used and how to control things in a game.
- 2 Object Design
Object design describes what are the objects and their uses are contained in a game. Objects can be important objects that can be controlled or used by players and supporting objects that exist as background supports in a game.
- 3 Level Design
Level design describes the design of the levels that must be completed by players in the game. The level design is made according to the plan so that players can solve problems smoothly.
- 4 Sound Design
Sound design describes the sound used in the game. The sound that fills the game is in the form of background sound and sound effects.
- 5 Score Design
Desain skor menjelaskan mengenai memunculkan perhitungan dari hasil yang sudah didapatkan oleh pemain.

Story

This game is an abstract game that has no storyline. This game presents a collection of puzzles where players solve problems that the higher the level, the more complicated the solution.

Audience

The game “Impressa” is designed to be played by all ages. This game is recommended for players who can operate a mouse and keyboard because both of these hardware devices are required to play the game.

Hardware and Software

To design and play the game “Impressa”, hardware and software are needed. Details regarding the hardware and software specifications used are:

1. Processor : AMD Ryzen 5 3600 6-Core Processor, 3600Mhz
2. RAM : 12 GB
3. VGA : NVIDIA GeForce RTX 2060 SUPER
4. HDD : 1 TB
5. HDD : 500 GB
6. Other hardware and software : Mouse, Aseprite, Unity

Puzzle Game

Puzzle are a mechanism used in games to make players stop and think. Puzzle problems are made as fun as possible which makes puzzle can stand as a genre. Good design puzzles follow certain principles. Here are the 10 principles of puzzle design from “The Art of Game Design: A Book of Lenses” by Jesse Schell.

1. Make the goal easily understood: Puzzles that are made must have a clear purpose. If the player doesn't know what to do, the player may lose interest in continuing the game.
2. Make it easy to get started: When the player already knows the purpose of a puzzle, the player will start to complete the puzzle. In making repetitive puzzles, the puzzle starts with an easy level and then continues with a more difficult level.
3. Give sense of progress: In the process of solving puzzles, players sometimes cannot complete a puzzle. Therefore, players need to be given a thought that the puzzle being made is getting closer to the required completion.
4. Give sense of solvability: In addition to a sense of progress, players need to be convinced that puzzles can be solved. This is needed to make players not have the thought that the time spent is wasted.
5. Increase difficulty gradually: Puzzles that use the same solution will bore players. Therefore, the difficulty of the games that are made needs to be increased gradually to make players feel challenged in solving puzzles.
6. Parallelism lets the player rest: Puzzles make players stop and think. One problem that can occur is when the player cannot think of solving the puzzle so the player will leave the game. To prevent this, players are given more than one level so players can work on other puzzles first.

7. Pyramid structure extends interest: Pyramid structure has the notion of a series of small puzzles that provide some sort of clue to a larger puzzle. This gives players short term goals and long term goals.
8. Hints Extend interest: When players are about to give up on doing a puzzle, timely clues can give players hope and increase their curiosity in solving puzzles.
9. Give the answer: A good puzzle is when a player understands and completes a puzzle, the player gets satisfaction with the completion. This experience is obtained not because the puzzle is completed but when the player sees the answer to the puzzle.
10. Perceptual shifts are a double-edged sword: In solving a puzzle, sometimes players have the wrong thoughts in solving the puzzle. When players are able to make a change in perception of a puzzle, they will get satisfaction and complete the puzzle.

3. RESULTS AND DISCUSSIONS

The game "Impresa" is a 2-dimensional puzzle game that is played as a single player by utilizing a sequential structure. The goal of the game is to walk from the start tile to the finish tile using inputs called elements. Elements are a collection of symbols that contain a variety of moves that players can use to clear a stage. The stage in this game has many ways of completion so that players can complete the stage in different ways.

The State Transition Diagram (STD) of this game describes the gameplay and transitions between states which can be seen as follows.

