Puzzly Patternz

Reference Manual

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GG Garage

Table of Contents

Executive Summary

Ever since the 1980s, video games have been an extremely popular hobby for both children and adults alike, being a large aspect of social culture. People of all ages enjoy bonding over playing games with their friends both online and at home. However, many of these games are created without taking into account people with disabilities, specifically children suffering from ASD and lacking a strong cognitive comprehension. Noticing that many games lack accommodation for these children, the Genteel Gaming Garage division within G3 Studios decided to produce the video game *Puzzly Patterns* in order to cater towards children with ASD while also being fun and enjoyable for all demographics. Our team has been working over the past few months in order to develop an enjoyable way to help enhance cognitive development through the concept of solving puzzles in a unique way, creating both random shapes and animals.

There is one main gamemode: puzzle matching. Here, the player chooses from a range of levels in increasing difficulty, either choosing levels from the “random theme” or the “animal” theme. The user must beat each puzzle in order to unlock the subsequent puzzle. The goal of each puzzle is to take each piece on the board and match them on the correct tile within an outline. In addition to moving the puzzle pieces to the correct spot, the user is striving to search for the fabled “collectable”, a symbol of completing a whole set of puzzles. In order to make sure the user is not frustrated, the Genteel Gaming Garage designed the innovative hint button, which will show the user where to place a piece of the puzzle, often a piece that is hard to figure out the placement of. In addition, in order to reward the user, we created a congratulations screen to celebrate their accomplishment and encourage them to to continue pressing onwards throughout the levels, putting their mind to the test due to the ever increasing difficulty of puzzles. Lastly, the game has a foundation based upon “Universal Design” and in order to stay true to those roots, the game has a settings screen that gives the user to change the volume of the game and select a song ranging from intensity, allowing the user to change the amount of pressure they feel.

This reference manual delves deeper into the implementation of these key features and how to use them effectively in order to have the best user experience.

Introduction

The purpose of this manual is to describe the game *Puzzly Patternz*, how it was made, and the inspiration/purpose behind its creation. The manual contains a game overview that outlines the intended audience of the game, the objectives that the game will accomplish, and the expectations for the experience of playing the game. Another section of the manual is devoted to the game design and illustrates the coding approach to the project and provides a modular

breakdown of the game where some of the screens encountered in the game are analyzed in greater detail. Then, there is an installation guide and conclusions for the game. Also included are appendices that document a coding sample and UML diagrams that represent the game more abstractly.

This manual was written to be used by anyone who interacts with the game *Puzzly Patternz*, but especially for parents or caretakers of ASD individuals, if applicable. This manual may also be of use to the players themselves or other customers of this product.

G3's Mission and *Puzzly Patternz*

G3 Studio's mission is to create a video game that helps children with Autism Spectrum Disorder (ASD). *Puzzly Patternz* is to improve the cognitive skills of children with ASD by providing a complex game that challenges them to think abstractly.

Overview of the Game

Intended Audience

Puzzly Patternz is primarily targeted towards children with Autism Spectrum Disorder (ASD), although it is an entertaining game for anyone to play. The ages suggested for playing the game range from 10-18. The game may be challenging for players who are under the age of 10, but may be a fun diversion for anyone, even beyond the age of 18. Beyond specific accommodation for those affected by ASD, the game is focused on improving cognitive ability and ability to think abstractly to solve problems.

Objective and Experience

The objective of the game is to complete all the levels in the game. In each level, there are two large rectangles on the screen. In the top box is a shape in gray boxes that makes up the target for colorful pieces from the bottom box to be dragged onto. Once all the gray boxes are filled by the colorful pieces, the level is complete, and the congratulations screen appears. There are 6 of these levels in 2 different themes to complete. Hopefully the earlier puzzles are not too hard and encourage the player to move on to later, harder puzzles. The hard puzzles should take significantly more time to complete and feel rewarding once the solution is found. At any time, if the stress is too great, the hint provided may be able to help. In addition, there is an optional side quest tasked to the user to find hidden collectables, a secret item present in two of the twelve puzzles in the game. If the user is stuck on a level, they can use a "cheat" by pressing the "**f3**" key on the bottom right corner of the level select screen to unlock all levels.

Fulfilling G3's Mission

The mission of G3 Studios is to create engaging video games with the purpose of being inclusive while developing games to provide entertainment to the largest audience possible. The particular focus for this project was to create a video game that was accessible for children with Autism Spectrum Disorder (ASD). The goal for *Puzzly Patternz* is to improve the cognitive skills of children with ASD by providing a game that invites them to think creatively and allows them to challenge themselves. Especially important in the creation of *Puzzly Patternz* was making the game fun for all audiences to play, and then giving special attention to accommodate those with ASD.

