"Do anything, but let it produce joy."
Walt Whitman
Journalist, Poet

VIII. GAME MECHANICS (PART 2)

There is still much more to talk about in terms of game mechanics, such as the chance or probability of an event, level design, combat design, opponent and character design, consumable item design, and more aesthetic aspects such as sound and cutscene. Understanding these characteristics will broaden your understanding of game design in general (Schell, 2008).

8.1 Character and Avatar

When playing a game, the character a player controls is very personal and magical. This character is commonly referred to as an avatar, which comes from a Sanskrit word that means a divinity taking physical form through sorcery (Lochtefeld, 2002). To help you with character design, define these:

1. **Character functions**

During the writing process, characters are often created as needed for the storyline. However, in the case of game development, it's important to plan out the cast of characters and determine the specific functions they must perform. A useful strategy is to create a list of these functions beforehand.

2. **Character traits**

Compiling a list of attributes, whether physical or behavioral, is a straightforward process that simply shows familiarity with the characters. However, for the player, it could also reflect their personality and general preferences. Consider using the interpersonal circumplex to help you reshape the characteristics of your characters. The interpersonal circumplex is a visualization tool that social psychologists sometimes use to understand how characters interact. While it is not the only tool available for analyzing character interactions, it can offer valuable insights to help you consider them in game design. Adding this tool could be helpful.

The Interpersonal Circumplex, as shown in Figure 65, is a system that categorizes different personality traits

and behaviors related to social interactions. It was created by Timothy Leary and is represented in a circular diagram. The system not only enables comparison of different traits but also provides a scale of healthy and unhealthy expressions of each trait (Horowitz, 2004).

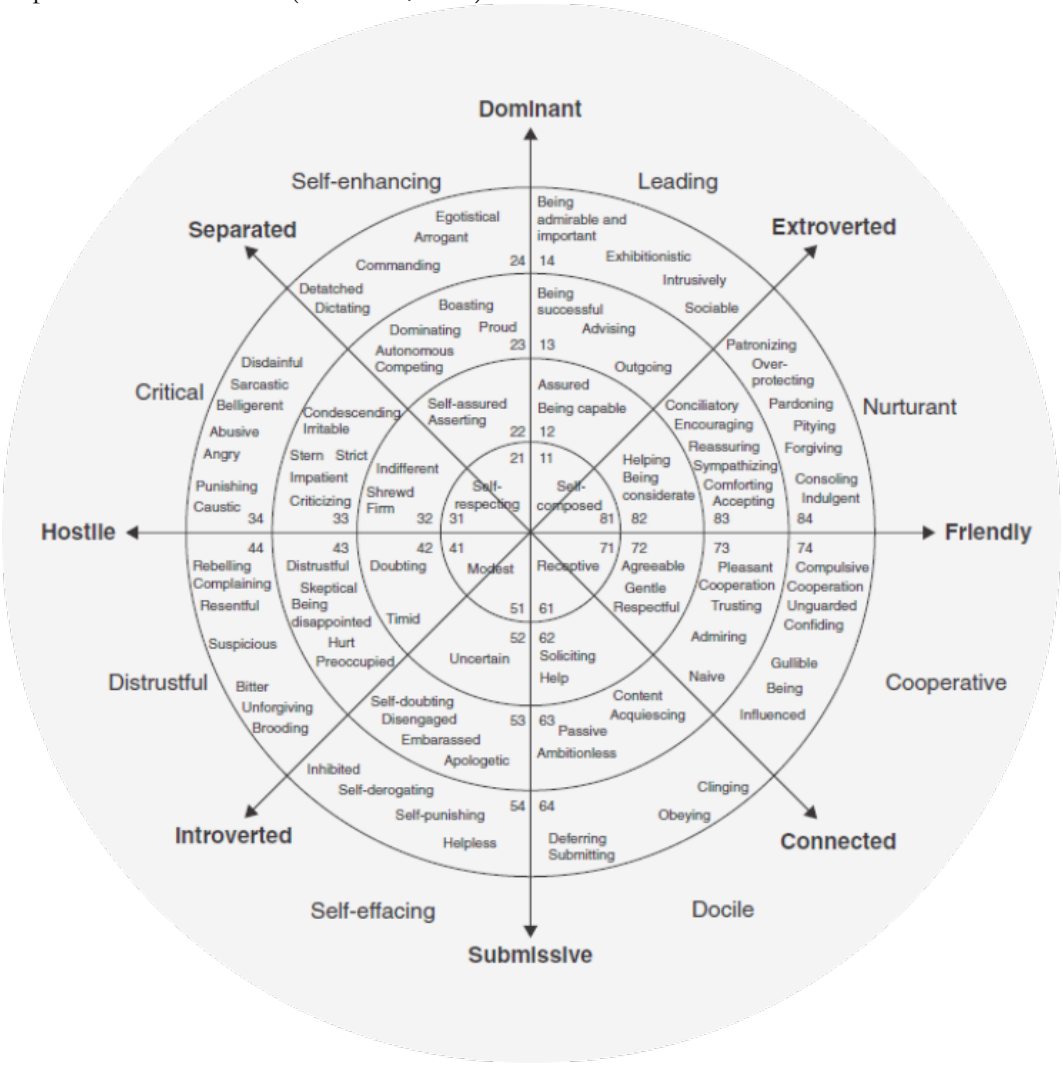


Figure 65. The interpersonal circumplex, a taxonomy of interpersonal personality traits and behaviors originally by Timothy Leary.

3. Character web

Visualizing character relationships can be done effectively with the use of the circumplex. However, it is

important to consider that other variables may also impact the connections between characters. To address this, creating a network that links these variables to your main or secondary characters can be helpful. Figure 66 shows an example of characters web using Milanote.