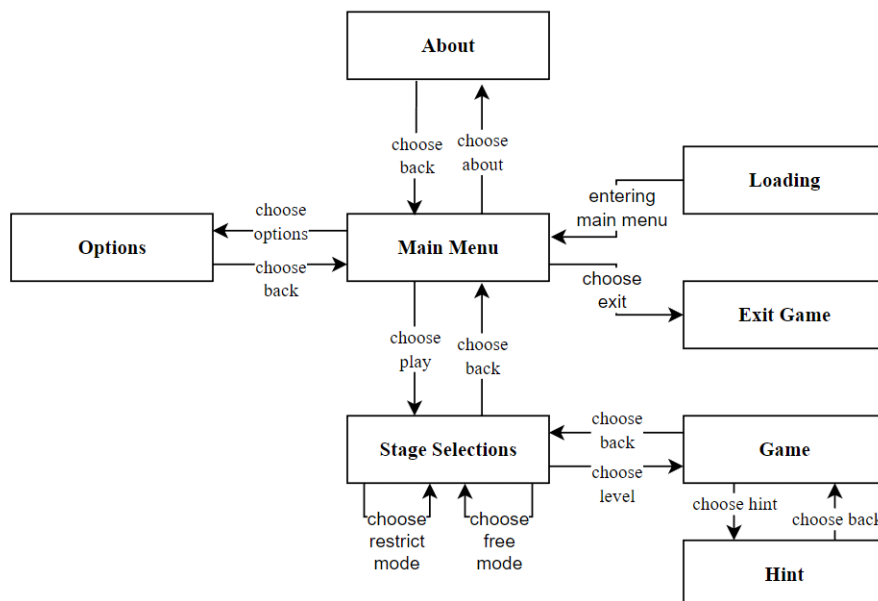


Figure 1. State Transition Diagram Design

Display Design

Based on the state transition diagram above, the display design of the game can be seen in Figure 2 to Figure 7.