Experience Narrative

The following is a hypothetical walkthrough of the game, as experienced by a player:

As I start up *Puzzly Patternz*, I'm presented with a main menu with 4 different buttons on it-- "Play", "Tutorial", "Settings", and "Level Select." I also hear calming music playing. I decide to start off by clicking on the "Settings" button, particles following my mouse as I drag over to it.

I am presented with a screen with five different buttons of song options. I listen to a bit of each song and decide on the one I like best. I adjust the volume as well, so it's not too loud. Then, I click on the arrow that takes me back to the home screen. This time, I decide to click the play button.

I see two gray boxes. The bottom box is filled with colorful puzzle pieces, all shaped like T's but rotated differently. The box above has a light gray puzzle board made out of smaller little squares. I also notice a plane fly in from the left of the screen and fly across the board until it exits out the other side. I click and hold down on one of the puzzle pieces, and a colorful splash animation goes off as I lift the puzzle piece and am able to drag it with my mouse. I drag the puzzle piece onto a spot on the board where it is able to fit, creating another splash animation with a snapping sound as it snaps into place.

I have one final puzzle piece left, and can tell it will fit perfectly into the final remaining spot on the board. As the final piece snaps in, I'm brought to another screen.

I immediately hear clapping on the new screen. There is text that says "Congratulations!!! You are the Puzzle Master!," as confetti falls from the top of the screen. I'm presented with two options, a button to go back to the main menu, and a button to continue onto level 2. I choose to continue on to level 2.

I continue on through multiple levels of the puzzle, increasingly difficult each time, sometimes clicking the hint button on the right which displays a flashing yellow outline on the board where one of the pieces should be placed. After reaching level 6, I see an airplane in the right corner. I click on it and all of a sudden a message appears: "Collectable Found!" I am very excited to complete part of the side quest of getting all collectables. After completing level 6, I'm given the option to return to the main menu or go to "Level Select". I go to level select where I see 2 themes of levels to choose from. I first click on the random shape theme which brings me to a page with all 6 levels unlocked, the ones I had just done, so I click the return button to go back. I

choose the animal theme and am brought to a screen with level 7 unlocked, while level 8 through 12 are still locked. I continue playing, but this time I'm making animals!

Game Design Reference

Coding Approach

The Genteel Gaming Garage utilized the incremental design process model in coding our game. We began the project by creating a list of what accommodations we might want to account for when designing a puzzle game for children with Autism Spectrum Disorder. In addition we compiled a list of features that would address these accommodations such as sound confirmations, intuitive controls, rewards, settings and tutorials and designated these as necessary features for our Alpha release. The Genteel Gaming Garage then transitioned to designing the code for the game *Puzzly Patternz*, attempting to implement all our features into this version. Once we designed our features, the Genteel Gaming Garage then went back to refine each of the features. In order to make the controls more intuitive, the Genteel Gaming Garage added a method of having the object "snap" onto the nearest open space. In addition, we added visual effects to make the reward more meaningful and fleshed out the tutorial. We kept this process of designing and testing until our Alpha Release where we delivered the first version of our game to the public. After gathering feedback, the Genteel Gaming Garage went right to work on fixing bugs and adding features to enhance the gameplay experience. This continued our incremental design process where we wrote new code, now regarding hints and random events within levels, and improving on them until the team was satisfied to present this product at the Beta Release Party.

The incremental design process was definitely the best approach for our game because it allowed us to be very flexible with adding features and ensuring that they work properly before moving onto adding new features. This approach made sure that each feature added was fleshed out and valuable and it gave us time to take in feedback and add new features if needed.

Game Modules

On the next few pages, each screen of the game is broken down in detail, with an explanation of the screen and a description of each feature that appears in the screen.

Main Menu Screen

The main menu, shown in **figure 1**, is the first screen that appears when a player starts the game. The game name is displayed in the middle of the screen, while there are buttons in each corner, when left clicked, that allow the player to start the game, go to the tutorial, go to the level select screen, and go to settings.

Figure 1: Main Menu Screen

Main Menu Screen Components:

Play Button: Take the play to the 1st level, where they can begin the game.

Tutorial Button: Takes the player to the tutorial level, where they can see how to play the game.

Level Select Button: Takes the player to the level select page, where they can then choose which type of level they want, the random shape levels or the animal-themed levels.

Settings Button: Takes the player to the settings page, where they can choose the song playing in the background and adjust the volume.

Exit Button: Signified by a large X, if this button is clicked, the game returns to the desktop.

Settings Screen

The settings screen, shown in **figure 2**, appears when the player left clicks the "settings" button on the main menu screen. On this screen, the player is presented with 5 song buttons. Each button, when left clicked, plays a different song. There is a music volume up and down button, as well as a sound volume up and down button, so the player can adjust the separate sounds as wanted. There is also a backwards arrow button that allows the player to return to the main menu when left clicked.