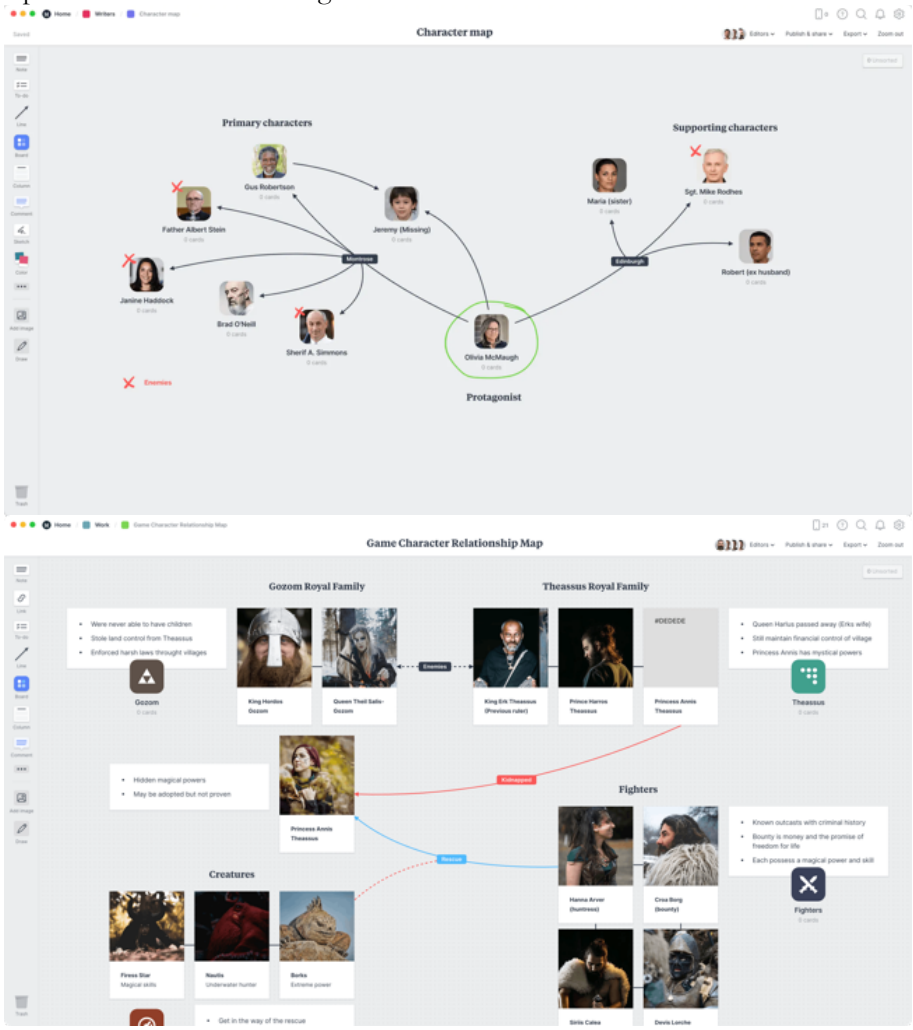


Figure 66. An example of a character's web using Milanote.
(This screenshot is taken from www.milanote.com)

8.2 Combat

If you want your character's attacks to be more authentic and distinct, do some research on actual combat techniques. Create a signature weapon for your character to help them establish their persona quickly. Be sure

to explore all four ranges of combat:

- **Close-range combat**: Involves various physical moves such as grappling, punching, striking, sweeping, and quick burst moves like head butts and uppercuts, as well as playful moves like tickle fights.
- **Medium-range combat**: Consists of weapon swings, flying kicks, and dash attacks.
- **Long-range combat**: Involves attacking enemies from a distance by shooting or casting spells.
- **Area effect**: Smart bombs and special attacks have area effects that can target enemies from a distance or on the entire screen.

To add more variety to combat, attacks can be executed from four different elevations or positions:

- **Standing position**: Is when the player is at shoulder height and can strike opponents of man-size or larger.
- **Low position**: Involves crouching or kneeling to deliver strikes at the enemy's waist height or lower.
- **High position**: Requires jumping to attack over the head of an average-height enemy.
- **Aerial position**: Is when a player has jumped or flown into the air to attack.
- **Underground position**: Some games even let the players hit enemies from exactly below.

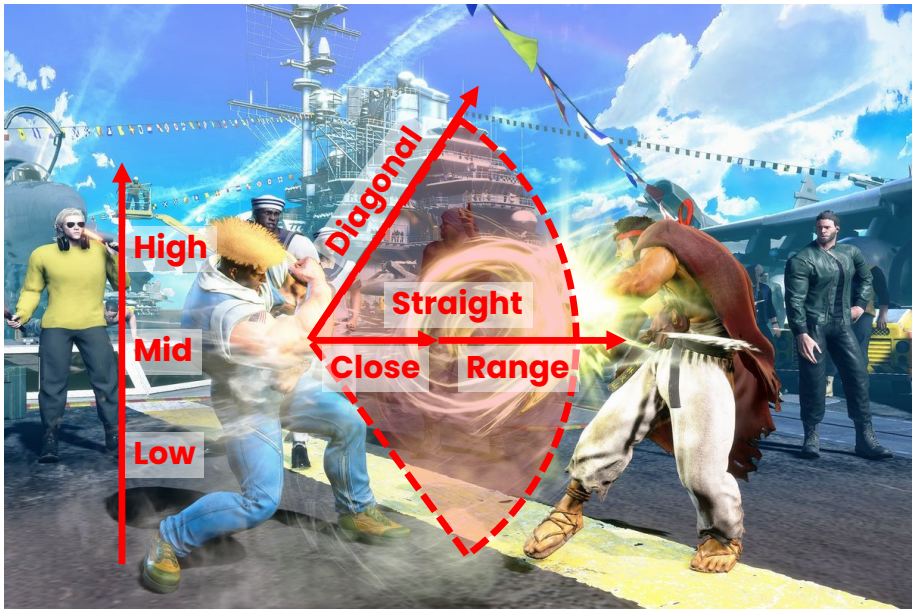


Figure 67. Various attack types in combat in Street Fighter 6.
(This screenshot is taken from https://www.polygon.com/23172651/street-fighter-6-simple-modern-controls).

Combat maneuvers can be performed with vertical and horizontal attacks from any distance or height. To keep track of the important details of these attacks, an attack matrix, like the one displayed above, is used. The matrix includes the attack name, control scheme, attack range, attack speed, attack direction, damage, and special abilities. Figure 67 shows the combat mechanic approximation in fighting game Street Fighter.

8.3 Enemy

It is important to identify your opponent's objective. Your decisions during the design process will have a significant impact on how the programmer codes it, how the animator builds the rigging model, and how the artist textures it. Take note of the following essential opponent attributes:

1. **Size**

In video games, enemy size often indicates their level of health. There are various enemy sizes in Metal Slug as shown in Figure 68.

- **Smaller enemies**: Typically, no taller than the player's character waist.
- **Average enemies**: Around the same height as the player character.
- **Larger enemies**: Several heads taller than the player, while huge enemies are at least twice the size of the player.
- **Gigantic enemies**: massive enemy that they can be viewed clearly from a distance.

Figure 68. Metal Slug X: on the most left is the character and the regular size of other characters including enemy is similar, while the second-last boss is bigger (the grounded UFO), and the last boss is the big,

levitating UFO.

