

Video Game Development and Accessibility

What does the following Java code do?

```
public class LinePrinter {  
    public static void main(String[] args) {  
        // Note: \u000A is Unicode for linefeed.  
        char c = 0x000A;  
        System.out.println(c);  
    }  
}
```

Compile Errors

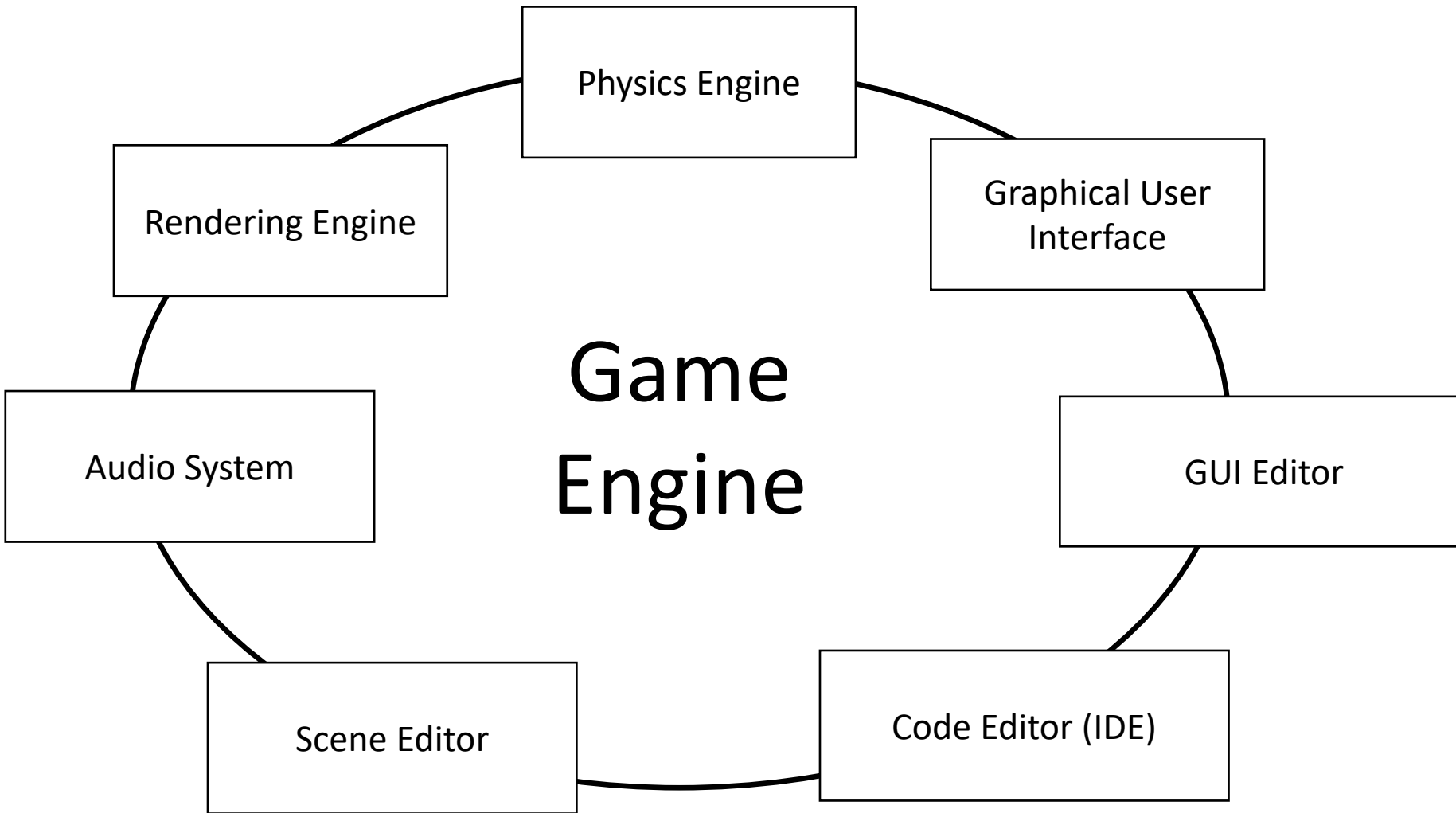
```
$ javac LinePrinter.java
LinePrinter.java:4: error: ';' expected
// Note: \u000A is Unicode for the linefeed (\n)
                                     ^
LinePrinter.java:4: error: '(' expected
// Note: \u000A is Unicode for the linefeed (\n)
                                     ^
LinePrinter.java:4: error: ';' expected
// Note: \u000A is Unicode for the linefeed (\n)
```

My Credentials

- Enthusiast, not an expert.
- Prototype games using Godot, Unreal, Unity, and Ogre3D.
- Godot in Procedurally Generated Content course.
- Still learning about accessibility.

Outline

- Game Engine Architecture
- Accessibility Hardware and Software
- Accessibility Guidelines for Games
- Some Examples
- Visual Accessibility
- Game Jams
- Lunch