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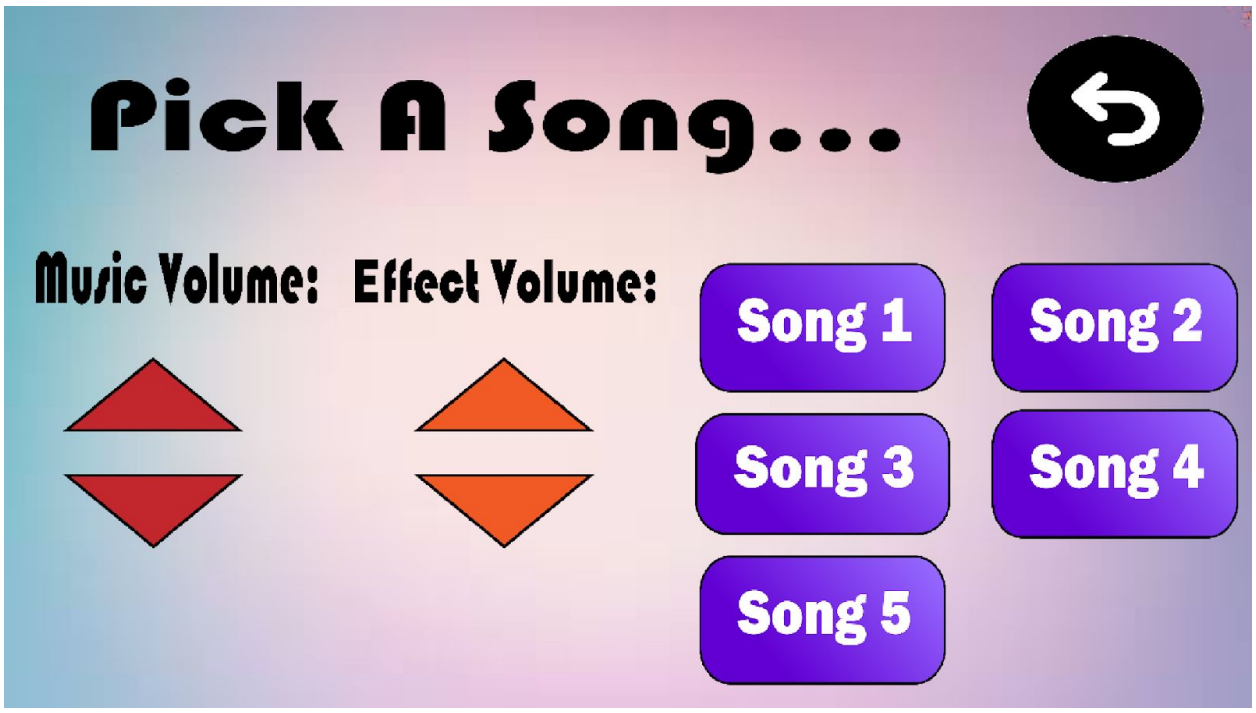

Figure 2: Settings Screen

Settings Screen Components:

Song 1-5 Buttons: Changes the music to the respective song selected.

Backwards Arrow Button: Takes the player back to the home screen.

Music Volume Up Button: Increases the volume of the game music.

Music Volume Down Button: Decreases the volume of the game music.

Effect Volume Up Button: Increases the volume of the game's sound effects.

Effect Volume Down Button: Increases the volume of the game's sound effects.

Tutorial Screen

The tutorial screen, shown in **figure 3**, appears when the player left clicks the "tutorial" button on the main screen menu. There is a text box that explains to the player how to play the game. There are puzzle pieces on the bottom in the puzzle board box that can be dragged up onto the puzzle board in the puzzle board box. The hint button displays a yellow outline on the board of where one of the pieces go. The circular arrow button in the bottom right resets the pieces/room. There is a plane that slowly flies across the screen as a distraction. There is also a main menu button that allows the player to return to the home screen when left clicked. Filling in all the puzzle pieces onto the board completes the level and moves the player to the congrats screen.

