

USER INTERFACE

UI & UX

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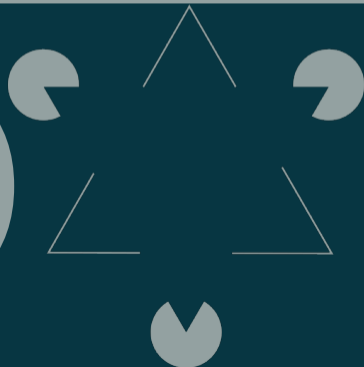
FACULTY OF INFORMATION TECHNOLOGY

DCGM, CPhoto@FIT

FACULTY OF FINE ARTS

GAME MEDIA STUDIO

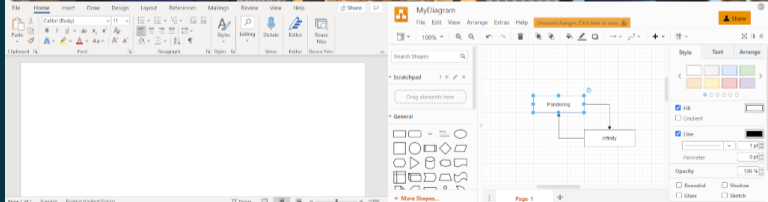
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PRINCIPLES & GOALS

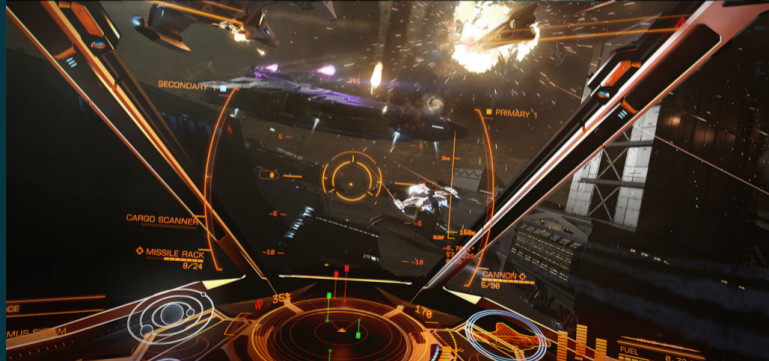
WHAT IS UI?

- User ↔ UI ↔ System
- Interaction
- Communication
- Five Senses
- Maximize Usability



UI IN GAMES

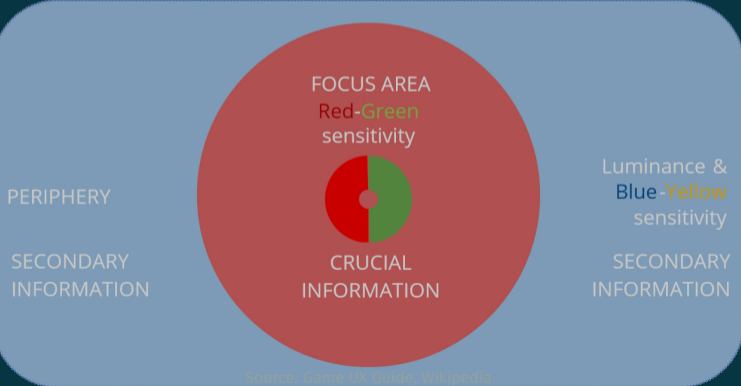
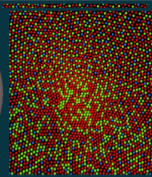
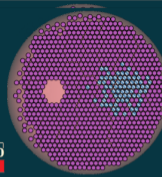
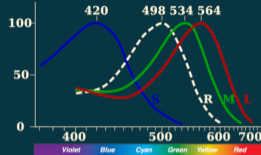
- Player ↔ UI ↔ Game
- = Player Feedback
- Three Senses
- Frontend & Gameplay
- Game Specifics