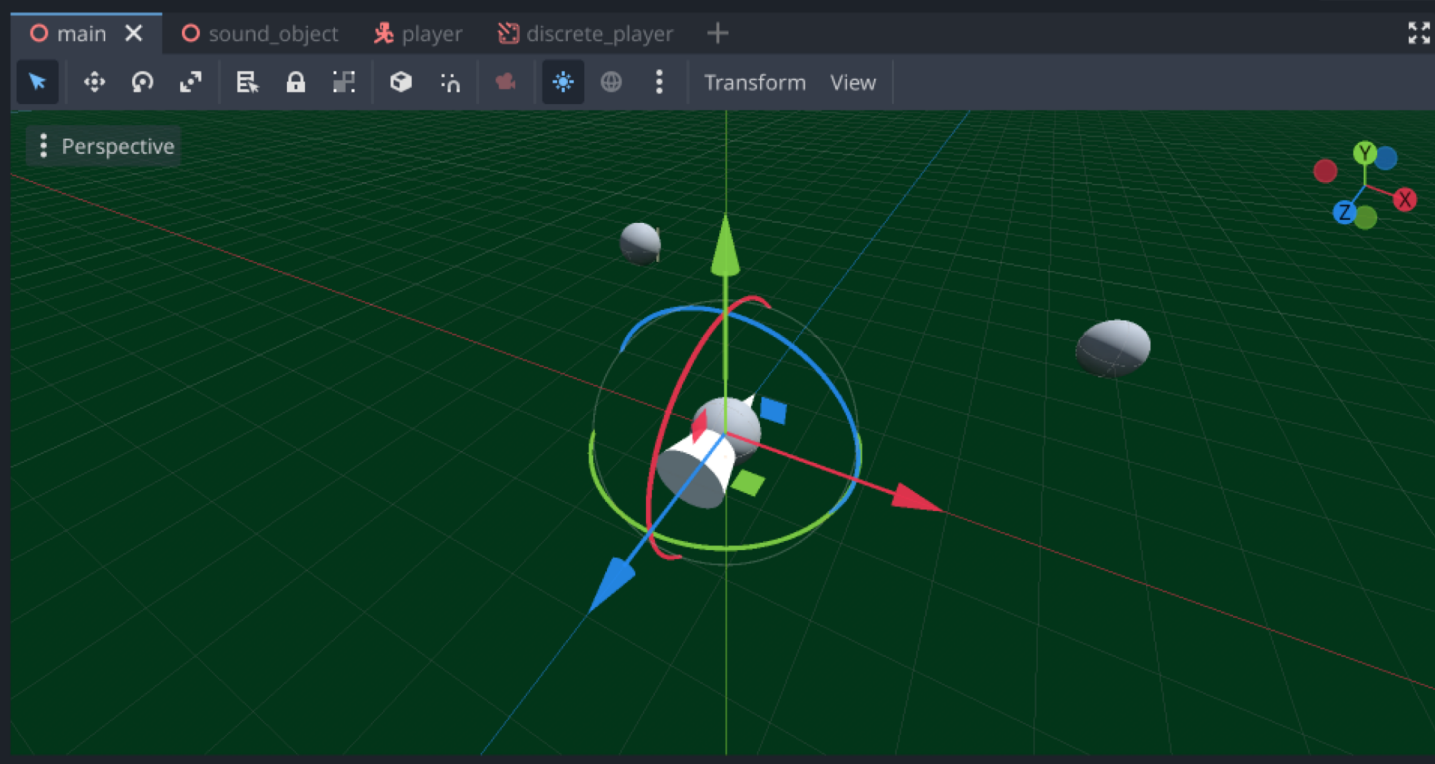
Game Engine

- Other Components
- Asset Store
 - VR/AR Components
 - Character Engine
 - Economics Engine

Scene Import

Filter: name, t:t

- Main
 - WorldEnvironment
 - Ground
 - CollisionShape3D
 - ActiveSounds
 - Sounds
 - GameSounds
 - PickupSounds
 - EmptyCamera
 - TopCamera
 - Player
 - Timer



Inspector Node History

Ground

Filter Properties

- StaticBody3D
 - Physics Materia... <empty>
 - Constant Linear Velocity
 - x 0 m/s y 0 m/s z 0 m/s
 - Constant Angular Velocity
 - x 0 °/s y 0 °/s z 0 °/s
- PhysicsBody3D
- Axis Lock
- CollisionObject3D
 - Disable Mode Remove
- Collision
- Input
- Node3D
- Transform
- Visibility
- Node
- Process
- Editor Description
 - Script <empty>
 - + Add Metadata

FileSystem

res://audio/bat_01.ogg

Filter Files

- res://
 - audio
 - bat_01.ogg
 - bear_02.ogg
 - Click_Electronic_13.ogg
 - Click_Soft_00.ogg
 - crow_caw.ogg
 - Mudchute_cow_1.ogg
 - Mudchute_duck_2.ogg
 - Mudchute_pig_1.ogg
 - osprey.ogg
 - peacock_scream_01.ogg
 - peppin_01.ogg

Layout: default_bus_layout.tres

Add Bus Load Save As Load Default Create

Master

S M B

-6dB

-0dB

-6dB

-24dB

72dB

Add Effect

Speakers

Output Debugger Search Results Audio Animation Shader Editor

4.2.1.stable

main.tscn - SearchForSound 2D 3D Script AssetLib

Scene Import

- Main
 - WorldEnvironment
 - Ground
 - CollisionShape3D
 - ActiveSounds
 - Sounds
 - GameSounds
 - PickupSounds
 - EmptyCamera
 - TopCamera
 - Player
 - Timer

Filter: name, ttt

main X sound_object player discrete_player +

File Edit Search Go To Debug Online Docs Search Help

Filter Scripts

- discrete_player...
- instructions.txt
- main.gd
- player.gd
- README.md
- sound_object.gd

main.gd

Filter Methods

- _ready
- _process
- _input
- init_game
- pause_game
- resume_game
- _on_sound_objec...
- remove_and_che...

```
143 $ActiveSounds.remove_child(object)
144 $Sounds.add_child(object)
145 #if this is not done last, it seems to skip everything else in HTML5
146 DisplayServer.tts_speak(bird, voice_id)
147
148 #check goal condition
149 if $ActiveSounds.get_child_count() == 0:
150     #done
151     var t = MAX_TIME + bonus_time - ticks
152     DisplayServer.tts_speak(
153         "Level %d complete in %d seconds. Press space to continue."%
154         voice_id)
155     reset_game()
156     level += 1
157
158
159
160 load_instructions():
161 #try to read the instructions
162 var iFile = FileAccess.open(INSTR_FILE, FileAccess.READ)
163 if iFile:
164     instruction_string = iFile.get_as_text()
165
166
167 _on_timer_timeout():
168     ticks -= 1
```

154 : 22 | Tabs

Inspector Node History

- Ground
 - StaticBody3D
 - Physics Materia... <empty>
 - Constant Linear Velocity
 - x 0 m/s y 0 m/s z 0 m/s
 - Constant Angular Velocity
 - x 0 °/s y 0 °/s z 0 °/s
 - PhysicsBody3D
 - Axis Lock
 - CollisionObject3D
 - Disable Mode Remove
 - Collision
 - Input
 - Node3D
 - Transform
 - Visibility
 - Node
 - Process
 - Editor Description
 - Script <empty>

