Teaching Music With Video Games: Piano Plunk

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Introduction

Music education has come a long way in the past decades for grades Pre-k through 12th. However, younger students might find certain theory concepts confusing and overwhelming when introduced for the first time. A great way to overcome these issues is to immersive kids with interactive activities. Hand-on learning have been proven leave a longer lasting impression on kids, and what better way to immerse kids in learning than with video games?

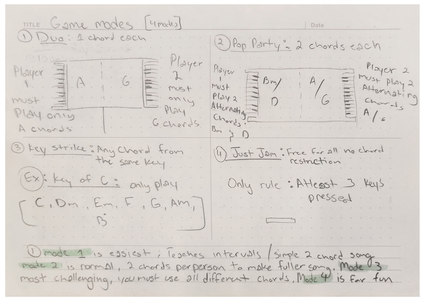
Atari's Pong is a classic game that is still played to this day. It's simple, straightforward, yet keeps players hooked. For my culmination I decided to mix these two elements to create an interactive learning tool for anyone who is interested in learning music theory. Using the piano as the main mechanic I developed a pong inspired game that teaches players different keys, and the many chord inversions that can be played on the piano. Using the programing and sound design knowledge I have learned at City Tech I will present a physical prototype of "Piano-Plunk"

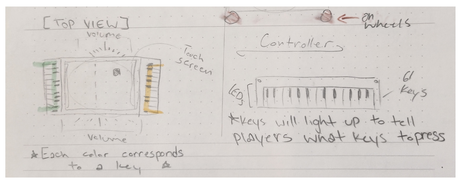
Materials & Concepts

- Game Document
- 2 Midi Keyboard Controller
- LED Projector
- Unity 2D
- Procreate
- GIMP
- Logic Pro
- Illustrator
- Keijiro Takahashi's MidiJack Unity Plugin

Piano-Plunk is a 2D game where the players need to hit the ball back and forth using piano chords. Each round focuses on 1 key, and each player can only hit the ball using the keys related to their designated chord.

Sketches & Initial designs





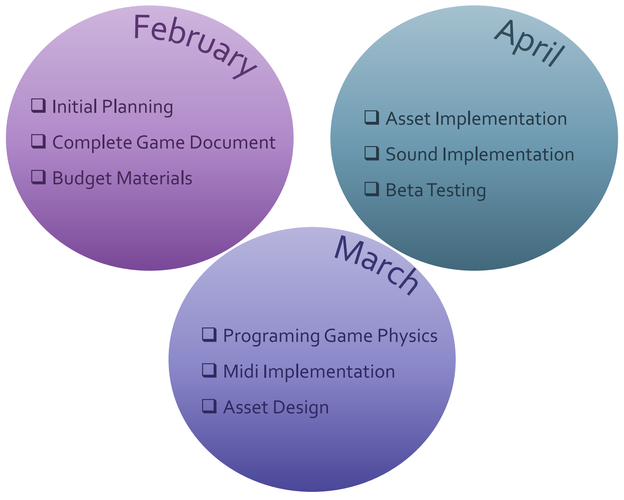
Work Break Down Structure

1. Planning and Outlining
    - 1.1. Develop Game Document
    - 1.2. Sketch/draft any character/assets
    - 1.3. Brainstorm sound design
    - 1.4. Sketch GUI layout design
2. Programing
    - 2.1. Program main physics mechanics
    - 2.2. Implement colliders and Trigger events
    - 2.3. Program and integrate midi controls
    - 2.4. Build Key/Chord Library (for controls)
    - 2.5. Assign 2 player controls
3. Design
    - 3.1. Create Ball design
    - 3.2. Create mid court net design
    - 3.3. Design visual effects
    - 3.4. GUI Formatting and Design
    - 3.5. Design GUI Assets (Illustrator)
    - 3.6. Create GUI layout
4. Sound Design
    - 4.1. Compose Percussion Rhythms (SCORE)
    - 4.2. Design virtual instrument bank 1 - 4
    - 4.3. Synthesize Sound Effects
    - 4.4. Design GUI Sound Effects
5. Testing