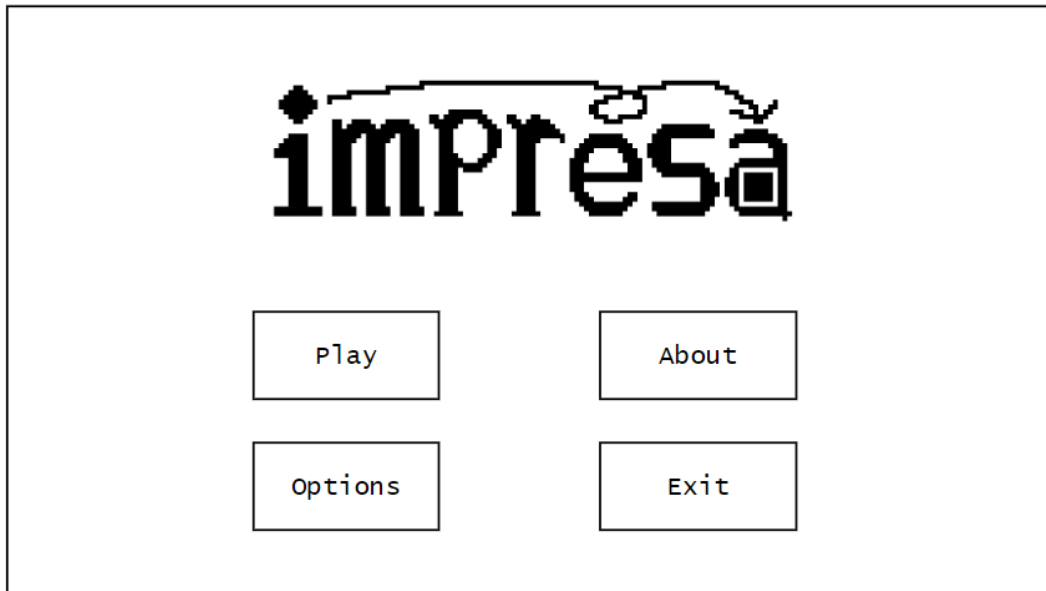


Figure 2. Main Menu Module Design

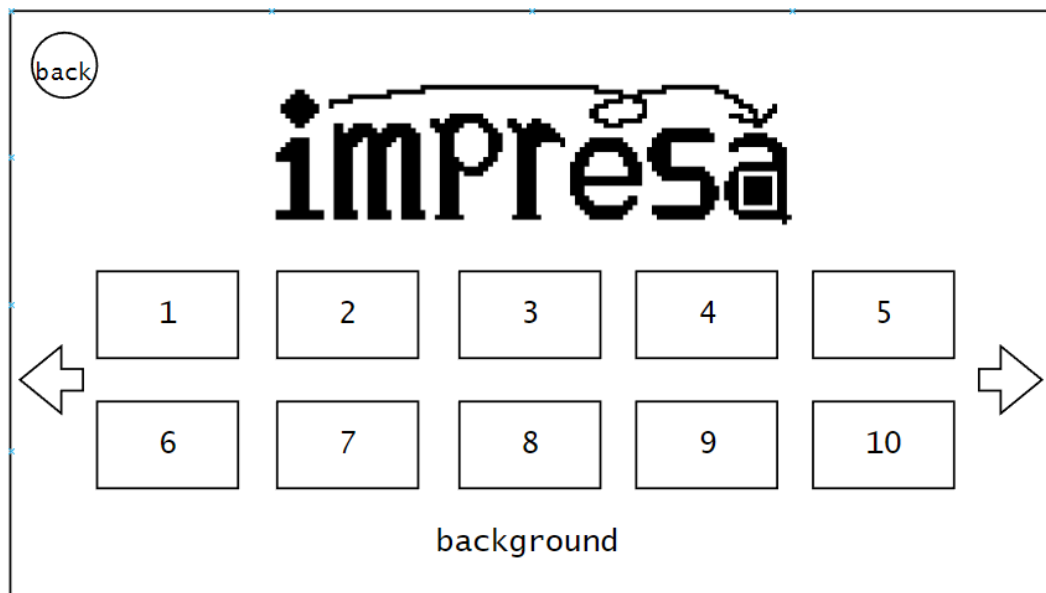


Figure 3. Stage Selection Module Design

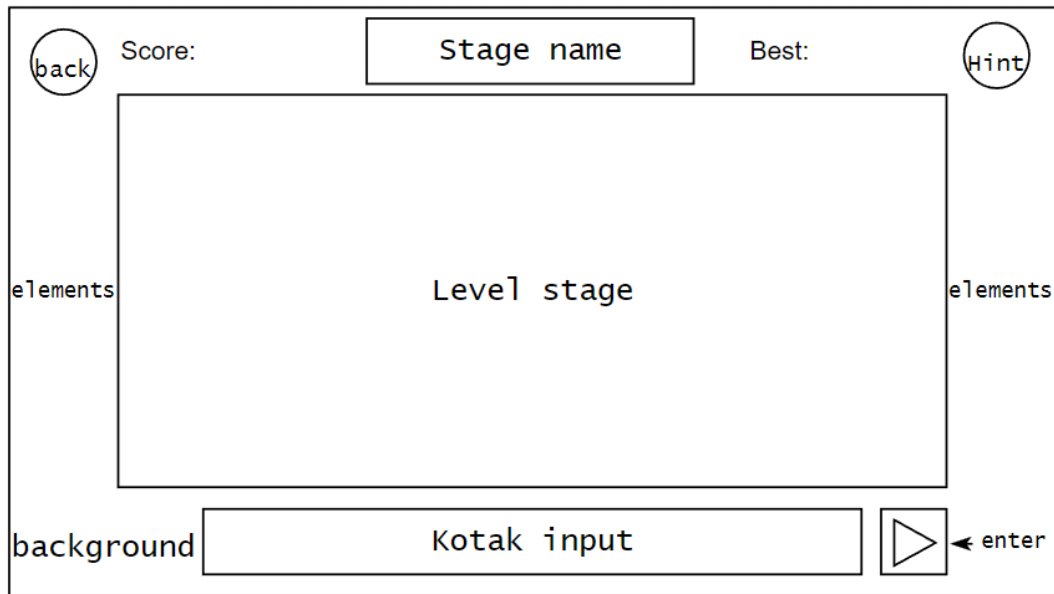


Figure 4. Game Module Design

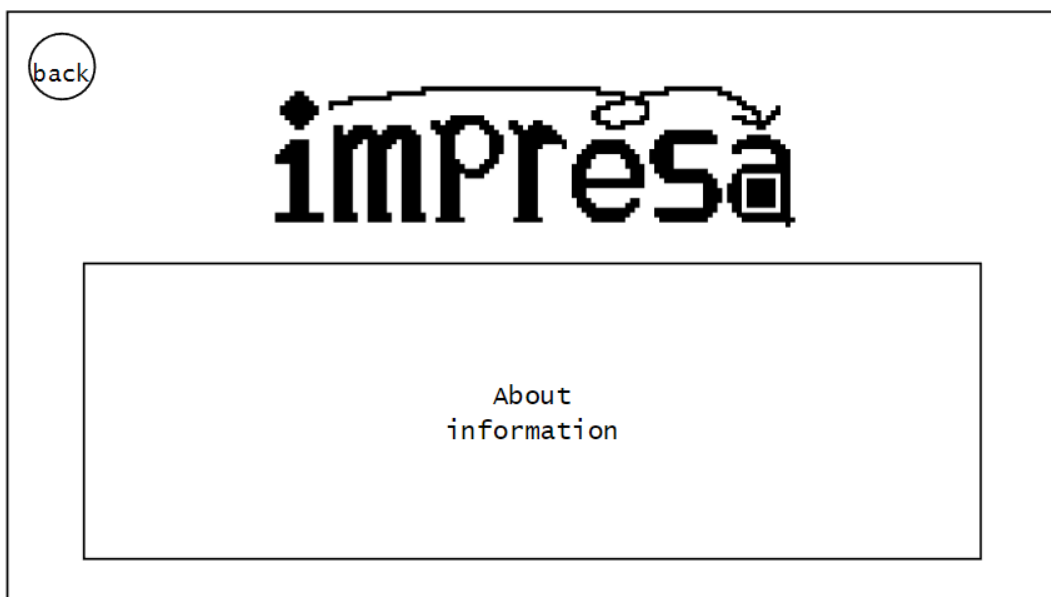


Figure 5. About Module Design



Figure 6. Options Module Design

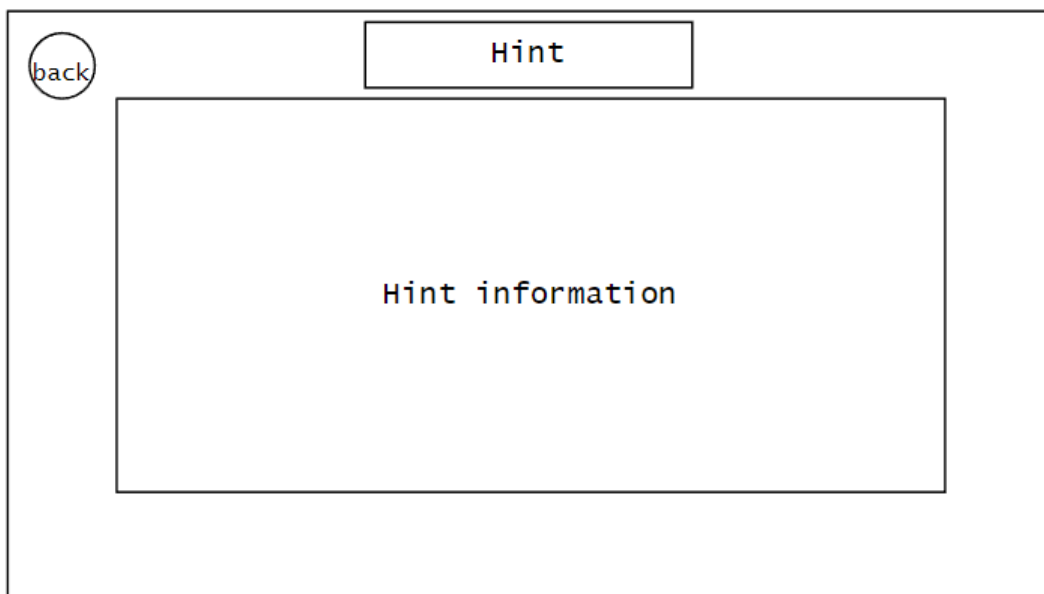


Figure 7. Hint Module Design

The explanation of the module display design is as follows:

1. Main Menu Module

The display of the main menu module is the display that appears when the player enters the game. This view displays the game title "Impressã" and the buttons that must be pressed such as play, about, options and exit.

2. Stage Selections Module

The appearance of the stage selections module is the display that appears when the player selects the play button on the main menu module. This module displays playable stages and a back button to return to the main menu module.

3. Game Module

The game module display is the display that appears when the player selects a level in the stage selections module. This module features puzzles, level scores and a back button to return to the stage selections module.

4. About Module

The about module display is the display that appears when the player selects the about button on the main menu module. This module displays information about the game maker and a back button to return to the main menu module.

5. Options Module

The options module display is the display that appears when the player selects the options button on the main menu module. This module is used to increase or decrease the sound of the game.









6. Hint Module

The hint module display is the display that appears when the player selects the hint button in the game module. This module is made to assist players in completing a stage. This module displays 3 things that are covered, namely the number of ways of solving, the score with the use of the fewest elements, and several examples.