2. **Behavior**

In a game, there are different types of enemies with unique behaviors. Here are some behavior patterns according to attack or defense styles:

- **Shooters**: Include patrollers and chasers, will attack the player once they have been spotted.
- **Flyers**: Moves in the air, have their own classification due to their added dimensionality. They can attack the player by swooping down or firing projectiles from a distance. Some flyers are also **Bombers**, attack from above and affect areas.
- **Burrowers**: An invulnerable state that allows them to position themselves advantageously.
- **Blocker**: An adversary that can defend itself from the player's attacks by using a shield or other defensive tool.

These are the patterns according to the movement styles:

- **Patroller**: Moves in a repetitive mechanical pattern, while a chaser pursues the player when certain conditions are met.
- **Guards**: Prioritize guarding a specific item or location rather than chasing the player.
- **Teleporters**: Change their position around the playfield, keeping the player on their toes.

Generally, you can combine between multiple types of behavior to create your unique enemies.

3. **Speed**

When it comes to enemies in video games, their speed and movement can greatly affect their danger level and how intimidating they appear. It's important to consider different speeds for enemies, such as non-mobile, slow, medium, fast, and quick.

- **Non-mobile enemy**: Even a non-mobile enemy can still move in some way, and it's important to remember that movement adds character and life to the enemy. For example, a giant creature like Cthulhu may be immobile due to its size or technological limitations, but it can still be considered a formidable enemy.
- **Slow enemies**: Work best in large groups, as one alone may not pose much of a threat, but a dozen or more can make even a brave hero nervous.
- **Medium speed enemies**: Move and attack at a pace similar to the player, making them predictable but suitable for most situations.
- **Fast enemies**: Fast enemies are great for horror and action games, as they can quickly strike and retreat or move around quickly and launch multiple attacks. Players will have less time to react to fast enemies, making defeating them more challenging. Figure 69 shows the screenshot of Days Gone where the enemies (zombies) have relatively medium-fast movement speed.

Figure 69. In Days Gone, player will face medium to fast zombies approaching in huge numbers.

4. Movement

To determine the movement of your designed enemies, consider asking yourself a few key questions:

- What is their movement style?
- Do they charge at the player aggressively or zigzag in an erratic pattern to avoid taking fire?
- Do they make a beeline towards the player and then retreat, or jump from cover to cover?
- Do they crawl on walls to ambush the player from above, or do they run away and never engage in combat?

Understanding the movement patterns of your opponent is crucial, as it not only determines their attacks but also their character. It is important to identify if your enemy moves randomly or predictably. Avoid being too one-dimensional and incorporate diversity. If the movement is too random, the player may feel that the enemy is moving in an arbitrary manner. Conversely, if the movement is too predictable, the enemy may seem too artificial.

5. Modifier

- **Block/ parry**: The enemy can block or parry the player's attacks, which can cause the player to become staggered during a combat. This can disrupt the player's combat flow, reset their combo meter, and even cause their weapon to rebound or ricochet.
- **Knockback**: When the player is hit, they are not damaged but instead knocked backward. This can interrupt any combat chain or activity the player was involved in, such as spell casting or operating a mechanic. Creating distance between the player and the enemy is advisable to avoid such interruptions.
- **Stun**: When the player is stunned, they become defenseless and may be standing or on the ground.

While they briefly lose control, the duration of the stun must be brief, as it can be frustrating for players.

- **Freeze/ paralyze**: In the game, a "**freeze**" attack can briefly immobilize characters. However, it can be countered by quickly pressing buttons or moving the control stick. This attack may or may not cause damage to the player. It's crucial to have a pleasing animation and visual effect when the player successfully breaks free from the attack. Some games differentiate the "**paralyze**" implementation, in which the affected object will gradually lose resources, including hp, energy, and coins per period of time.
- **Heal/ repair**: The option of the enemy regaining health sparingly is recommended, as it may seem unjust to the player. For best results, it is advisable to use only when the enemy has a healing animation and a health bar to indicate that they have returned to their partially or fully healed state.
- **Buff**: This action functions similarly to healing, but the opponent accumulates power to launch an attack. It's commonly observed when preparing for magical spells, but not limited to.
- **Steal**: If the enemy steals money or equipment from the player, the gameplay dynamic changes from "fight the enemy" to "retrieve what was stolen." It's important to ensure the player has a fair chance to recover their lost items. There is also "**Leech**", the player's "charged up" resources are depleted by the attacked enemy, such as power, mana, shield power, or fuel.
- **Vulnerability/ resistance**: Ensure that the weaknesses of the characters are easily understandable and logical. For instance, it's obvious that a snow angel that is harmful can be defeated by fire, while a flaming bat would be unaffected by a burning torch waved in front of it.

Creating an enemy the player strongly dislikes can enhance their immersion in the game and make it a memorable experience. Figure shows the Dota2 screenshot again, where a character might be affected by several buff effects, either positively or negatively.

Figure 70. In Dota 2, player status buffs are displayed above the main HUD. Status like being stunned is showed with a circular time indicator. Typically, red circle indicates negative buff, while the positive buff is shown by green circle.

8.4 Power Ups & Consumable Items

Power-ups can be found in various gaming genres, including driving, puzzle, action-adventure, and shooters. They are obtained by defeating enemies, uncovering treasure chests and crates, or simply located along the player's path. Power-ups can be categorized into four types. Figure 71 shows a two-type power up where it can be considered as an offensive or defensive one.

1. **Offensive**

Enhance combat or attack for players to defeat foes quicker, with greater effectiveness, and in a more impressive manner.

- **Buffs**: temporarily enhance the player's skills and abilities. One example is the damage modifier, which can increase the player's elemental or base damage. These power-ups may also come with dynamic visuals.
- **Upgrader**: players can permanently enhance their equipment or improve their stats such as strength, speed, and attack damage. For instance, the Ammunition boost feature will partially or fully replenish the player's ammo supply.
- **Companion**: small object appears beside them that can offer extra attack or shielding abilities.

2. **Defensive**

Assist in enhancing the player's resilience to withstand damage and advance further in the game.

- **Recharger**: In the game, the player's health bar or life needs to be refilled when it runs out. However, even if the player runs out of health, they can still continue playing thanks to this feature.
- **Invulnerability & Invincibility**: Invulnerability means that the player is not affected by enemy attacks. Invincibility is similar, but the player can also defeat most enemies automatically by clashing with them.
- **Protective**: As a form of protection, there are momentary force fields, physical shields, or auras that can defend the player from projectiles, fire, or any potential damage caused by opponents.
- **Bomb**: Refers to a type of bomb that eliminates all enemies visible on the game screen, providing relief to the player from challenging gameplay.

Figure 71. The Super Vehicle (SV), called Slug in Metal Slug, can be an offensive and defensive power-up.

3. Movement

You can give the player the option to upgrade their current movement abilities or even add new ones. The movement buff can be used as an offensive or defensive trait.