USER INTERFACE DESIGN

COMMUNICATION CHANNELS

- Goal: Optimal Usage
- Matter of Bandwidth
- Hearing \rightsquigarrow Sound
 - ▶ Afterthought \rightarrow 50% [1]
 - ▶ Combined Effect
 - ▶ Mood, Attention, Mode
- Touch \rightsquigarrow Controls
- Sight \rightsquigarrow GUI
 - ▶ Human Visual System
 - ▶ Visual Perception
 - ▶ Distance & Readability

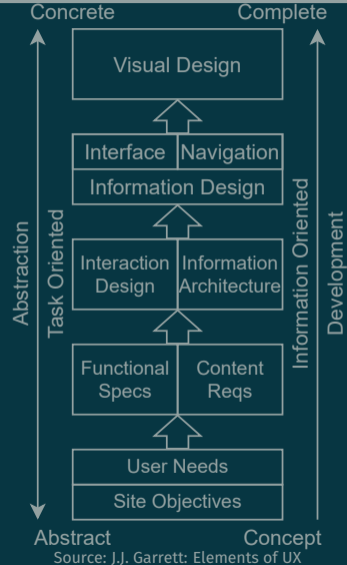
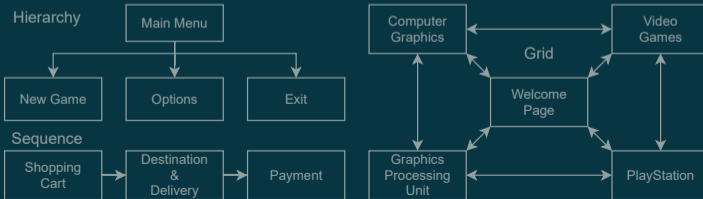


Source: Game UX Guide, Wikipedia

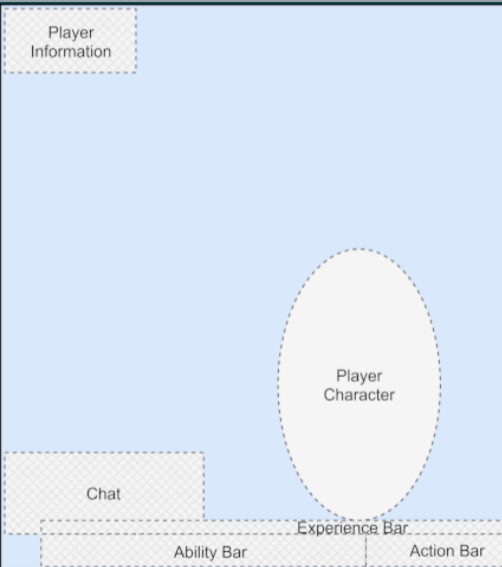
USER EXPERIENCE

- Interaction Experience [3]
- UI vs UX Design [6]
- Goal: Design for Needs
- Information Architecture (IA)
 - ▶ Organization & Categorization
 - ▶ Labeling, Navigation, Search
 - ▶ Graph – Nodes + Edges
 - ▶ Organization Structure

■ Interaction Design (IxD)



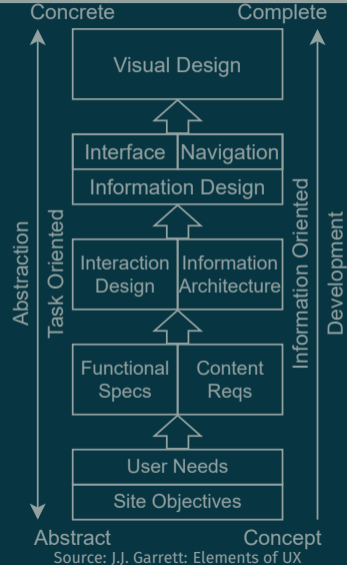
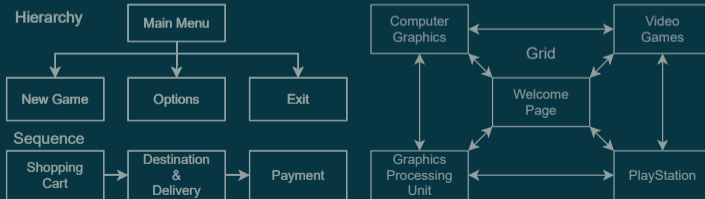
USER EXPERIENCE AND USER INTERFACE