Control Design

The control used in the game "Impressa" is the mouse. The mouse is used to navigate the game and as a control to move from the start to the end tile. The input used to play is in the form of letters and symbols from the game title. Player moves are counted as steps where each move is one square. The controls used can be seen in Table 1.

Table 1. Control Design Impresa

Function	Elements
One step forward	
Rotate 90° to the right	
3x next element	
Two step forward, rotate 90° to the right, two step forward	
One step forward, rotate 90° to the right, one step forward	
One step forward, rotate 90° to the right, three step forward	
Mirroring 1 next element	
Input elements	

Object Design

Objects in the game "Impressa" are supporting objects that are used to solve puzzles. There are 5 objects used, namely:

1. Start

Start is the starting tile of player movement. Start always starts facing up and can be seen with a round shape. The shape of the start can be seen in **Figure 8**.

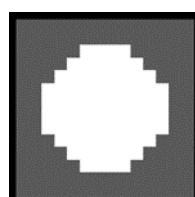


Figure 8. Start Object Design.

2. Wall

Walls are tiles that players cannot pass when moving. Wall can be seen with a triangular shape. The shape of the wall can be seen in **Figure 9**.

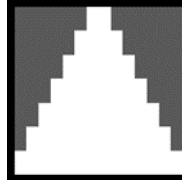


Figure 9. Wall Object Design.

3. Star

Stars are tiles that must be passed by the player before touching the final square. Star can be seen with the shape of a star. The shape of the star can be seen in **Figure 10**.

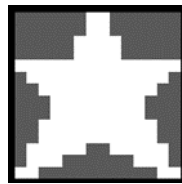


Figure 10. Star Object Design.

4. Bridge

Bridges are tiles that can be passed by the player two times. Bridge can be seen with the shape of a cross. The shape of the bridge can be seen in **Figure 11**.

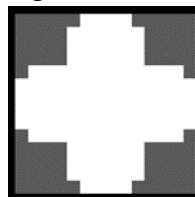


Figure 11. Bridge Object Design.

5. Finish

Finish is the final tile that must be touched in solving the puzzle. Finish can be seen with a square shape. The shape of the finish can be seen in **Figure 12**.

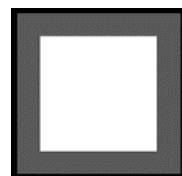


Figure 12. Finish object design.

Level Design

The levels in the game "Impressa" are divided into 4 parts which are measured by the difficulty levels, namely easy, medium, hard, insane and 2 modes which are free and restriction. Each level section is distinguished using different colors and music. The details of each level section can be seen as follows:

1. Easy

The easy difficulty level has a pastel green background with the RGB color codes 119, 221 and 119. The easy level uses music as a backdrop under the name puzzle-game-1. Easy level display can be seen in **Figure 13**.