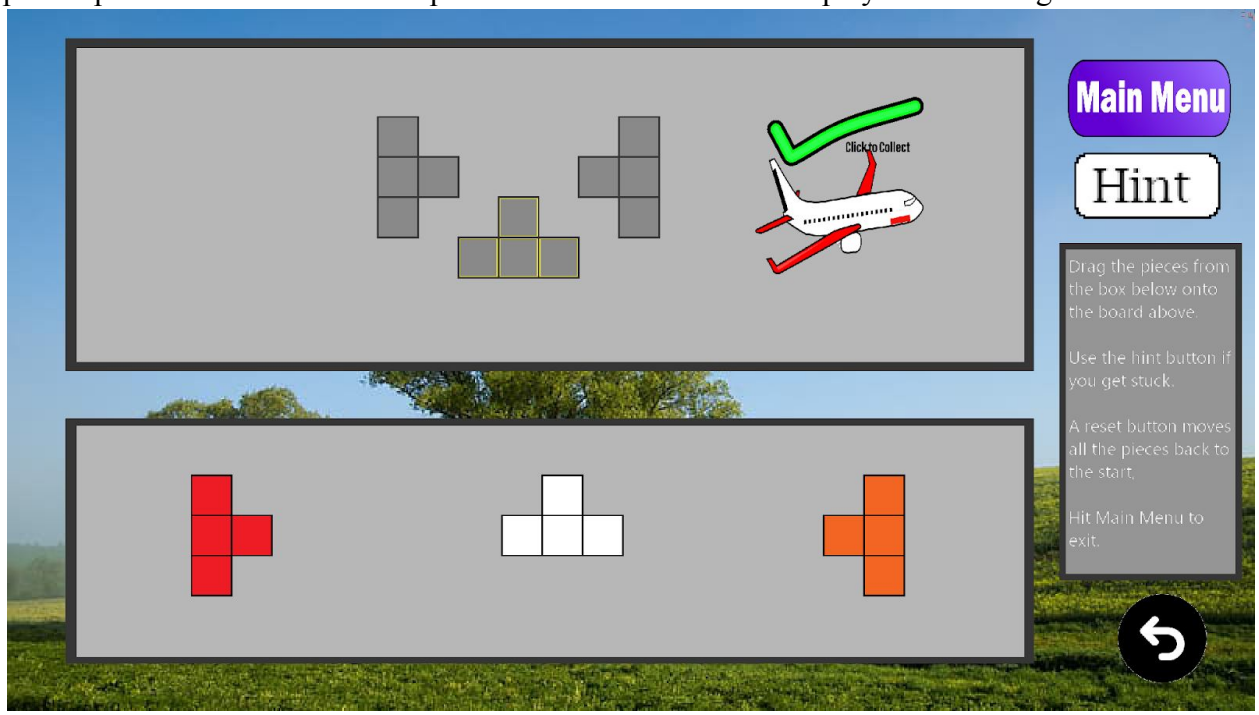

Figure 3: Tutorial Screen

Tutorial Screen Components:

Game Explanation Text Box: Describes to the player how to play Puzzly Patternz and what the buttons do.

Puzzle Pieces: Can be dragged onto the puzzle board to fill out the puzzle.

Puzzle Piece Box: The box the puzzle pieces begin in.

Puzzle Board: The board that is to be fully filled with puzzle pieces.

Puzzle Board Box: The box the puzzle board is in.

Hint Button: Gives a hint by displaying a yellow outline on the board to show where a piece goes.

Reset Level Button: Resets the room so the puzzle pieces are back to where they originally were.

Main Menu Button: Takes the player back to the home screen.

Collectable Airplane: Provides an example of a collectable within the actual game. Can be collected by clicking with your left mouse button.

Level Theme Select Screen

The level theme select screen, shown in **figure 4**, appears when the player left clicks the "level select' button on the main menu screen. On this screen, the player is presented with 2 theme options, "random", "animal." The player can left click any of these to be taken to the respective level select screen for each theme. There is also a main menu button that allows the player to return to the home screen when left clicked.

Figure 4: Level Theme Screen

Level Theme Select Screen Components:

Random Theme Button: Takes the player to the level select page for the random theme.

Animal Theme Button: Takes the player to the level select page for the animal theme.

Main Menu Button: Takes the player back to the home screen.

Random Level Select Screen

The random level select screen, shown in **figure 5**, appears when the player left clicks the "random' button on the level theme select screen. On this screen, the player is presented with buttons to take the player to levels 1-6. Unlocked levels appear purple, while locked levels appear gray. If you complete a level, the next level becomes unlocked. The player can left click any of the unlocked levels(purple buttons) to be taken to the respective level. If the level is locked(gray buttons), the button does not work. There is also a main menu button that allows the player to return to the home screen when left clicked.

Figure 5: Random Level Select Screen

Random Level Select Screen Components:

Level 1-6 Buttons Unlocked: Takes the player to the respective "random" level.

Level 1-6 Buttons Locked: Does not do anything until unlocked.

Main Menu Button: Takes the player back to the home screen.

Bottom Right Box: Hovering over this while pressing the key "**f3**" will unlock every level in the set. The levels remain grayed out but are now selectable.