+ Add Metadata

FileSystem

res://audio/bat_01.ogg

Filter Files

- Player
 - discrete_player.gd
 - discrete_player.tscn
 - player.gd
 - player.tscn
- SoundObject
 - sound_object.gd
 - sound_object.tscn
- export_presets.cfg
- icon.svg
- instructions.txt
- main.gd
- main.tscn

Filter Messages

Output Debugger Search Results Audio Animation Shader Editor

4.2.1.stable

Game Engine Comparison

	Godot	Unity	Unreal
Installed Disk Space	70 MB 800 MB w/ exports	21 GB	114 GB
Small Project*	37 kB	262 MB	183 MB
Recommended RAM	4 GB	16 GB	8 GB
Scripting	GScript, C#	C#	Blueprint, C++
IDE	Internal	Visual Studio MonoDevelop	Internal Visual Studio

*Project size can vary quite a bit, based on 2D/3D, start-up assets, etc.

Game Architecture

Game

Game Engine

Operating System

Hardware

Accessibility Implementation

Accessibility Features

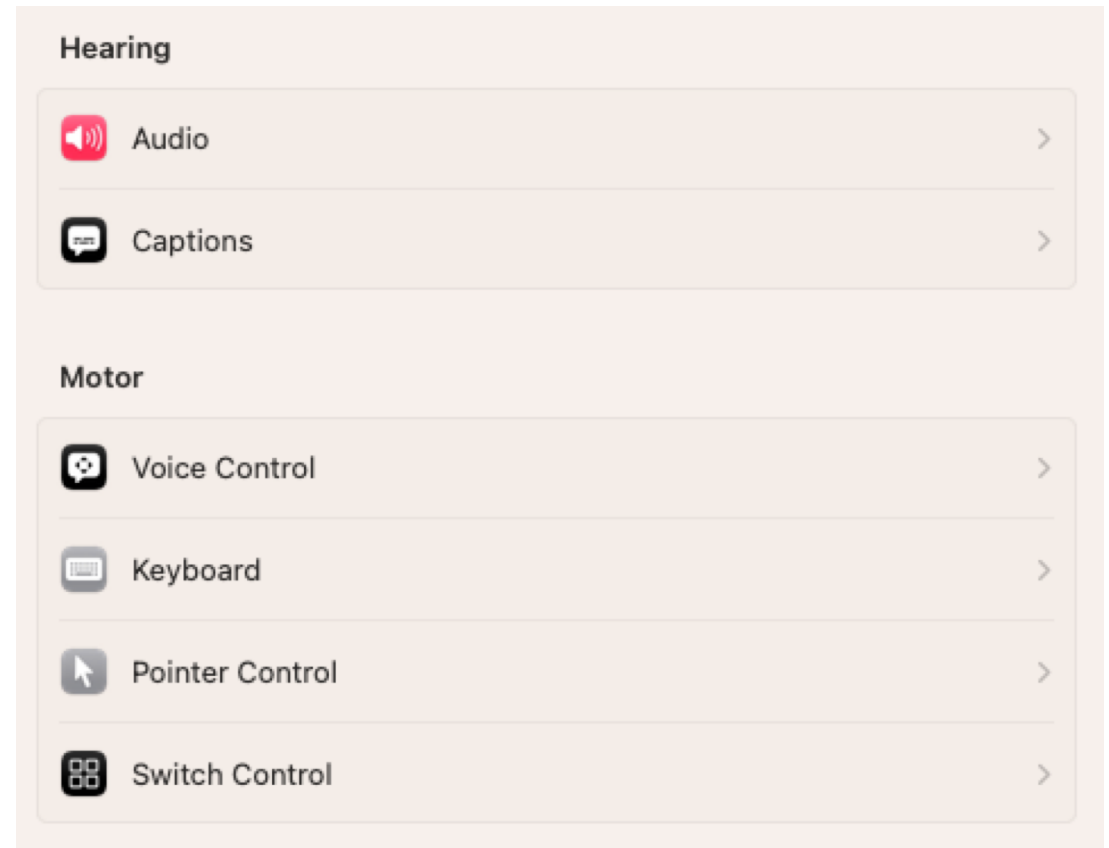
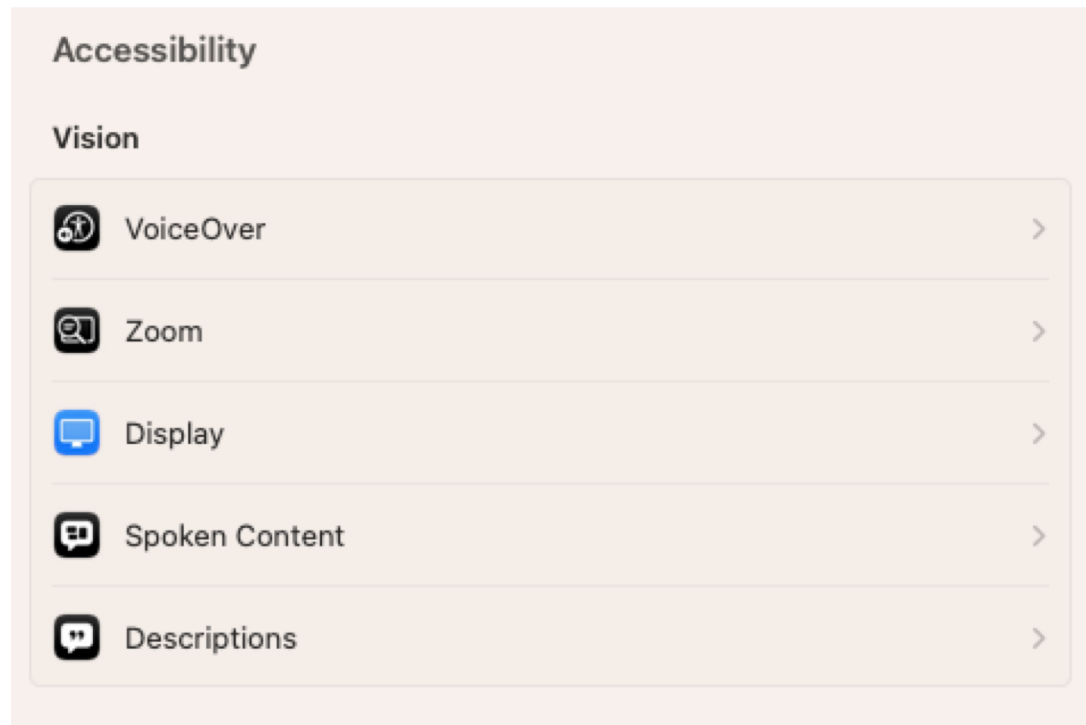
Assistive Software