- **Speed change**: The player can achieve remarkable speeds in their gameplay, thanks to the implementation of nitro boosts and other powerful enhancements. These game features allow for a thrilling and fast-paced experience that adds an exciting element of challenge and excitement to the game.
- **Access change**: If the player acquires a power-up ability, they can gain access to areas that would otherwise be inaccessible. This can be a useful strategy for exploring and discovering hidden secrets within the game. See an example in Figure 72, a player can get special access to certain area with certain trigger.
- **Size change**: It has been observed that in certain games, modifying your size can grant you access to a range of unique abilities. These abilities can range from basic ones, such as being able to squeeze through narrow spaces, to more complex ones that can significantly enhance your gameplay experience.

Figure 72. In Crash Team Racing (CTR), players are provided with shortcuts that can be reached in specific ways. For instance, in the Temple circuit, players may find a narrow hallway after firing some explosives.

4. Game Changers

Even a simple mechanism can greatly change the way the game is played and how the player interacts with it.

- Magnetic: This power-up helps players attract treasure items during battles and eliminates the need for them to collect them afterwards, which can be risky in dangerous areas.
- Comedy or unknown: Some power-ups are designed to be funny or unexpected, solely for the purpose of entertaining the player. However, not all power-ups are useful or practical. Game designers have also created anti-power-ups to make the game more challenging. Figure 73 shows a Crash Bash, a multiplayer party game that accommodates up to 4 players. In one of the game modes, called Polar Push, players must push each other to remain standing until the end of the game. Random power-ups are available, some of which have negative effects. For example, a power-up may shrink your character, making it easier for others to push you and potentially leading to being crushed by a 500 lb metal object.

Figure 73. Crash Bash is a multiplayer, comedy-party game that accommodates up to 4 players. In this game there are some funny and crazy items that may alter the game ends.

8.5 Level Design

The definition of a level in video games can be ambiguous. Some people believe that a level refers to the location or environment where the gameplay takes place, while others think it refers to a player's rank based on their score, experience, or skills. Both definitions are commonly used in the gaming industry, but it is important to be clear with your development team about which definition you are using. Personally, I prefer to use the term "level" to refer to a game space and use specific terms to describe level progression, such as the name of a world or city in the game. If you want to learn more about terms related to levels, there are additional keywords to understand, but don't worry - this is not an exam and you can always revisit the chapter later. Let's review these keywords together:

- **Round**: In games where the same action is repeated, we use the term "rounds". It is commonly seen in sports games like MMA, boxing, or golf. See Figure 74, an example of sport game, UFC.
- **Wave**: When referring to combat, the term "wave" is used. The player is served with multiple waves of zombie raids in Plants vs. Zombies, see Figure 75.
- **Stage**: To describe the behavior of a boss adversary, we use the term "stage". Usually, the player will venture through several stages before finally arriving at the boss stage.
- **Act**: When game creators want players to focus on the game's story, they use "acts" and "chapters". It just sounds narratively correct, right?
- **World**: Lastly, the term "world" refers to the video game setting, mainly defined by its visual or genre concept, and can consist of multiple areas with a common theme.

Figure 74. EA Sports' UFC 3. The gameplay segmented into 3 to 5 rounds each match. (This screenshot is taken from https://www.youtube.com/watch?v=jJcMWwhYGvQ).

Figure 75. The final wave in the game of Plant vs. Zombies is incoming.

1. Level Design Elements

Level design involves combining various playable game components to create a puzzle-like experience for the player. The designer must utilize the game engine, artwork, and gameplay mechanics to construct levels. Poor level design is often the most noticeable issue in a game. The following elements make up a level:

- **Action**: The level of action in a game is determined by the type of game being designed. However, it is important to determine the level of conflict that players will encounter.
- **Exploration**: Planning the flow of a level is crucial to ensure that the exploration aspect of a game is enjoyable. This involves deciding whether players need to deviate from the main path to advance or if there is only one way to progress.
- **Problem-solving**: Players must experiment in the environment and with the game mechanics to solve the problem. This requires them to move beyond just finding the puzzle and instead focus on figuring out how to handle it correctly.
- **Storytelling**: It is crucial to know the story goals for each level before building it to effectively present the story. However, it's also important to keep the story flexible enough for the level designer to have the freedom to create the best possible level.
- **Aesthetics**: Most level designers prioritize the visual and auditory aspects of their work, as these are often the first elements that receive feedback from team, the press, and of course the players.

2. Beat Chart

Designers often use popular themes such as outer space, dungeon, cavern, factory, jungle, spooky, pirate (town, ship, or island), urban, and more to enhance their game design. A beat chart, which is a tool used by Hollywood writers and filmmakers to plan and organize the production of their films, is also helpful for game design. Your beat chart should include the file name, level name, player's objective, story beat, enemies, mechanics, and NPCs. Bonus materials, time of day, color mapping, and play style are also important. Creating a beat chart can help identify gaps and clustering in your game, allowing you to reorganize game elements to make it feel more natural.

Nick Filatov, the game designer behind the 2D action-adventure game Die with Glory, has shared his approach to designing level and player progression. A beat chart is a one-page document that outlines the game's structure, including its mechanics, narrative, and other contents (Arbeau et al., 2020). This chart helps monitor gameplay progress and ensures that players are always entertained without feeling overwhelmed at any point in the game. The most convenient form for this chart is a table format. To create a beat chart for your game, you'll need to:

- Describe all the parameters required for each location.
- List the game mechanics and content you want to include.
- Distribute them in a way that avoids excessive overload, obvious gaps, and boring repetition of game elements.

Let's examine their beat chart example, which includes the following details:

- Name or code name
- Brief description (including time of day, season, and color scheme)
- Additional mechanics (each location has a new global mechanic)
- Storyline events
- Player progress (focus of gameplay, game resources obtained, and where they can be spent)
- Approximate time to complete
- Content list (characters, objects, items, threats, and specific game mechanics)
- Audio content list (sound and music)

It is very convenient to have access to all this data for gameplay tuning. The primary recommendations for content distribution are straightforward: avoid overwhelming players with excessive new information or frequently repeating game element combinations. Nick recommends finding further information about beat charts (along with many other valuable tips) in the book "Level Up" by Scott Rogers. Once you have established the structure of the game, it is time to focus on designing each individual location. To do this, we will create another table that expands on the information from the beat chart and provides more detailed information on each location. Each location is broken down into individual "screens" where game objects, items, characters, and other content are placed. Figure 76 illustrates the example of a beat chart.