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COGNITIVE LOAD

- Mental Processing
- Intrinsic × Extraneous
- Minimize Effort
 - ▶ Progressive Disclosure
 - ▶ Modes
 - ▶ Nesting & Clicks
- Miller's "Law" : 7 ± 2
- Recognition, not Recall
- Immunda Rasa → Mental Model



COGNITIVE LOAD



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PERCEPTUAL PSYCHOLOGY

- Gestalt Psychology → Perception
- “The Whole is More than the Sum of Its Parts” [5]
 - Kurt Koffka
 - ▶ Emergence
 - ▶ Reification
 - ▶ Multistability
 - ▶ Invariance

■ Prägnanz ~→ Gestalt Principles [4]



Source: Gestalt Principles in UI Design



Closure



Figure-Ground



Proximity



Enclosure



Continuity



Symmetry



Similarity

Source: Game UX Master Guide

SPECTATOR

TEAM 1
GERMAN EMPIRE

Emort190

Wotanson3

lapplander1

TEAM 2
BRITISH EMPIRE

- + APPLES 5/5
- + BUTTER 2/5
- + CHARLIE 5/5
- + DUFF 5/5
- + EDWARD 5/5

- + NO SQUAD
- + APPLES 5/5
- + BUTTER 5/5
- + CHARLIE 5/5
- + DUFF 5/5

450 14:19 403

A B C D E F

130 m

Wotanson3 ★

KILLS: 11	DEATHS: 6	POINTS: 4800
Gewehr 98 Sniper	Mars Automatic	Shovel
K Bullets	SQUAD: HARRY	HEALTH: 100%
ipwire Bomb — HE	Gas Grenade	5/9
		0

PLAYER VIEW

OPTIONS

1P

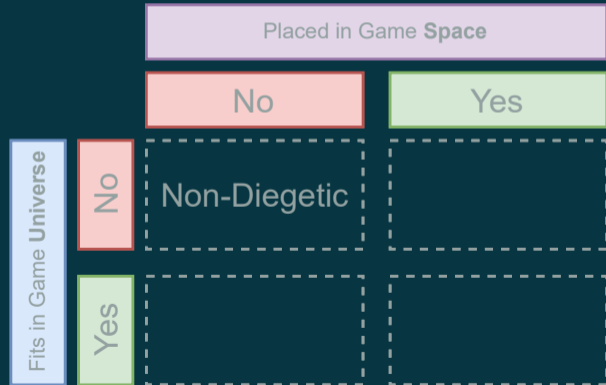
3P

DIRECTOR

ORBIT

GAMEPLAY UI

- Used in Core Gameplay
- Genre, Art, Style
- Use-Based Classes: **Universe** × **Space** [2]
- Non-Diegetic UI
 - Classical & Common
 - Easy Design / Implementation
- Diegetic UI
 - Integrated & Immersive
 - More Difficult, Performance
- Spatial UI
 - Straightforward & Immersive
 - Limited Style, Information
- Meta UI
 - Entire Game & State Change
 - Screen-Space, Details