Assistive Devices

Hardware: Xbox Adaptive Controller



OS: Mac Accessibility Settings



Application: PowerPoint Accessibility

The screenshot shows the Microsoft PowerPoint interface in the Review tab. The main slide content is a table titled "Game Engine Comparison" comparing Godot, Unity, and Unreal. The Accessibility Checker panel on the right shows a list of errors, with "Table 3 Style has low contrast" highlighted in blue. Below the error list, there is a "Why Fix?" section and a "Steps To Fix:" section.

	Godot	Unity	Unreal
Installed Disk Space	70 MB 800 MB w/ exports	21 GB	114 GB
Small Project*	37 kB	262 MB	183 MB
Recommended RAM	4 GB	16 GB	8 GB
Scripting	<u>GDScriot</u> , C#	C#	Blueprint, C++
IDE	Internal	Visual Studio <u>MonoDevelop</u>	Internal Visual Studio

*Project size can vary quite a bit, based on 2D/3D, start-up assets, etc.

Click to add notes

Accessibility Checker

Inspection Results

- Errors
 - Missing alternative text
 - Content Placeholder 3 (Sl...
 - Content Placeholder 7 (Sl...
 - Content Placeholder 8 (Sl...
 - Table 3 (Slide 9)
 - Content Placeholder 4 (Sl...
 - Picture 4 (Slide 21)
 - Picture 5 (Slide 22)
 - Missing slide title
 - Slide 5
- Warnings
 - Hard-to-read text contrast
 - Table 3 Style has low cont...**
- Tips
 - Check reading order
 - Slide 1
 - Slide 5
 - Slide 6
 - Slide 7
 - Slide 9
 - Slide 21
 - Slide 22

Why Fix?

Text becomes difficult to read when its color is too similar to the color behind it. Increasing contrast makes text easier to read, especially when viewing documents in bright light.

Steps To Fix:

Increase contrast by changing the color of the font (Home tab) or by changing the table style (Click in the table, then go to the Design tab under the Table Tools tab).

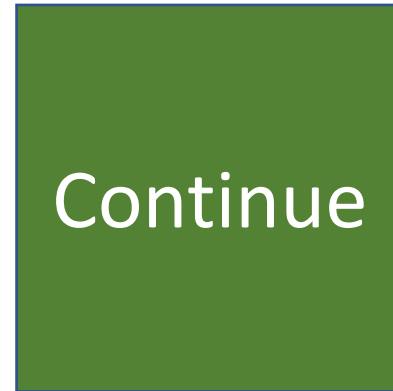
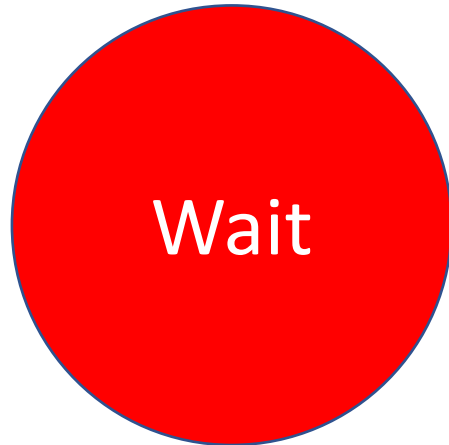
Bad Idea

- Select red to wait or green to continue.



Improved

- Select the red circle to wait or the green square to continue.



Guideline Categories

- Motor – control and mobility.
- Cognitive – thought, memory, processing information.
- Vision – color, contrast.
- Hearing – volume, source identification.
- Speech – vocal input, communication.

<https://gameaccessibilityguidelines.com/>

Motor Guidelines

Basic:

Make controls simple, or provide a simple alternative.

Intermediate:

Avoid repeated inputs (button-mashing).

Advanced:

Do not require precise timing, or provide alternatives.

Cognitive Guidelines

Basic:

Avoid flickering images.

Intermediate:

Highlight interactive elements.

Advanced:

Allow all narrative and instructions to be replayed.

Vision Guidelines

Basic:

Use simple clear text formatting.

Intermediate:

Provide an option to adjust contrast.

Advanced:

Ensure screen reader support.

Hearing Guidelines

Basic:

Ensure no essential information is conveyed by sound alone.

Intermediate:

Provide captions or visuals for important sounds.

Advanced:

Ensure captions or subtitles are displayed at readable rate.

Speech Guidelines

Basic:

Ensure speech is not the only input available.

Intermediate:

Support text chat as well as voice for multiplayer.

Advanced:

Base recognition on volume instead of words.

General Suggestions

- Consider accessibility in the design process.
- Provide alternatives.
- Flexibility – map input, configure volume/speed, etc.
- Save configurations.
- Get feedback from gamers who use the features.
- Enable/disable non-essential mechanics.
- Doing something is better than doing nothing.

CVAA US Legislation - 2010

Communication and Video Accessibility Act

- Requires accessibility for any communication mechanism.
- For video games: text, voice, and video chat features.
- Implementation Requirements.
- Reporting Requirements.

Motor Options – Just Dance

The screenshot displays the Just Dance game's song selection screen. At the top, there is a "Surprise me!" button and sorting options: "Sorting: by product" and "Order: owned songs first". The main area features a song card for "Tití Me Preguntó - Barbecue version" by Bad Bunny, with a difficulty level of "Easy" and a star rating. Below the song card is a circular profile icon. On the right side, a filter menu is open, showing categories like "CHOREO STYLES", "MUSIC GENRES", "MOODS", and "DECADES". The "ACCESSIBILITY" filter is expanded, showing options such as "Jump-free", "Ground moves-free", "Small spaces", and "Leg-friendly". A "Seated" filter is currently active, indicated by a count of 12 and a close button. At the bottom, there is a "RESET FILTERS" button. The background of the interface is a dark blue space theme with stars.