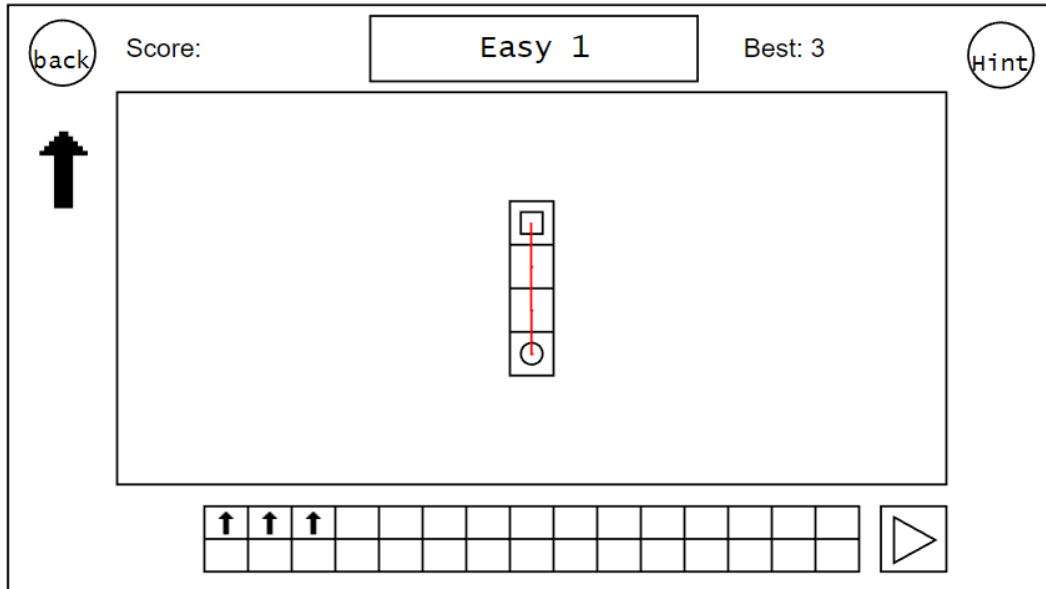


Figure 13. Mode Free Level Easy Stage One

2. Medium

The medium difficulty level has a pastel yellow background with the RGB color codes 244, 238 and 177. The medium level uses music as a background with the name puzzle-game-2. The medium level display can be seen in **Figure 14**.

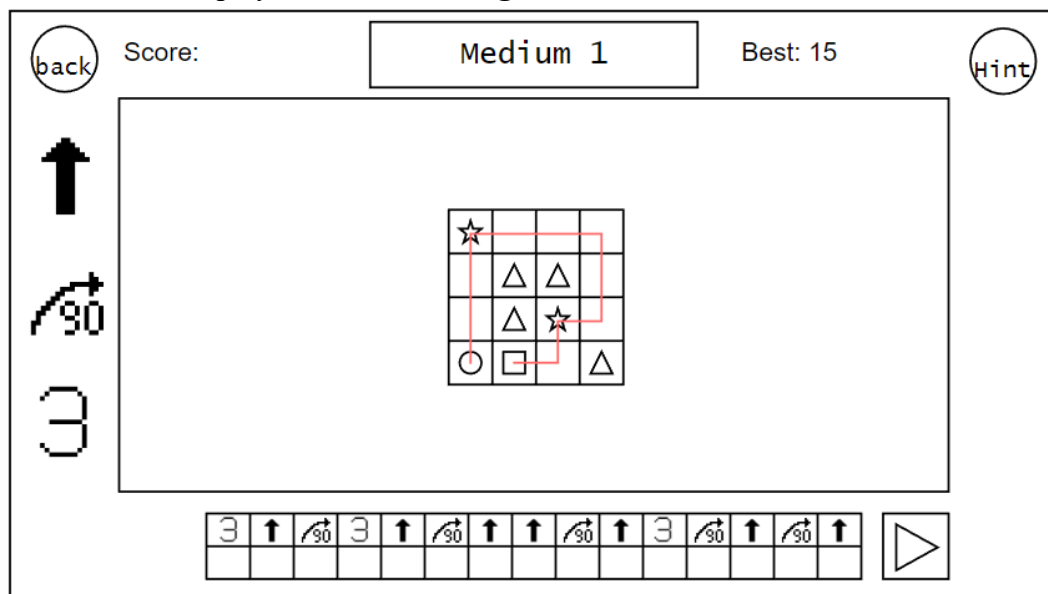


Figure 14. Mode Free Level Medium Stage One

3. Hard

The hard difficulty level has a bright coral background with the RGB color codes 240, 128 and 128. The hard level uses music as a backdrop under the name puzzle-game-3. Hard level display can be seen in **Figure 15**.