Location "Nine"	**Kiwik Village**	**Room with Failling Diamonds**	**Troll Cave**	**Dark caves with hungry shadows**	**Falling bridge to exit**	**Waterfall Cave**
Goal	Bring all Kiwiks back to the village alive	Catch 6 diamond keys to open the door to Firi	Run from troll with Kiwik	Pass them	Put mirrors to the right places to open door to rescue Kiwik	Put mirrors to the right places to open door to rescue Kiwik
Characters	Kiwik Shaman, Torch Merchant	Firi	Kiri, Troll	Shadows	Spider Queen, Tori, Green Knight	Raven
Items	Casket, Torches, Jinn Lamp, Guitar	Keys, Smoking Pipe, Coin	Coin (2)	Coin (2), Special Kiwik, Smoking Herb, Long Stick, Portal, Crossbow	-	Tobacco
Objects	Ladder Upstairs	Lever (triggers event), Misc flying dangerous stuff	Ropes, crops, stones, lanterns	Levers, gates	-	Mirrors, Ropes
Assets	Village houses, Cave background, Black background	Moving ceiling, Room interior, Door, Glowing Stone	Cave background, Black background, Glowing stone	Cave background, Black background, Glowing stone	Falling bridge, Cave background, Lava stream, Red background	Cave background, Waterfall, Light beams

Events	If collected, Shaman dies of smoking, but Sigurd got Bottled salt	-	Burn crops to fear troll	-	Bridge falling	System or boxes, ropes and swings to move mirrors
	Buy torches for coins	Poltergeist (sudden flames, closing and opening doors, moving objects, flying objects)	Pull crops under lanterns, drop lanterns on crops	-	-	Scare Raven to move mirror
Notes	Save Kiwiks	Horror atmosphere	All scene are dark	Torches consumption rate	-	-
Level Scheme	Waterfall	Bridge				
	Dark	Village	Dark	Troll	Troll	
				Diamond		

Figure 76. Extended beat chart of Die with Glory.

In Figure 68, you can see an older version of the "Nine" table location in Die with Glory. The bottom of the table includes a scheme that explains the relative position of the recreated screens in Illustrator. Once Nick has the blank "map" and a list of all game elements that need to be placed, it's time to start putting them in their proper places. However, keep in mind that the initial location configuration may change frequently, with elements and their relationships appearing, disappearing, and changing locations. It's important to avoid these changes once the team has already started working on the location, as later changes can be costly. Therefore, it's crucial to plan as many details in advance as possible. Moreover, visuals are a more effective way to communicate information. This is an important point that should be addressed. The level layout of Nick's game is shown in Figure 77 and the refinement of the level is shown in Figure 78.

Figure 77. Template of level layout used in level "Nine".

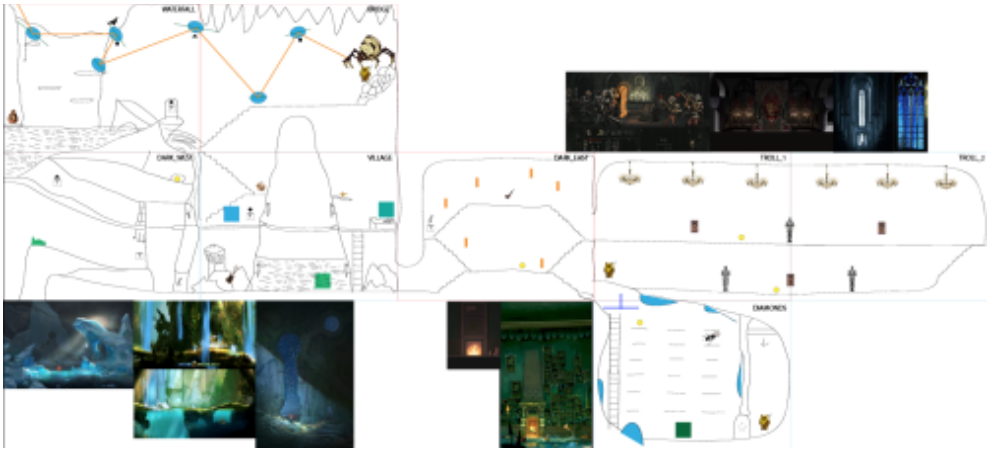


Figure 78. The refinement of level design in level "Nine". Nick also attaches the references.

Nick usually focuses on hand-drawing landscapes and tends to use colored markers or placeholders for characters and objects. To effectively communicate your game design ideas with artists, it's crucial to provide detailed visual references. Don't forget to include background references in the location map. It's a good idea to have one or two meetings to discuss the location and listen to input from teammates. Based on those discussions, make adjustments to the location as needed. Remember to stay open to feedback and work together to create the best location possible. Once everything is prepared, discussed, and approved, Nick sends a location map to the artists. Figure 79 shows the refined level design by visual artist.