Play a random song!
by filters and owned songs.

Surprise me!

Sorting: by product

Order: owned songs first

▶ CHOREO STYLES

▶ MUSIC GENRES

▶ MOODS

▶ DECADES

▼ ACCESSIBILITY 1

Jump-free

Ground moves-free

Small spaces

Leg-friendly

12 Seated X

RESET FILTERS

Tití Me Preguntó - Barbecue version
Bad Bunny

Difficulty: Easy

GS

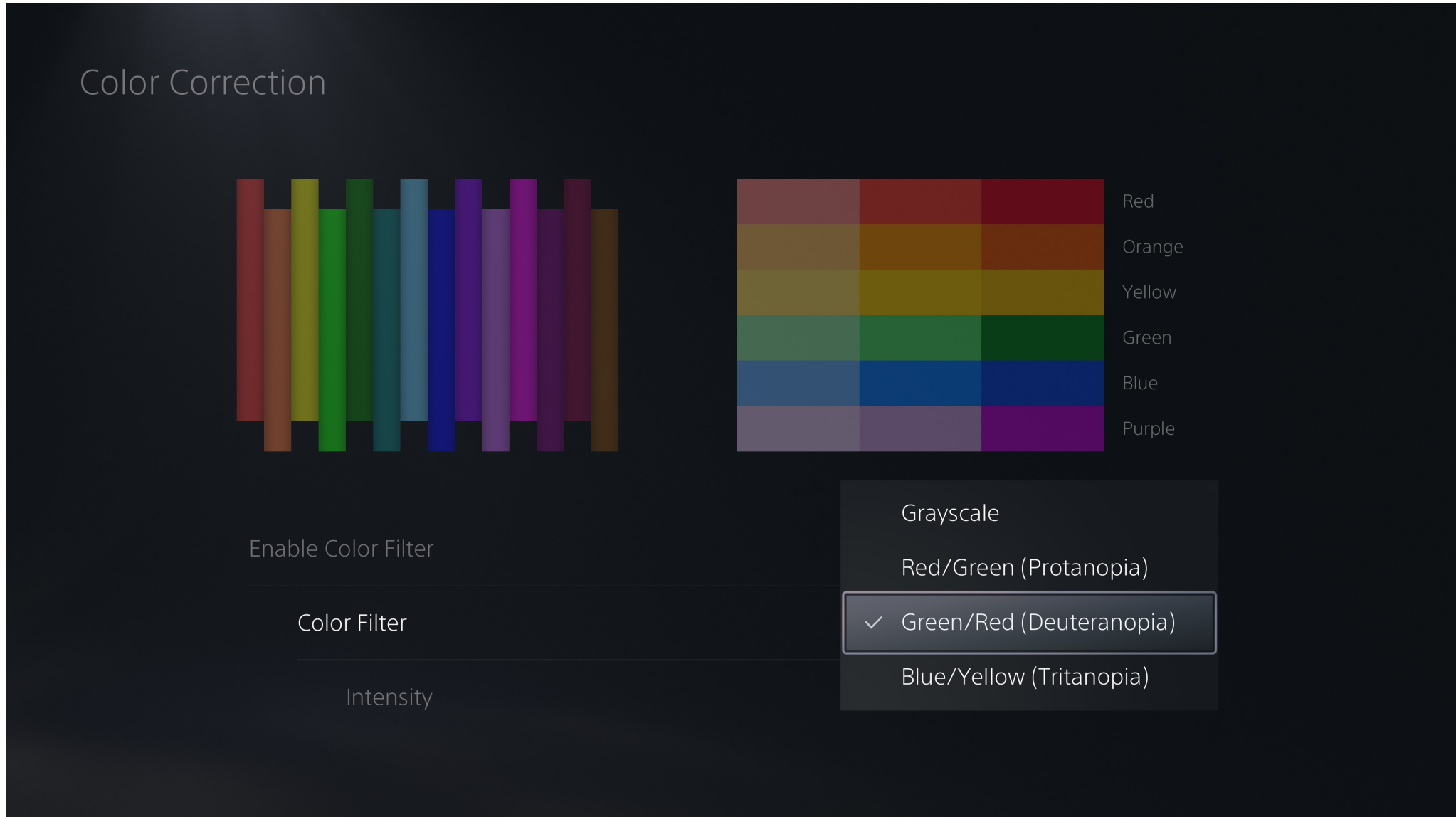
N

Espresso

Played songs: 0

0.0

Vision – Color Blindness PS5 Settings



Hearing – Hogwarts Legacy

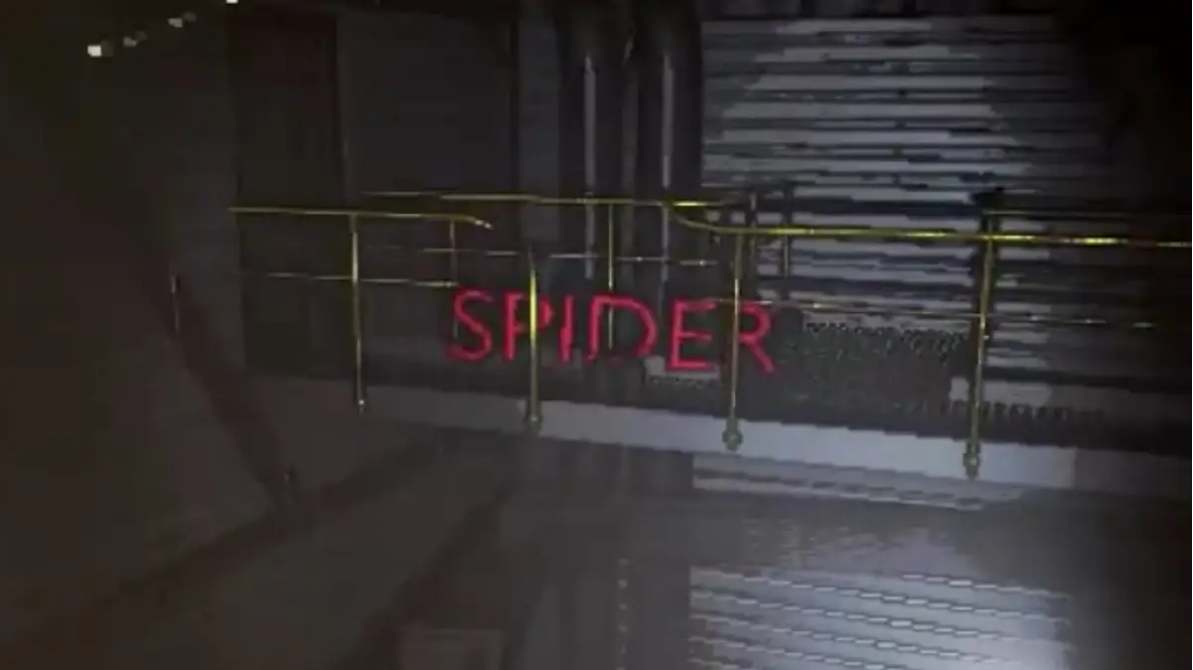


Arachnophobia Settings

Hogwarts Legacy



Lethal Company



INNOVATION IN ACCESSIBILITY

Recognizing software and/or hardware that is pushing the medium forward by adding features, technology and content to help games be played and enjoyed by an even wider audience.



VOTING CLOSED

CALL OF DUTY: BLACK OPS 6

Treyarch/Raven/
Activision/Xbox



VOTING CLOSED

DIABLO IV

Blizzard/Xbox



VOTING CLOSED

DRAGON AGE: THE VEILGUARD

BioWare/EA



WINNER

PRINCE OF PERSIA: THE LOST CROWN

Ubisoft Montpellier/Ubisoft



VOTING CLOSED

STAR WARS OUTLAWS

Massive
Entertainment/Ubisoft

Call of Duty: Black Ops 6

- Asymmetric Hearing Compensation
- Low Motor Strain inputs
- Simplified Controls