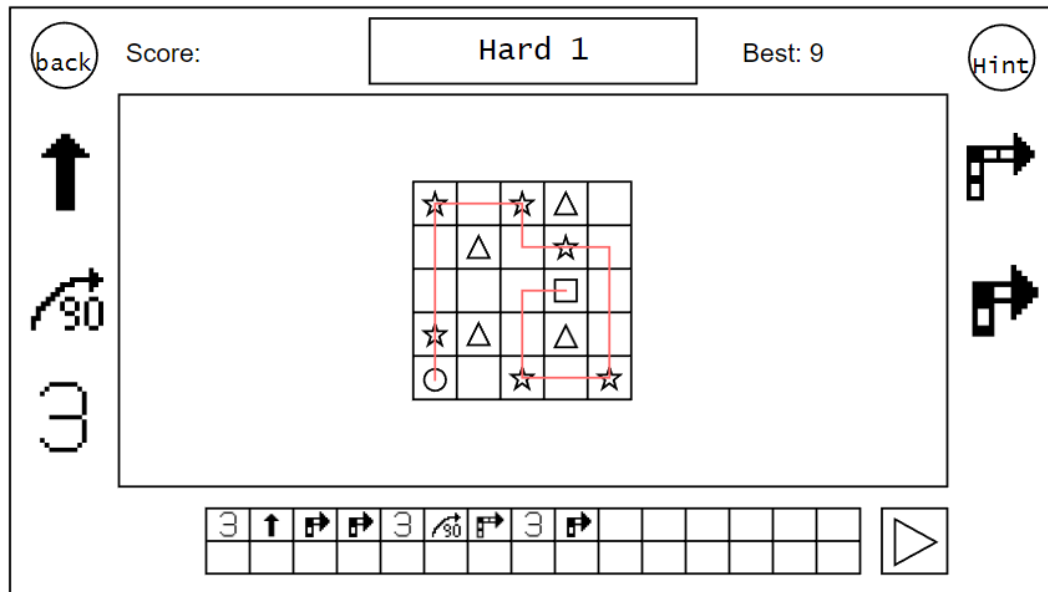


Figure 15. Mode Free Level Hard Stage One

4. Insane

The insane difficulty level has a dark gray background with the RGB color codes 90, 90 and 90. The insane level uses music as a backdrop under the name puzzle-game-5. The insane level display can be seen in **Figure 16**.

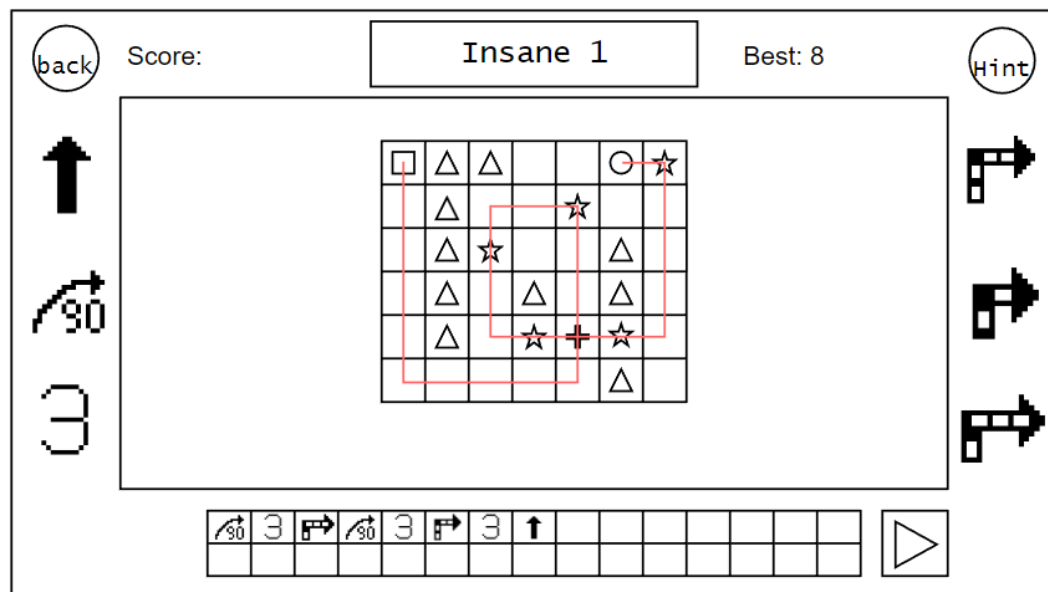


Figure 16. Mode Free Level Insane Stage One

Sound Design

Sound is a supporting element to fill the sound in a game. The voice used in the game "Impressa" can be seen in **Table 2**.

Table 2. Sound Design Details.

Song name	Used in	Source
Game-Menu	<i>Main menu, about, options, stage selections</i>	https://soundimage.org/puzzle-music/
Puzzle-Game	<i>Game difficulty easy</i>	https://soundimage.org/puzzle-music/
Puzzle-Game-2	<i>Game difficulty medium</i>	https://soundimage.org/puzzle-music/
Puzzle-Game-3	<i>Game difficulty hard</i>	https://soundimage.org/puzzle-music/
Puzzle-Game-5	<i>Game difficulty insane</i>	https://soundimage.org/puzzle-music/

4. CONCLUSIONS AND SUGGESTIONS

“Impresa” is a 2D puzzle game using sequential structure. This game can be played online or offline where players complete stages of puzzle. The purpose of this game is to create a 2-dimensional puzzle game on a PC platform that can accept input and has more than one solution in solving problems.

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