Random Level Gameplay Screen

Levels 1-6 compose of the random level gameplay screens, and level 3 and 6 are shown in **figure 7** and **figure 7** respectively. There are puzzle pieces on the bottom in the puzzle board box that can be dragged up onto the puzzle board in the puzzle board box. The hint button displays a yellow outline on the board of where one of the pieces go. The circular arrow button in the bottom right resets the pieces/room. There is a plane that slowly flies across the screen as a distraction. There is also a main menu button that allows the player to return to the home screen when left clicked. Filling in all the puzzle pieces onto the board completes the level and moves the player to the congrats screen.

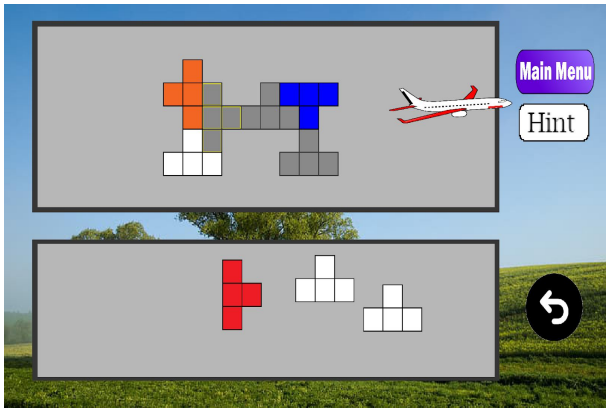

Figure 6: Random "Level 3" Gameplay Screen

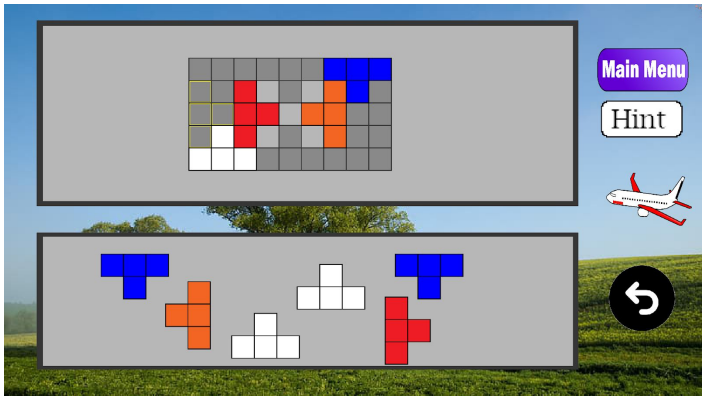

Figure 7: Random "Level 6" Gameplay Screen

Random Level Gameplay Screen Components:

Puzzle Pieces: Can be dragged onto the puzzle board to fill out the puzzle.

Puzzle Piece Box: The box the puzzle pieces begin in.

Puzzle Board: The board that is to be fully filled with puzzle pieces.

Puzzle Board Box: The box the puzzle board is in.

Hint Button: Gives a hint by displaying a yellow outline on the board to show where a piece goes.

Reset Level Button: Resets the room so the puzzle pieces are back to where they originally were.

Plane: Distraction that slowly flies across the screen.

Main Menu Button: Takes the player back to the home screen.

Collectable: Present only in the last level of a set, if the user clicks on it, a green checkmark appears, signifying that the user has got a collectable as a reward for reaching the final level of a set. This can be seen as the airplane on the right within **Figure 7**.

Congratulations Screen

The congratulations screen, shown in **figure 8**, appears when the player completes the tutorial level or any levels 1-12. On this screen, there is text that congratulates the player and gives them a compliment for completing the last level. There is also confetti falling in the background. There is a button that displays the next level and will take the player to that level if left clicked. There is also a main menu button that allows the player to return to the home screen if left clicked.

Figure 8: Congratulations Screen

Congratulations Screen Components:

Congratulations Message: Congratulates and celebrates the player for completing the previous level. This message is randomly generated from a list of encouraging phrases.

Confetti Animation: Falling confetti to celebrate the completion of the previous level.

Next Level Button: Takes the player to the next level.

Main Menu Button: Takes the player back to the home screen.

Animal Level Select Screen

The animal level select screen, shown in **figure 9**, appears when the player left clicks the "animal' button on the level theme select screen. On this screen, the player is presented with buttons to take the player to levels 7-12. Unlocked levels appear purple, while locked levels appear gray. Level 7 is unlocked when opening the game. If you complete a level, the next level becomes unlocked. The player can left click any of the unlocked levels(purple buttons) to be taken to the respective level. If the level is locked(gray buttons), the button does not work. There is also a main menu button that allows the player to return to the home screen when left clicked.

Figure 9: Animal Level Select Screen

Animal Level Select Screen Components:

Level 7-12 Buttons Unlocked: Takes the player to the respective "animal" level.

Level 7-12 Buttons Locked: Does not do anything until unlocked.

Main Menu Button: Takes the player back to the home screen.

Bottom Right Box: Hovering over this while pressing the key "**f3**" will unlock every level in the set. The levels remain grayed out but are now selectable.