- Motion Sickness Mitigation
- Arachnophobia adjustments for zombies
- Highly adjustable color schemes

Diablo IV

- Configure character highlighting for contrast
- Screen Reader Narration
- Directional pings: audio for navigation
- Adjustable audio.

Dragon Age: The Veilguard

- Prevent death settings
- Adjustable parry timing
- Aim assist
- Audio cues for visual information (combat, object location)
- Left-right panning of audio
- Memory and learning assist for maps

Prince of Persia: The Lost Crown

- Memory Shards: pin screenshots to the map
- Conversation logs
- Consequence-free training areas
- Extra visual cues for enemy attacks

Star Wars Outlaws

- Configurable high-contrast modes.
- Audio descriptions of cinematics.
- NPC chatter captioning.
- Visualization of sounds.
- Granular difficulty settings.

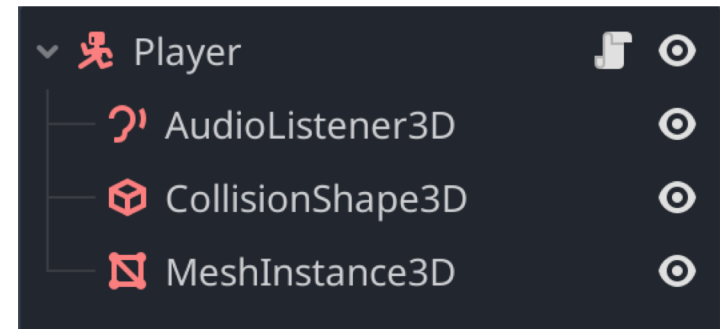
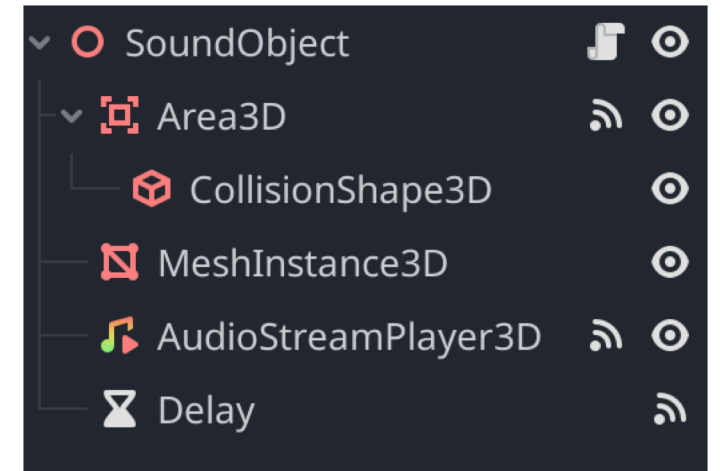
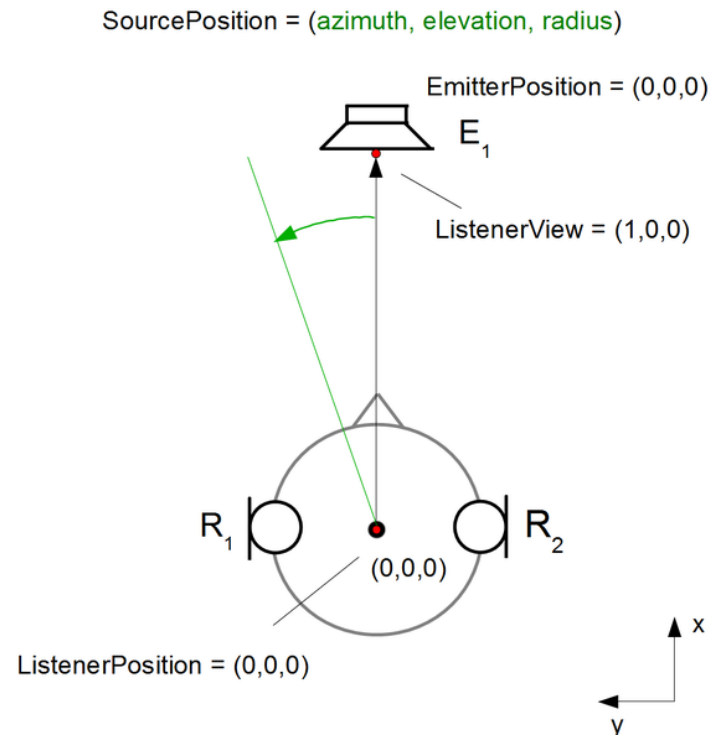
The background features a dark red, textured surface with a large, glowing orange and yellow sigil on the left side. The sigil is a complex geometric design with a central triangle and various lines and symbols. The overall atmosphere is dark and ominous.