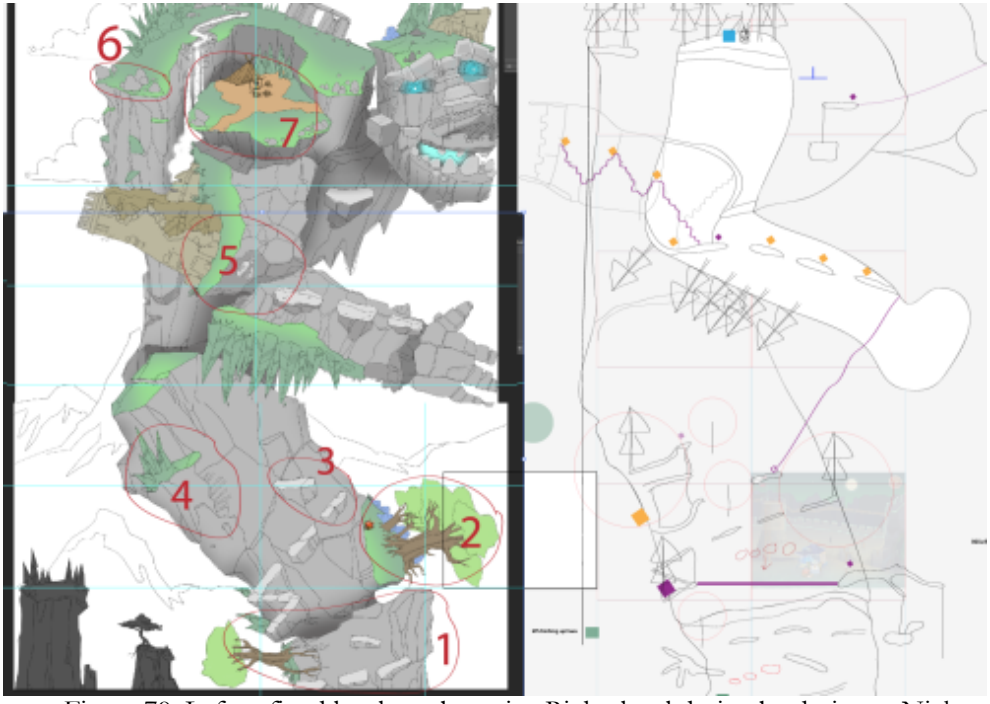


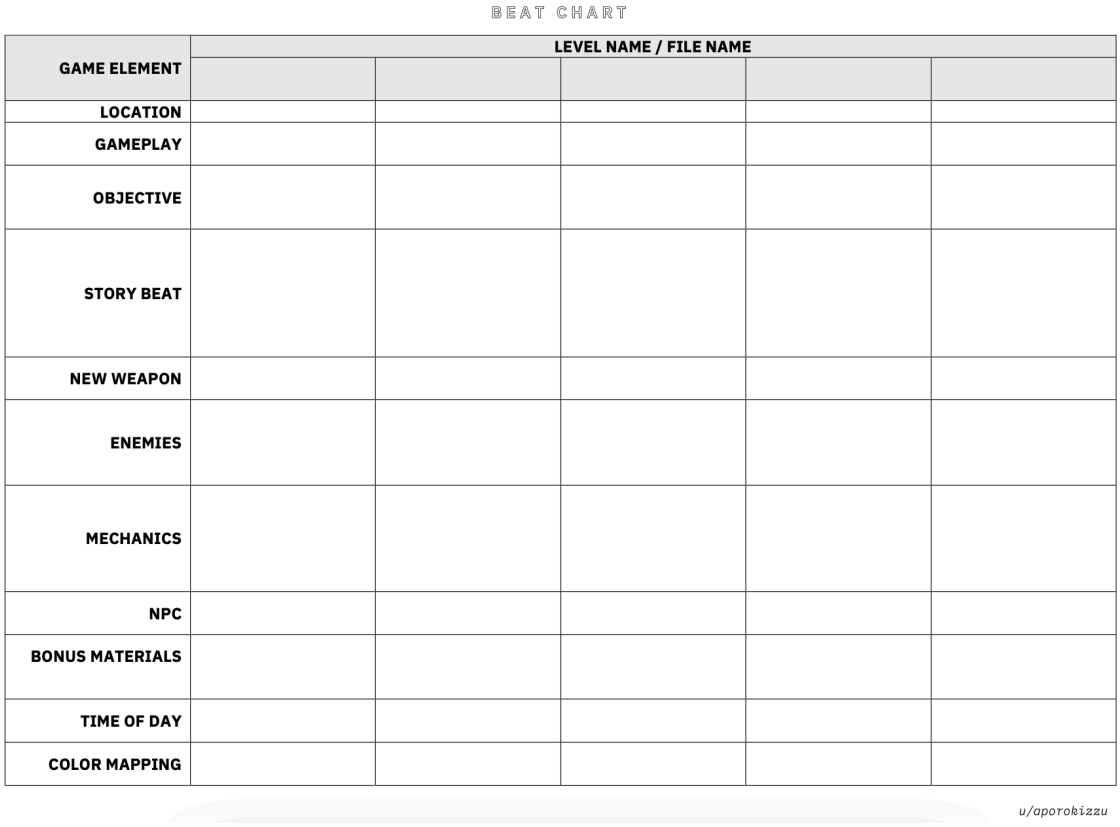
Figure 79. Left: refined level arts by artist. Right: level design by designer, Nick.

Please note that there is no strict template for making a beat chart. A Reddit user, u/aporokizzu, shared his template and example of a beat chart. Figure 80 shows the beat chart template, and Figure 81 shows the example use of it.

BEAT CHART

LEVEL					
NAME					
TIME OF DAY					
STORY					
PROGRESSION					
EST. PLAY TIME					
COLOR MAP					
ENEMIES					
MECHANICS					
HAZARDS					
POWER-UPS					
ABILITIES					
ECONOMY					
BONUS MATERIALS					
MUSIC TRACK					

u/aporokizzu



BEAT CHART

GAME ELEMENT	LEVEL NAME / FILE NAME				
LOCATION					
GAMEPLAY					
OBJECTIVE					
STORY BEAT					
NEW WEAPON					
ENEMIES					
MECHANICS					
NPC					
BONUS MATERIALS					
TIME OF DAY					
COLOR MAPPING					

u/aporokizzu

Figure 80. A beat chart template. The first part of image shows the general, wider picture of beat chart. The second part of image shows the detailed description per area or level.

Relic Raider beat chart

Game Element	Level Name/File Name				
	Shanghai/ Roof01	Jungle 01/ Jung01	Jungle 02/ Jung02	Temple of the Hidden Skulls/ Jung03	Mountain Escape!/ Road01
Location	Shanghai roof-tops	Jungle	Jungle	Ancient temple (int)	Mountain pass
Gameplay	Stealth, shoot-ing, jumping	Shooting	Fighting	Platform, jump-ing	Driving
Objective	Find crime boss Wu-Fan	Jungle part 1	Jungle part 2	Reach chamber of skulls	Car chase
Story beat	Jake steals medallion, is caught by Wu-Fan	Jake explores jungle	Jake finds temple of skulls	Jake places medallion in statue; Nazi general Hauser shows up	Jake steals truck, flees Nazis
New weapon	.45, machine gun	Machete	No	No	No
Enemies	Tong thug, axe man, machine gunner	Jaguar, native (spear)	Jaguar	Jaguar, Nazi soldier	Nazi truck, Jeep w/ machine gun
Mechanics	Swinging rope, zip line	Swinging rope, zip line	Zip line	Spiked pits, blow darts, crushing walls, fall-away floor	Falling rocks
NPC	Wu-Fan	Guide	None	Hauser	None
Bonus materials	Art gallery 1	Art gallery 2	Art gallery 3	Alt. costume	Art gallery 4
Time of day	Night	Night	Night	Day	Day
Color map-ping	Blue/red	Green/brown	Green/brown	Green/gray	Tan/sky blue