L2

X	□	△	○	R1	R2

OPTIONS

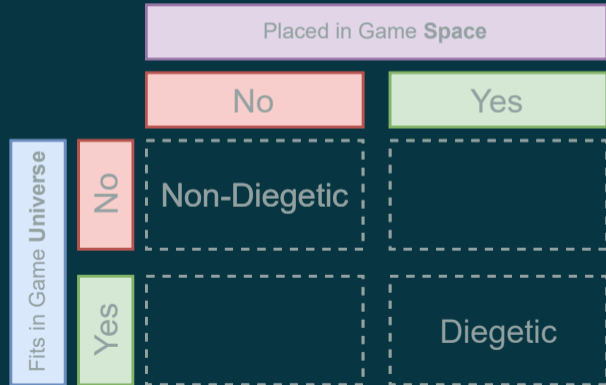
●	●	●	●

Run

L3

GAMEPLAY UI

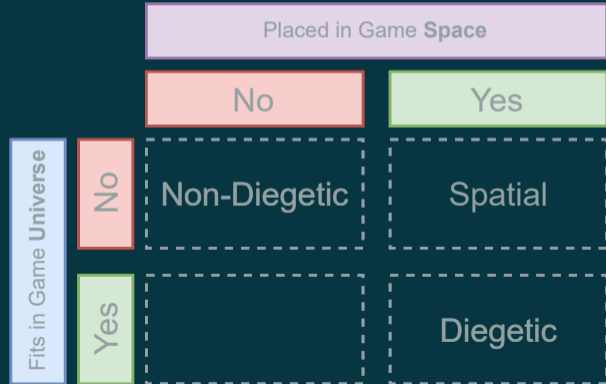
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THROWABLE: Traffic Cone

[E] Grab

[T] (HOLD) UNMARK ALL

TRANQUILIZER RIFLE

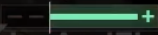
6 $\frac{2}{z}$

16 $\frac{2}{z}$

SMOKE



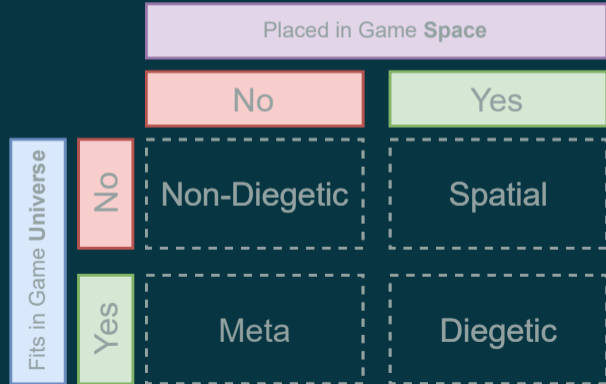
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MKIceAndFire

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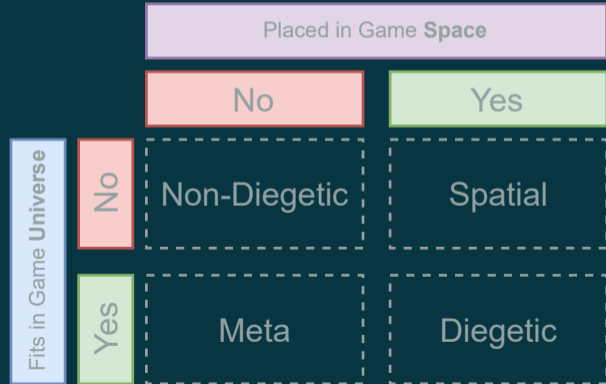




Ai! Blya! Radioactive... I almost feel it burning through my gloves.

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DESIGNING FRONTEND

- Cognition + Psychology → Frontend UX
- Rules, Principles, Guidelines
- Seven Principles of Usability [4]



Unique Items



State Change



3 Levels Deep



Page Flow



Affordances



Help & Hint



Focus Area

Source: Game UX Master Guide



ABILITIES

[21]

	INTEL+	★2
	INTEL+	★3
	OPTICS+	★1
	OPTICS+	★2
	OPTICS+	★3
	ANTI-MARKING+	★1
	ANTI-MARKING+	★2

Faster enemy marking.
Increased enemy markers display duration.
Larger enemy marking area of effect.

Select abilities.