HELL WELCOMES ALL
ACCESSIBILITY IN DIABLO IV

IV
DIABLO

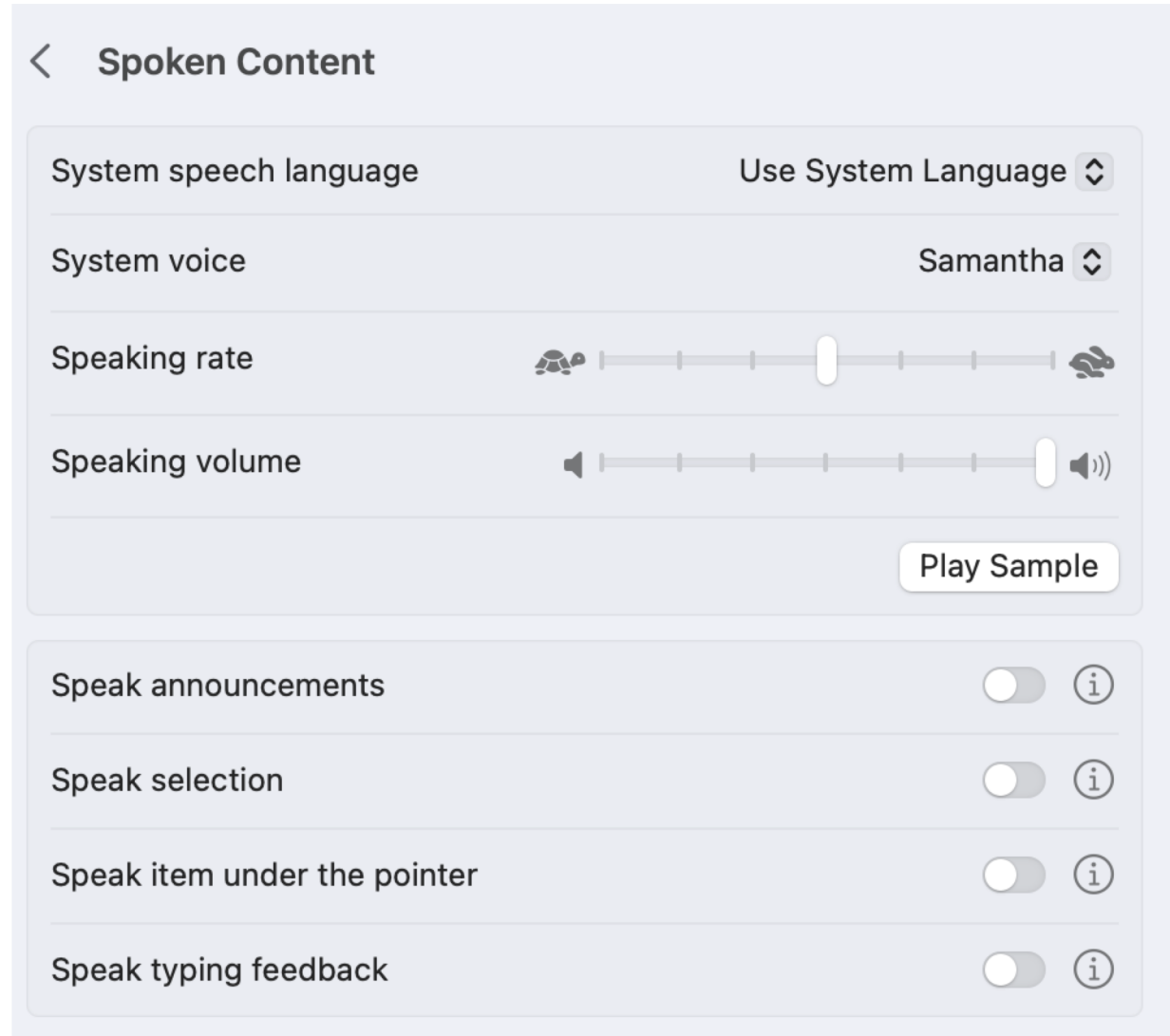
More Visual Accessibility

- Menu navigation.
- Good sound design.
 - Actions.
 - Objects.
 - Events.
- 3D Audio.
- Text-to-speech.