Maximo: Ghosts to Glory beat chart

Level: World 1-1	Level: World 1-2
Name: Grave Danger (Boneyard)	Name: Dead Heat (Boneyard)
TOD: Night	**TOD:** Night
Story: Maximo enters the graveyard, fighting his way through undead creatures that bar his way.	**Story:** Achille's drill has cracked open the earth, causing lava pits to open up throughout the graveyard.
Progression: Player taught basic movement, combat and defensive moves. Player learns how to collect and map abilities.	**Progression:** Player masters hazardous jumps and more intense combat.
Est. play time: 15 min	**Est. play time:** 15 min
Color map: Green (trees), brown (trees/rock), purples (tombstones)	**Color map:** Red (lava), brown (trees/rock), pur-ples (tombstones)
Enemies: Skeleton (basic), sword skeleton (red), skeleton (axe), ghost, zombie (basic), wooden coffin, chest mimic	**Enemies:** Skeleton (basic), skeleton (axe), sword skeleton (red), sword skeleton (blue), skeleton (guardian), zombie (basic), raven, ghost
Mechanics: Holy ground, breakable tomb-stone, breakable torch, breakable crypt lid, breakable rocks, Achille key statue, key lock, opening gate (door), opening gate (cave), prize wheel, treasure chest, locked chest, hidden chest, end plinth	**Mechanics:** Holy ground, breakable tombstone, breakable torch, breakable crypt lid, key statue, key lock, opening gate (door), enemy coffin, floating platform, prize wheel, treasure chest, locked chest, hidden chest, end plinth
Hazards: Unholy ground, Achille statue, fall-away ground, skull tower, breakaway bridge, deep water, lava pit	**Hazards:** Unholy ground, swinging gate, skull tower, flame jet, lava pit
Power-ups: Koin, koin bag, diamond, death koin, spirit, life up, flametongue, shield recharge, sword recharge, half health, full health, iron key, gold key, armor up	**Power-ups:** Koin, koin bag, diamond, death koin, spirit, life up, flametongue, shield recharge, sword recharge, half health, full health, gold key, armor up
Abilities: Second strike, mighty blow, magic bolt, doomstrike, foot cheese	**Abilities:** Second strike, mighty blow, magic bolt, doomstrike, throw shield
Economy: 200 koins, 2 death koins	**Economy:** 200 koins, 1 death koin
Bonus materials: N/A	**Bonus materials:** N/A
Music track: Graveyard 1	**Music track:** Graveyard 2

Figure 81. The example use of a beat chart by u/apporokizzu.
(This is taken from https://www.reddit.com/r/gamedev/comments/e9wp41/game_design_document_beat_chart_description_blank/)

8.6 The 3 Cs (Control, Character, and Camera)

When designing a game, it is important to establish three fundamental elements early on in the pre-production phase. These elements, known as the "Three Cs," are essential and serve as a basis for the rest of the design process.

1. Control

The field of ergonomics focuses on adjusting equipment to fit the user. When designing hardware, developers pay close attention to how players hold and operate the controller (human ergonomics). For younger players, it is important to keep button presses simple and avoid complex combinations that their fingers may not be able to handle. It is also helpful to offer a variety of control options and even allow players to customize their controls in the options menu. An example of control mapping in Pro Evolution Soccer 2021 (PES2021) is shown in Figure 82.

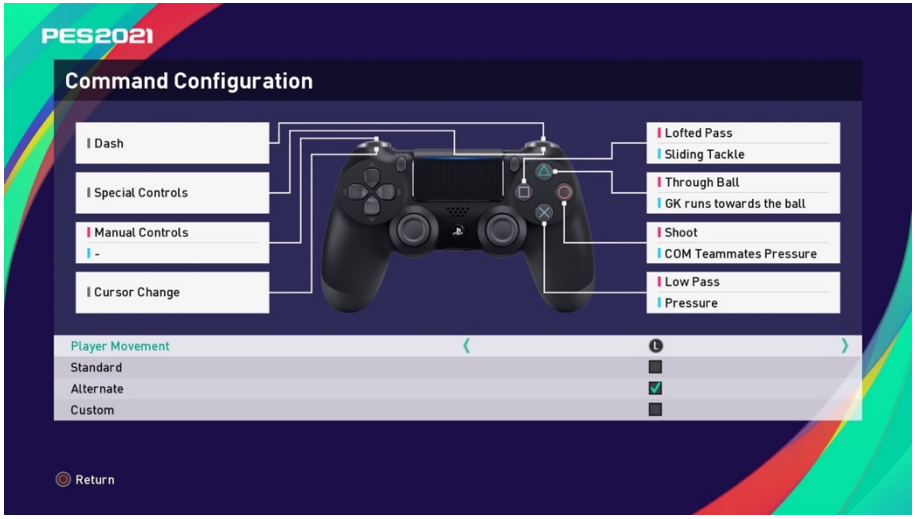


Figure 82. Control configuration in PES2021 game. Players may change the control to fit their preferences.

2. Character

If you want your game characters to be more believable and lifelike, use these guidelines to define them:

- **Personality Traits**: As an example, players can choose to create characters with comedic, heroic, or badass traits. They have the freedom to customize various aspects such as their character's name, appearance, clothing, armor, gear, vehicle, base of operations, weapons, and pet.
- **Physical Characteristics**: the shape of the body, age, and any historical scars. Figure 83 illustrates the different main shape of characters. The shape's differences will be beneficial for player to differentiate between one character to another. While Figure 84 more describing the differences in the behavior characteristics.
- **Metrics**: The metrics of the character are based on these proportions, which are crucial for designing and playing the game. These metrics determine various factors such as the character's height, passage width, walking and running speed, jump height and distance, attack distance, and projectile distance.

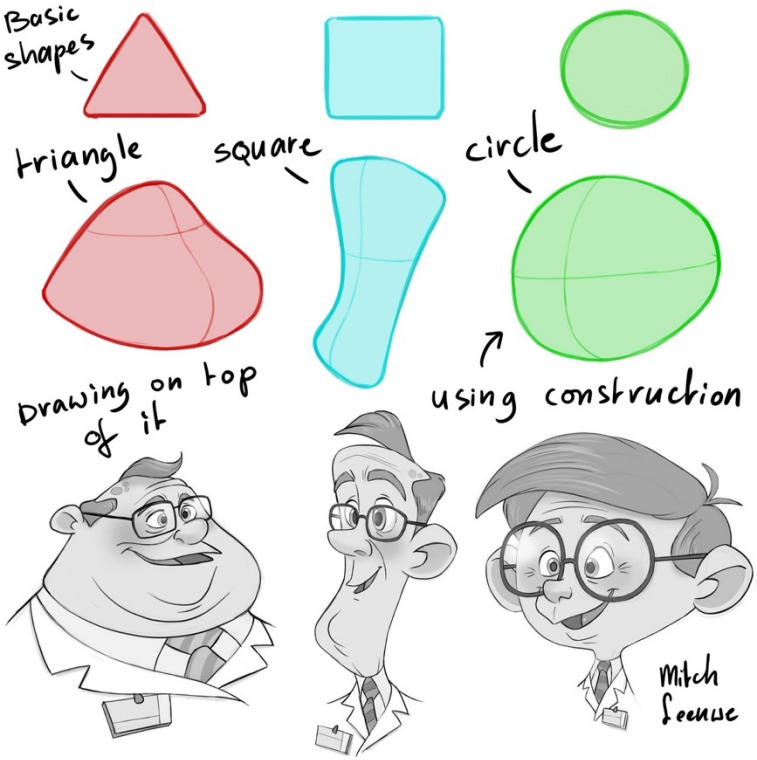


Figure 83. Characters main shapes by Mitch Leeuwe. (Taken from http://mitchoo.blogspot.com/2019/08/shapes_18.html)

Figure 84. A player board from Root board game. This player board informs the characteristics of play from a specific certain character. Mainly, there are three phases: birdsong, daylight, and evening. But between players, the activities on those phases are very different. In Marquise de Cat board for instance, the play-style is that the player must recruit and build as many as the player can.