Animal Level Gameplay Screen

Levels 7-12 compose of the animal level gameplay screens, and level 8 and 9 are shown in **figure 10** and **figure 11** respectively. There is a textbox that tells the player what animal they are making. There are puzzle pieces on the bottom in the puzzle board box that can be dragged up onto the puzzle board in the puzzle board box. The hint button displays a yellow outline on the board of where one of the pieces go. The circular arrow button in the bottom right resets the pieces/room. There is a plane that slowly flies across the screen as a distraction. There is also a main menu button that allows the player to return to the home screen when left clicked. Filling in all the puzzle pieces onto the board completes the level and moves the player to the congrats screen.

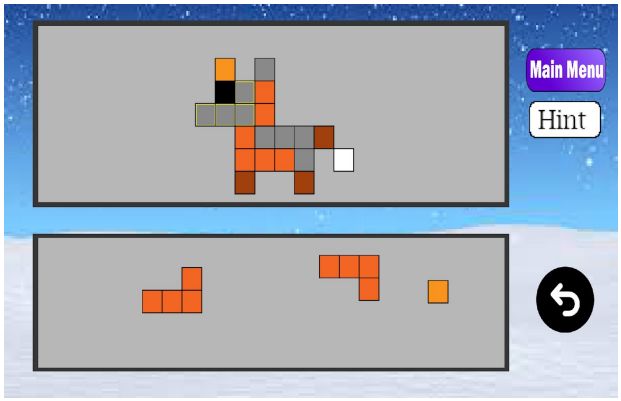

Figure 10: Animal "Level 8" Gameplay Screen

Figure 11: Animal "Level 9" Gameplay Screen

Animal Level Gameplay Screen Components:

Animal Text: Displays what animal the player is supposed to be making.

Puzzle Pieces: Can be dragged onto the puzzle board to fill out the puzzle.

Puzzle Piece Box: The box the puzzle pieces begin in.

Puzzle Board: The board that is to be fully filled with puzzle pieces.

Puzzle Board Box: The box the puzzle board is in.

Hint Button: Gives a hint by displaying a yellow outline on the board to show where a piece goes.

Reset Level Button: Resets the room so the puzzle pieces are back to where they originally were.

Snowman: Distraction that slowly strolls across the screen.

Main Menu Button: Takes the player back to the home screen.

Installation

System Requirements

OS	Windows 7 or above
Graphics	DirectX 9 compatible
Sound Card	DirectX 9 compatible
Storage	512 MB
RAM	512 MB
CPU	1.4 GHz
Resolution	2048x2048 with 16-bit colors

Installation Instructions

1. Make sure you have, and can access, the latest version and latest run version of GameMaker Studio 2 with an appropriate license. This version should be **v2.3.1.536**
2. Download the .zip or .yyz game file.
3. Save the file wherever you would like.
4. Launch the .yyp GameMaker project file.
5. Run the game by clicking the "Run" button at the top of the screen, or by pressing F5.
6. Have Fun!

Conclusion

Genteel Gaming Garage is proud to present the omega release of *Puzzly Patternz*. It was made specifically with children with Autism Spectrum Disorder(ASD) in mind, but it is a great game for anyone to play. With puzzles ranging from random shapes to animals, along with varying levels of difficulties, *Puzzly Patternz* aims to improve the cognitive skills of children with ASD by providing a complex, thought provoking, and incredibly fun game that challenges them to think abstractly. We hope that everyone enjoys *Puzzly Patternz* and thank G3 Studios for giving us the opportunity to develop this game.

In the future, we hope to continue the development of *Puzzly Patternz* and continue to make it better and more fun by developing more themes, levels, features, and fun game modes. Current ideas we have as of now include a timed gamemode where you have to complete puzzles before the timer runs out. We also hope to find fixes to current very rare bugs that we were unable to fix right now. We would also like to create versions of *Puzzly Patternz* for various devices such as iPhones, Androids, and potentially more.