Unequip all

Assault



6.1 KG



ABILITIES

LETHAL AIM+



★3

INTEL+

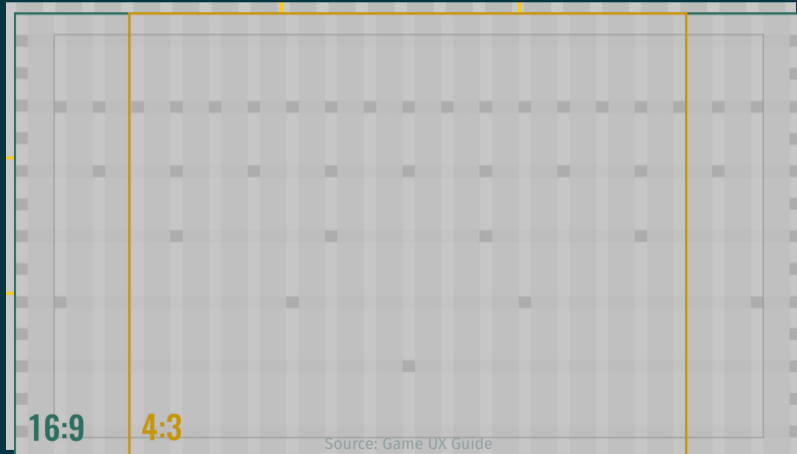
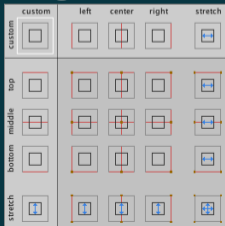


★1



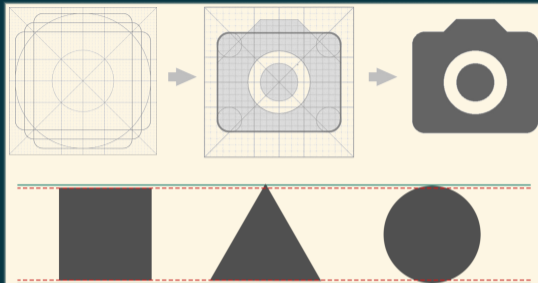
USER INTERFACE LAYOUT

- Layout = Placement of Elements
- Grid Layout
- Safe Frame
 - ▶ Action Safe $\approx 95\%$
 - ▶ Title Safe $\approx 90\%$
- Golden Ratio
- Aspect & Resolution
- Alignment Anchors



ON THE MATTERS OF DESIGN

- Color Palette
- Typography
 - ▶ Font Family
 - ▶ Variations
 - ▶ Localization → 40%
- Iconography
 - ▶ Construction
 - ▶ Optical Balance
- And Much More...



Source: Game UX Guide

Network info shown here



#DEEDE2 - TITLE TEXT COLOUR (26pt)

Player DogTag shows Profile and stats

Secondary Display Area (36pt)

Secondary Display Area (30pt)

Secondary Display Area (26pt)

Secondary Display Area (24pt)

Secondary Display Area (22pt)

Smallest Font Size? (18pt)

Buttons should be stacked 2 high, max 3 columns
Priority from right to left (shown above) #9AD5B7 colour

ALL Rounded Corners - 5px

All boxes should be rounded corners

#9AD5B7 - 100% ALPHA

#DEEDE2 - 100% ALPHA

#9AD5B7 - 30% ALPHA

#6D6E70 - 100% ALPHA

#AC0000 - 30% ALPHA

#9AD5B7 - 10% ALPHA

#9AD5B7 - HINT TEXT COLOUR (22pt)

Visor Design Elements always on (to enhance 3D parallax)

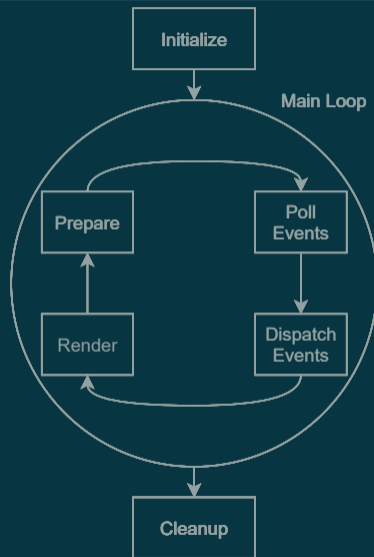
Glow on Edges for Visor Effect



USER INTERFACE IMPLEMENTATION

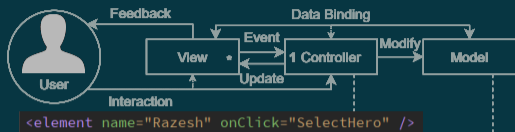
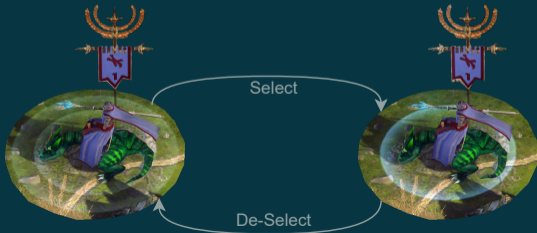
ANATOMY OF THE MAIN LOOP