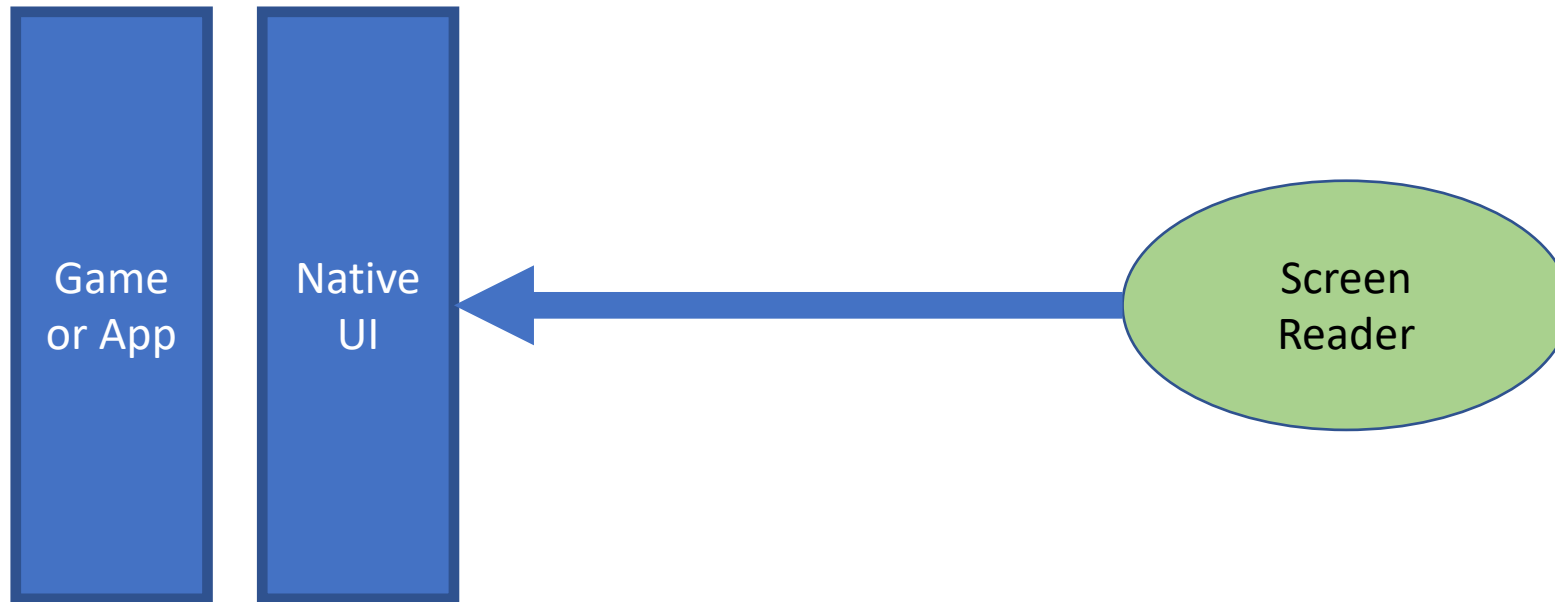


Screen Reader Configurations

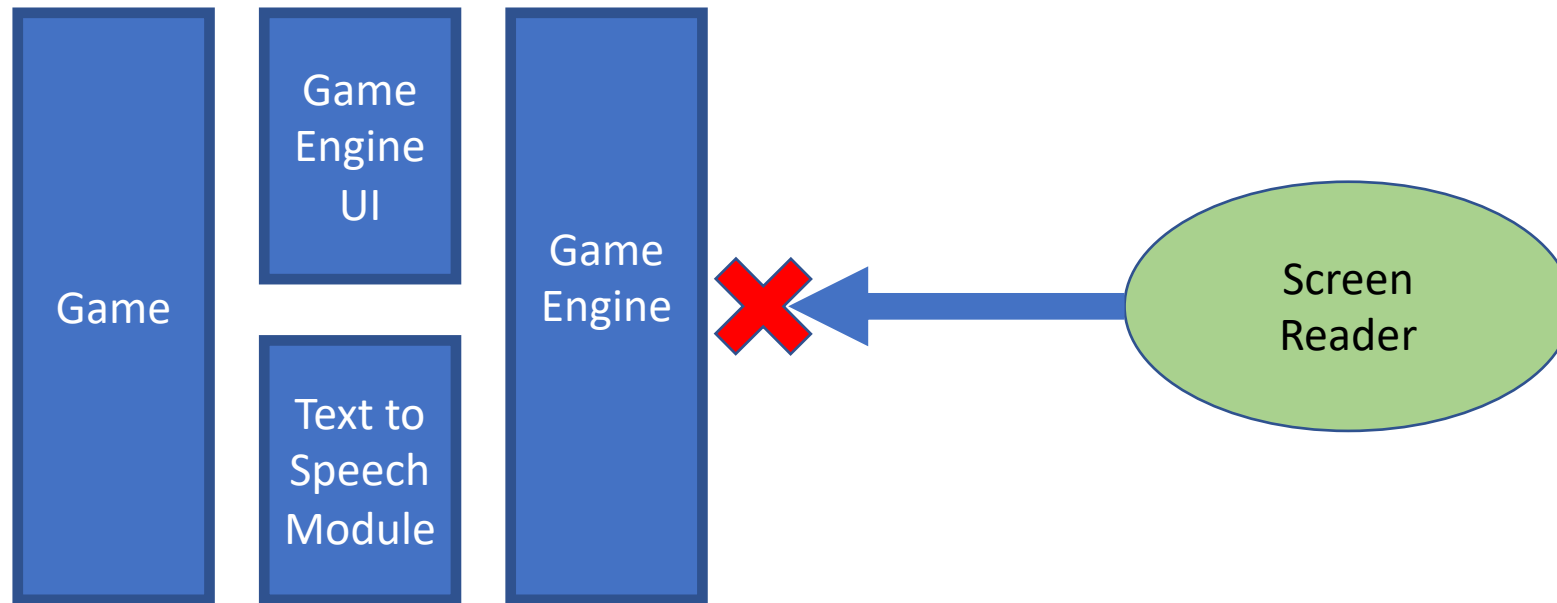
- Voice
- Speed
- Volume
- What gets spoken



Screen Reader Access – Native Programs



Screen Reader Access – Game Engine



My Attempts – Previous Game Jams

Memory

- Keyboard Locations
- Nothing Visual
- Generated Audio Recordings

E-I-E-I-O

- Nothing Visual
- 3D Audio “Hidden Object”
- Godot’s Text-to-Speech
- Browser Based
- Revision in progress

Games for Blind Gamers #4



Games for Blind Gamers

Games for Blind Gamers 4

Hosted by [NightBlade](#) · [#GamesForBlindGamers](#)

139
Joined

<https://itch.io/jam/games-for-blind-gamers-4>

Thank you!

cpresser@gettysburg.edu

References

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 - <https://www.fcc.gov/consumers/guides/21st-century-communications-and-video-accessibility-act-cvaa>
- Diablo IV Hell Welcomes All: <https://www.youtube.com/watch?v=vCuywYFjcJs>
- Game Accessibility Guidelines: <https://gameaccessibilityguidelines.com/>
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- Xbox Adaptive Controller: <https://www.xbox.com/en-US/accessories/controllers/xbox-adaptive-controller>