Appendices

Appendix A: Coding Sample

Below is part of the code contained in the mouse left released event of every piece, executed when dropping pieces on the board. The `design` matrix contains all the squares in the piece, and the `obj_goal1.goal_design` matrix contains the spaces in the board. The `location` matrix is calculated earlier in the event and is being checked to see if it can actually be placed on the board.

```
// Checks if the place you want to drop the object is valid
if(obj_goal1.goal_design[location[0]][location[1]] == 1) {
  still_valid = true;

  // Checks if place you want to drop object is close enough to make sense
  if(least_dist > 34) still_valid = false;

  // Checks if place you want to drop object is correct
  for(row = 0; row < array_length(design); ++row){
    for(col = 0; col < array_length(design[0]); ++col){
      if(design[row][col] == 1) {
        // Outside of grid (top):
        if(row == 0 && location[0] == 0) still_valid = false;
        // Outside of grid (left):
        else if(col == 0 && location[1] == 0) still_valid = false;
        // Outside of grid (bottom):
        else if(row == 2 && location[0] == 4) still_valid = false;
        // Outside of grid (right):
        else if(col == 2 && location[1] == 9) still_valid = false;

        // Outside of goal:
        else if(obj_goal1.goal_design[location[0] +
                row - 1][location[1] + col - 1] == 0) still_valid = false;

        // Spot is already filled by other block
        else if(obj_goal1.goal_filled[location[0] +
                row - 1][location[1] + col - 1] == 1) still_valid = false;
      }
    }
  }

  // If the place is valid:
  if(still_valid) {

    // Set x and y to valid location
    x = obj_goal1.x + location[1]*_dist;
```

```
    y = obj_goal1.y + location[0]*_dist;
    // Let the goal know that spots are filled
    for(row = 0; row < array_length(design); ++row){
      for(col = 0; col < array_length(design[0]); ++col){
        if(design[row][col] == 1) {
          obj_goal1.goal_filled[location[0] +
              row - 1][location[1] + col - 1] = 1;
        }
      }
    }

    // Note that the piece is in place on board
    in_place = true;

    // Play sound effects and play graphic if the piece was grabbed
    if(grab) {
      audio_play_sound(thump, 0, 0);
      effect_create_above(ef_ellipse, mouse_x, mouse_y, 200, c_yellow);
    }
  }
}
```

Appendix B: UML Diagrams

B.1 Class Diagram

This diagram represents the class structure and relationship between various elements of *Puzzly Patternz*.