- Goal: Keep Interactivity
- Focus on GUI
- Initialize & Cleanup
- Main Loop:
 1. Prepare State
 2. Poll Events
 3. Event Dispatch
 4. Render Results
- Engine Integration
- UI Frame Rate



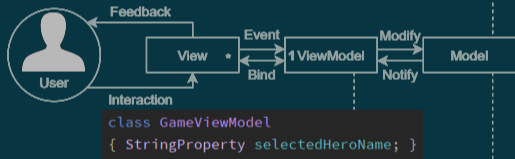
COMPUTATION MODEL

- Data × Logic × Interaction
- Architectural Patterns
- MVC Pattern
 - ▶ Model \rightsquigarrow Data + Logic
 - ▶ View \rightsquigarrow Feedback
 - ▶ Controller \rightsquigarrow Interaction
- MVVM \Rightarrow ViewModel
- MVP \Rightarrow Presenter

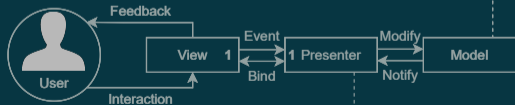


```
<element name="Razesh" onClick="SelectHero" />
```

```
Unit mSelectedHero;  
void SelectHero(string heroName)  
{ mSelectedHero = GetRef(heroName); }
```



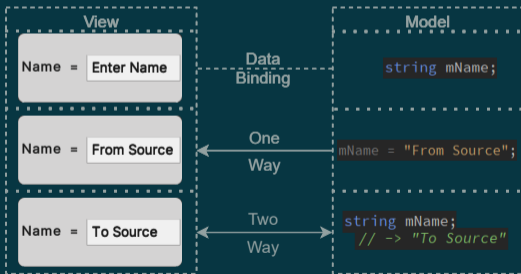
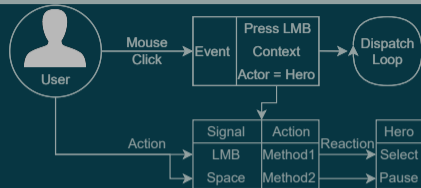
```
class GameViewModel  
{ StringProperty selectedHeroName; }
```



```
void SelectHero(string heroName)  
{ mModel.selectedHero = GetRef(heroName); }
```

SYSTEM DESIGN

- Asynchronous → Events
- Event ≈ Message
- Signals & Actions
- UI Markup × Backend
- Data Binding



```
<ui:UXML xmlns:ui="UnityEngine.UIElements" engine="UnityEngine.UIElements">
  <Style src="project://database/Assets/UI/UIStyle.uss" />
  <ui:VisualElement name="Background" style="height: 100%; width: 100%; ...">
    <ui:VisualElement name="Menu" style="height: 414px; width: 389px; ...">
      <ui:Label text="Main Menu" name="MainMenu" style="font-size: 32px; ..." />
      <ui:Button text="Start Game" name="StartButton" class="button-style" style="..." />
      <ui:Button text="Exit" name="ExitButton" class="button-style" style="..." />
    </ui:VisualElement>
  </ui:VisualElement>
</ui:UXML>

.button-style {
  background-color: rgb(121, 171, 226);
  font-size: 22px;
  border-radius: 10px;
}

.button-style:hover {
  background-color: rgb(162, 188, 217);
}

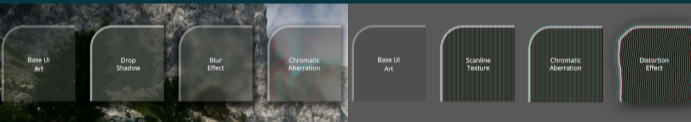
.button-style:active {
  background-color: rgb(50, 88, 130);
}
```

```
<ui:TextField name="HeroName" label="Name = "
  text="Enter Name" binding-path="mName"/>
```