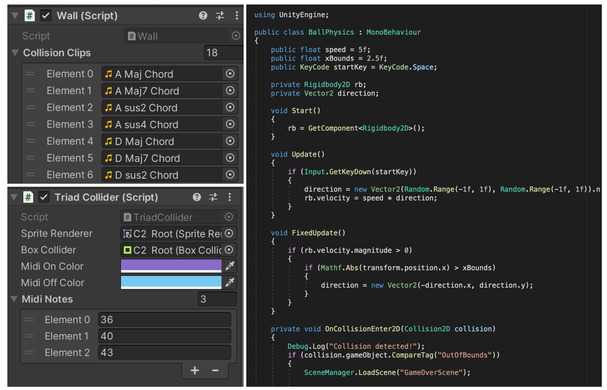
Expenses

Culmination Project - Materials & Resources				
Hardware				
Materials:	Description:	QTY	Unit Cost	Total Price
Midi Controller	Carry-on 49 Keys Folding Piano	2	$99.00	$198.00
Laptop	Macbook Pro	1	$0.00	$0.00
Unity	Game dev software	1	$0.00	$0.00
Logic	Sound design software	1	$0.00	$0.00
Adobe CC	Adobe Illustrator for Assets	1	$0.00	$0.00
			Subtotal	$99.00
			10% Contingency	$9.90
			Total Materials	$108.90

Semester Game Plan - Monthly Goals



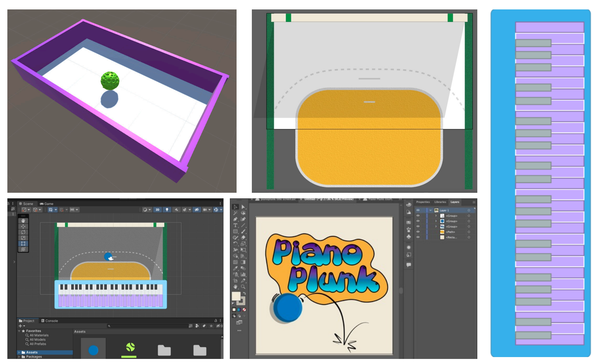
Programming Process - (Unity)




```
if (MidiMaster.GetKeyDown(midiNote))
{
    spriteRenderer.color = midiOnColor;

    if (!hasPlayedAudio)
    {
        AudioSource.PlayClipAtPoint(myAudioClip, transform.position);
        hasPlayedAudio = true;
    }
}
```

Asset Design Process - (Illustrator)



Asset Design Process - (Illustrator)

Conclusion

Creating memorable moments in learning is very important for younger kids. It enforces essential skills and concepts that might otherwise be lost in traditional teaching methods. By converting key musical theory concepts into mechanics within a video game, students can build their memorization and hand-eye coordination skill. By utilzing sound design and harmonics, students can also strengthen their listening skills and pitch. This would overall, create a deeper connection and understanding to music.

Throughout the development of the "Piano-Plunk" prototype, I overcame a variety of obstacles that gave me an inside look to what game development entails. Although my concentration is Music Technology, I felt it was important to broaden my knowledge and build experience in game design and development. This project felt very intimidating at the very beginning, but once I began to dig deep into the research I felt more confident about my progress, even when I needed to scrap certain elements and start from scratch.

Next Steps & Future Plans

I plan on continuing this project and expanding the game modes. The current prototype is a 1-player level, and has players "perform" in the key of C. I currently only have sound banks created for C chords in all the inversions, but I would like to build banks for the rest of the chords in the key of C. That way, players would be randomly given a chord, making each round more exciting. Another addition I want to work on, is the implementation of the 2-player mode. This game mode would allow players to be more creative during rounds and build their sense of pitch.

In terms of visual additions, I want to add more indicators. This includes, an inversion indicator, that shows the player what inversion they are playing, as well as indicators for chords so players can associate visuals and sound together.

Ultimately, I see the project be accessible to anyone who wants to play it. I will look into different websites where I can publish my game, such as Itch.io or github. I would alson love to continue designing a phyiscal

Acknowledgements

I would like to thank:
- Professor Adam Wilson for guidance throughout development
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