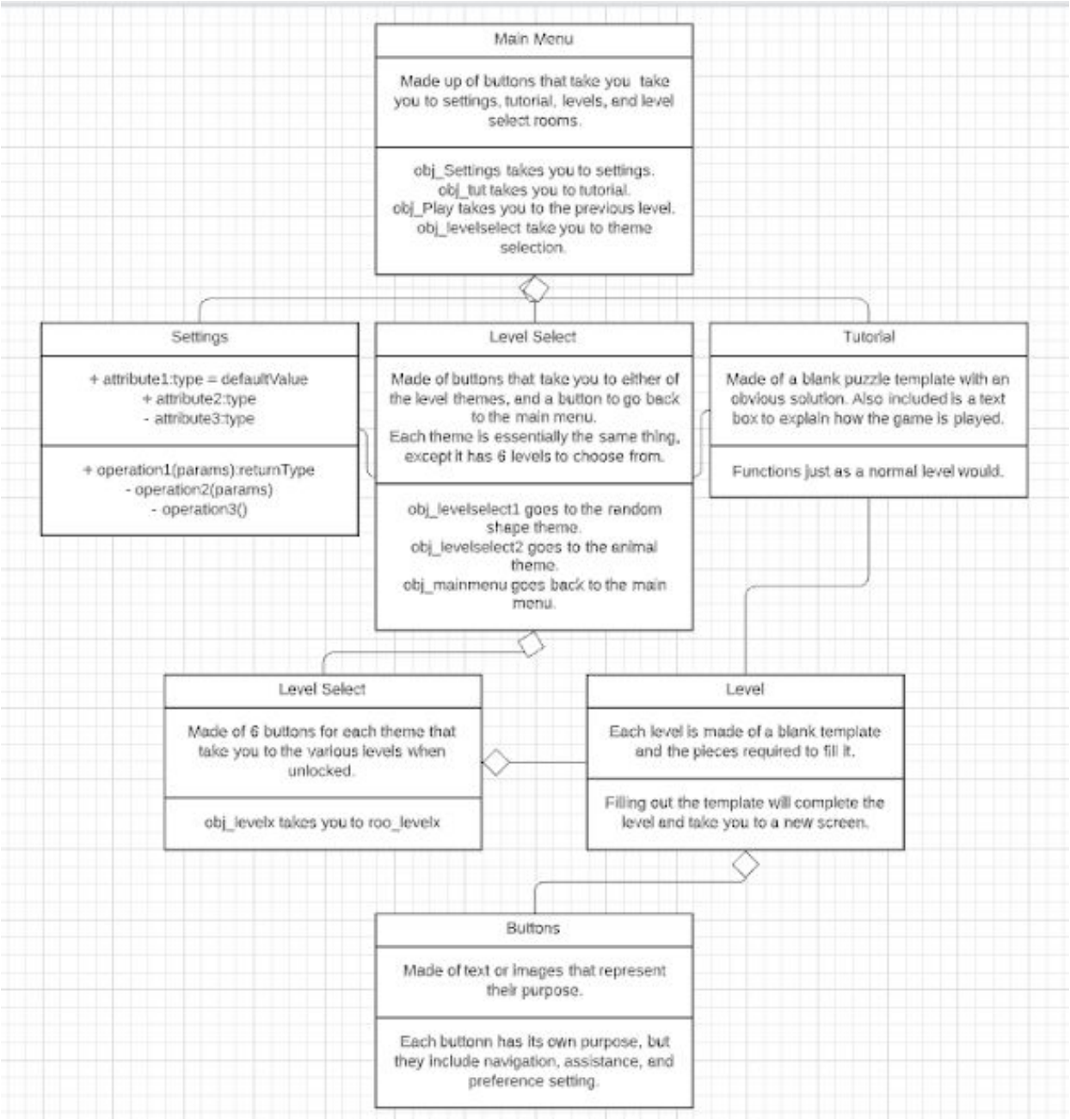

Figure B.1

B.2 State Chart Diagram

Figure B.2 represents the various states of *Puzzly Patternz* and the navigation between them.

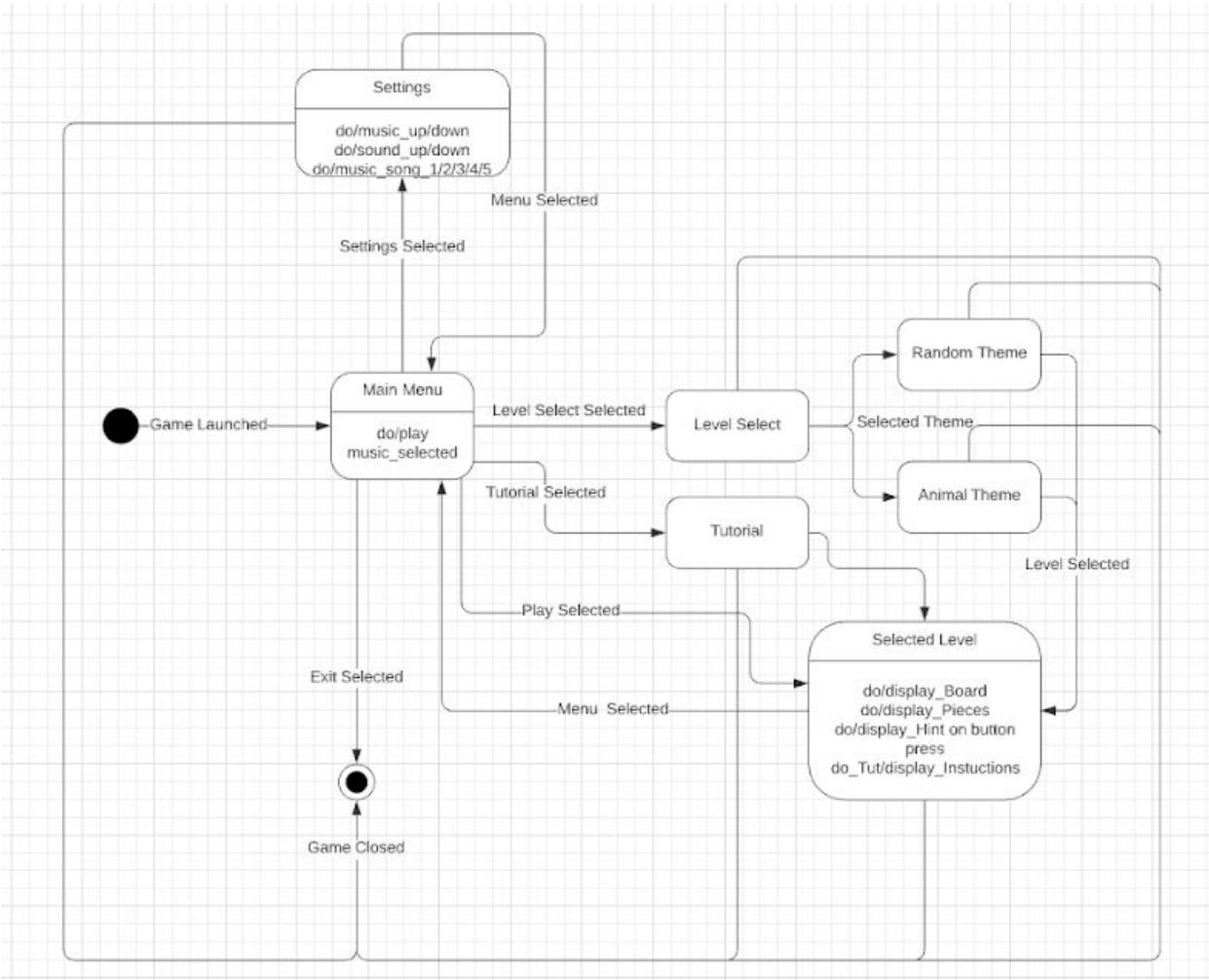

Figure B.2