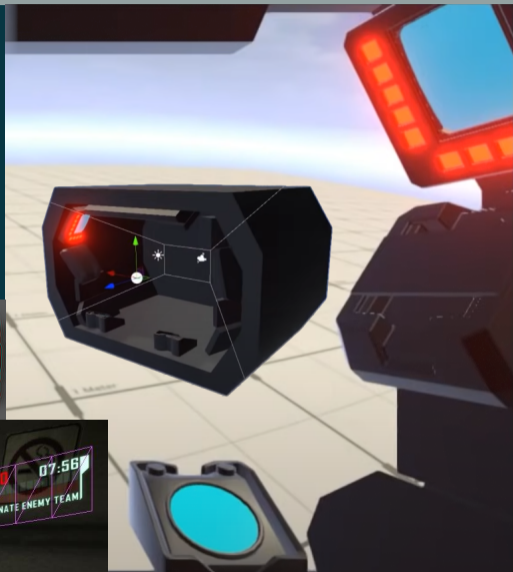


RENDERING UI

- Rendering & Feedback
- Vector → Raster
- Units, Scales, Pixels
- Layer Composition
- Screen-Space × In-Scene
- Shader Effects



Source: Omer Younas: Art Direction for AAA UI



UI IN UNITY

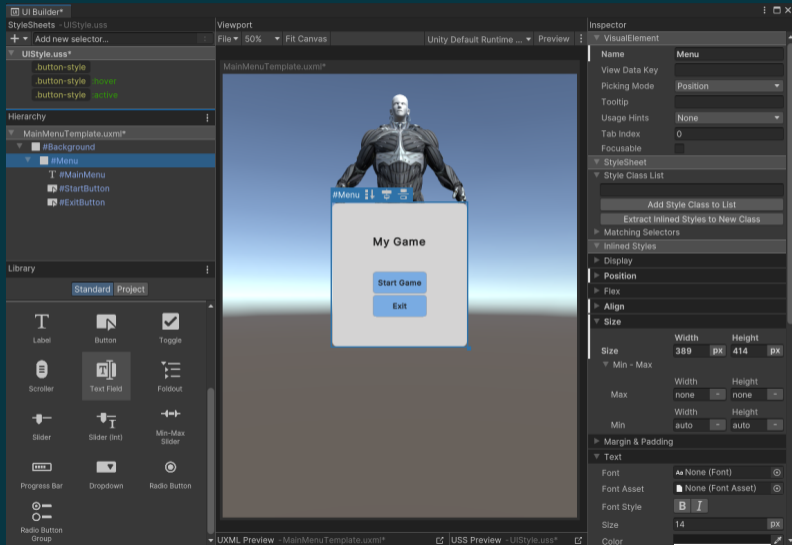
USER INTERFACE SYSTEM

- UI Fully Supported
- Various Modes
- Camera Stacking
- Three Options
 - UI Toolkit
 - Unity UI
 - ImGUI

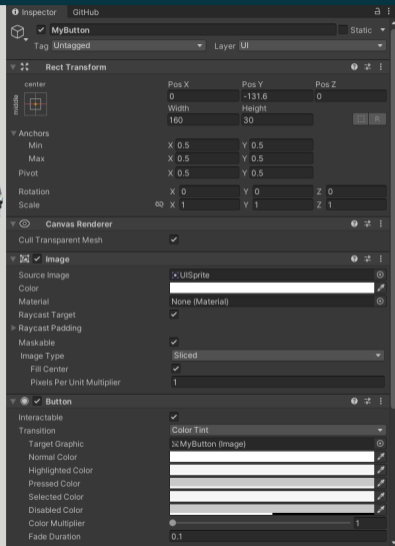


UNITY UI TOOLKIT

- Newest System
- “Classical UI”
- Integrated Editor
- HTML + XML + CSS
- Performance