3. Camera

Selecting the appropriate camera for your game is crucial not only in terms of programming it, but also in terms of influencing the design of your game, control mapping, and artwork creation.

- **Static Camera**: A static camera is a camera that doesn't move and is fixed to a single screen, location, and image (Figure 85).
- **First Person Camera**: First-person cameras are used in a wide range of game genres, from platformers to racing games. It shows how you see (your point-of-view) (Figure 87).
- **Third Person Camera**: Shows how other people see another. Getting a third-party camera to work properly may be the most difficult problem a team encounters (Figure 88).
- **Isometric Camera**: There are certain advantages to using an isometric (or iso) camera. It provides players with a fast understanding of an environment's layout and item relationships, making it perfect for environmental puzzle solving (Figure 89).
- **Scrolled Camera**: A camera where it can follow the game objects. It can scroll sidewards, or upwards-downwards (Figure 86).
- **Top-Down Camera**: While some game level features (usually world objects and power-ups) are presented from the top down, others (such as characters) are presented from the side (Figure 90). Yes,

top-down camera is actually a scrolled camera. Because of the peculiar game designs using this technique frequently, we consider as separated type.

- **Multiplayer Camera**: A camera that shows multiple players on a single monitor. The most popular multiplayer camera is as follows: Split Screen (Figure 92) and Zooming Screen (Figure 91).

Figure 85. Static camera view in Mario Bros (Atari C64), 1984.

Figure 86. Rayman Legends by Ubisoft uses parallax environment. Where the object closer to the camera will move faster than in the background.

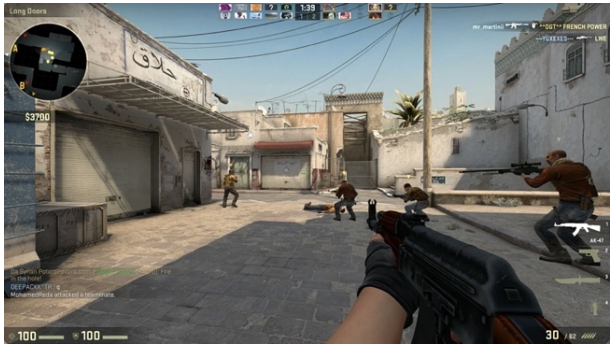


Figure 87. A first-person-shooter (FPS) camera in the Counter Strike: Global Offensive.

Figure 88. Third-person view in the game of Tom Clancy's The Division.

Figure 89. Isometric view in Metal Slug Tactics.

Figure 90. Top-down camera in the game of Sonic Wings 3. Typically, a shooter-airplane games are using this view.

Figure 91. One-screen multiplayer view in Diablo 3. Where all players are looking in the same frame.

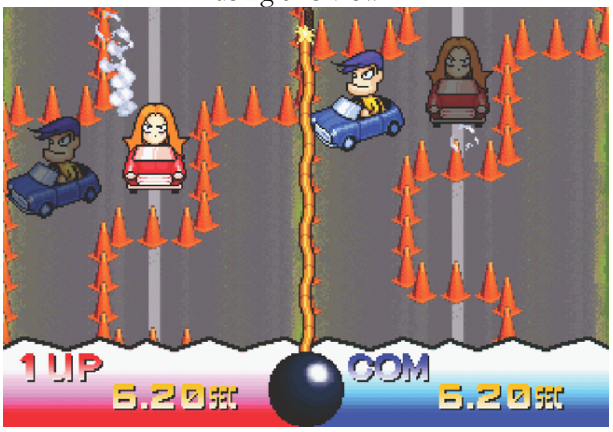


Figure 92. Split-screen multiplayer in the Bishi Bashi (PlayStation1), a comedy game.

8.7 Heads-Up Display (HUD)

The HUD, named after the heads-up display featured in modern airplanes, is the most efficient method of communicating with the player. The HUD is any visual feature that delivers information to the gamer. A HUD's small screens and icons are among the most useful tools in a video game designer's arsenal. They can transmit information, emotions, and even point the player in the right direction. Figure 93 and 94 shows PUBG and Ni no Kuni; two games which have rich of HUD components.

HUD elements on a typical gaming screen include:

1. **Health Bar/ Lives**

The health bar, which is common in action, adventure, platformer, and shooter games, shows how near the player is to death or needing to restart for some other reason.

2. Targeting Reticule (Aim)

A targeting reticule helps players find and/or lock onto long-range targets. They can be as simple as a "dot" on a laser sight to as complex as a lock-on system that also communicates target information like as health and range.

3. Resource Gauge

The gauge shows the information of resources you have. For example, your ammunition gauge will be one of the most watched gauges on-screen, whether it displays bullets or a basic number.

4. Inventory

Inventory is a frequent element in adventure and role-playing games, allows players to keep track of and handle objects obtained throughout the game. Keys, potions, puzzle pieces, and weapons are all common inventory items.

5. Map/ Radar

A radar or map is a user interface element that displays geo-location information surrounding the player. Sometimes players want to see the big picture of where they are in order to gather information and plan their strategy.

6. Score and Experience

Make your scoring huge and flashy when it happens, whatever form it takes. Here are some suggestions for making your awards more rewarding:

- When a player obtains a prize, call emphasis to it with voice and sound effects.
- Stop the game so the player can appreciate the moment of reward.
- In order to grasp how they arrived at their score, the player must see a clear "cause and effect" for scoring.

7. Context Sensitive Prompt

When the player is near an object or character with which it interacts, a context-sensitive prompt emerges in the form of an icon or text. The most typical context-sensitive prompt shows the icon of the button or control that the player must press in order for the event to occur. This UI is typically displayed with more highlighted objects.

Figure 93. The screenshot of one of the most popular games in 2020, PUBG (Player Unknown Battle Ground). You can see that this mobile version of game is using some HUD elements, like health bar, target reticule, ammunition gauge, inventory, and a radar.

Figure 94. Ni no Kuni: Wrath of the White Witch is also implementing some HUD elements such as: experience (level), contextual UI (action that the player can choose) like when in battle, and more.