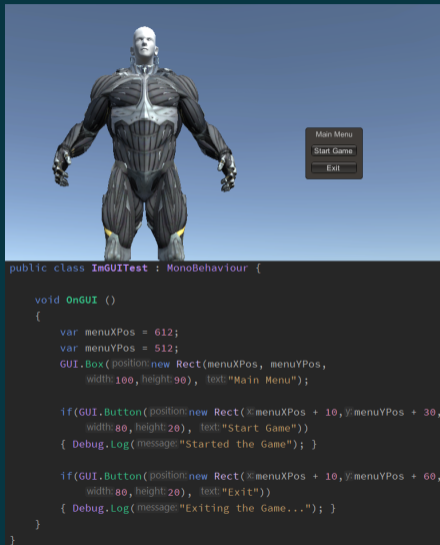


- Older System
- Based on GameObjects
- Utilizes Assets
- Code Integration



UNITY IMGUI

- Based on ImGui
- Immediate Mode
- Good for Programmers
- Debugging & Tools



ADDITIONAL RESOURCES

- [YouTube] Hearthstone: 10 Bits Of Design Wisdom
- [YouTube] Art Direction for AAA UI
- [Article] Game UI Discoveries: What Players Want

Non-Diegetic	Diegetic	Spatial	Meta
<p>In the game story? <input type="radio"/> NO</p> <p>In the game space? <input type="radio"/> NO</p> <h3>Ring Menu</h3> <p>Circular menu that allows a player to spin through resources or actions.</p>  <h3>Life Meter</h3> <p>Meter that shows how much life a player's avatar has remaining.</p>  <h3>Level Map</h3> <p>Small-scale map that shows the entire layout of a level.</p> 	<p>In the game story? <input checked="" type="radio"/> YES</p> <p>In the game space? <input checked="" type="radio"/> YES</p> <h3>Futuristic UI Overlays</h3> <p>Advanced UI, often inside of a helmet, that provides a player's avatar with vital stats and information.</p>  <h3>In-Game Gadgets</h3> <p>Gadget that holds important clues for a player's avatar.</p>  <h3>Physical Limitations</h3> <p>When a player's avatar is physically hindered after sustaining damage.</p> 	<p>In the game story? <input type="radio"/> NO</p> <p>In the game space? <input checked="" type="radio"/> YES</p> <h3>Selection Auras</h3> <p>Colored bracket that a player uses to select in-game objects.</p>  <h3>Racing Lines</h3> <p>Highlighted line that indicates the path a player's vehicle should follow.</p>  <h3>Object Text Labels</h3> <p>Text label that hovers near an in-game object.</p> 	<p>In the game story? <input checked="" type="radio"/> YES</p> <p>In the game space? <input type="radio"/> NO</p> <h3>FOV Color Filters</h3> <p>Color filter that overtakes a player's field of view and denotes a change in resources, health, or scenario.</p>  <h3>Grime</h3> <p>Materials like blood, dirt, and cracked glass that advance the story but exist only on the 2D plane.</p>  <h3>Scrolling Text</h3> <p>Spoken dialogue that scrolls horizontally across the screen.</p> 

Source: Level Up: A Guide to Game UI

REFERENCES I

- [1] JAIME CROSS. **GAME AUDIO AND THE 50% FALLACY**.
<https://speedyjx.com/2015/06/04/game-audio-and-the-50-fallacy/>. 2015.
- [2] ERIK FAGERHOLT AND MAGNUS LORENTZON. “**BEYOND THE HUD-USER INTERFACES FOR INCREASED PLAYER IMMERSION IN FPS GAMES**”. MA thesis. 2009.
- [3] JESSE JAMES GARRETT. **THE ELEMENTS OF USER EXPERIENCE: USER-CENTERED DESIGN FOR THE WEB AND BEYOND**. Pearson Education, 2010.
- [4] OMER YOUNAS LEE B STEG. **GAME UX MASTER GUIDE**.
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- [6] TECHNOLOGY TRANSFORMATION SERVICES. **USABILITY.GOV**.
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