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Design and Implementation Visual Environment of 2D Puzzle Platformer Computer Game: ASCENDER

Abstract

ASCENDER is a single player 2D puzzle platformer PC game which has an explorative world called GOA set under the land of a realm. The game equipped with the basic of all game visual design assets such as characters, environment, properties, visual effects, and user interface. Environment visual design were created by game visual artist to provide a realistic and beautiful set of environmental assets, props and scenery element required for game character exploration and interaction.

Designing visual game environment involved visual artist, story writer, game designer and curve level designer. The design process itself included brainstorming, creating concept art, coloring, layering (parallax), and compositing. Environment design build with consideration based on story, world logic, and gameplay, can be effective and immersive for the player to enjoy the game experience, exploring the world, interaction of the game, solving puzzle, and follow the storyline.

Keywords: Environment Design, 2D platformer, PC Game.

1. Introduction

ASCENDER is a single player 2D puzzle-platformer-PC game built with Unity game development engine [1] developed by Gamechanger Studio in Indonesia and planned to release at 2017 on Steam [2]. The environment set of Ascender game has an explorative set in a great cave under the land surface, which Indonesian called 'Goa'. The main playable character named Sky, a bipedal dog-sized robot assistance set on adventure helping its owner, the teen limbless girl named Ocean and Professor Toro Hudo in their mission to collect materials that will be useful to create an artificial arms and legs for Ocean.

The game environment is located in an underground cave called Goa which is one of the multilayer civilization in Ascender world concept. The title Ascender itself means 'going up', and the journey begins from Goa. This paper describes how the environment in Goa was built and implemented into the game.

1.1. GOA DESCRIPTION

Goa is an underground large cave where humans live in and build their civilization as a survivor from a toxic realm surface named Ataran. The civilization builds their own environmental system inside Goa and provide themselves with artificial light and rain, power and electricity, and also clean air and water system. Goa as the large structure cave system is divided into some smaller caves as districts that connect to the central capital city which is the largest cave called Dolopo.

Every district has its own function to support the live of civilization inside Goa, such as providing power source, artificial farm and plantation, minerals, and IT center. Each district connected to Dolopo and are accessible by using the hanging stone ship as transportation system via district terminal that is available on each district.

Every district at Goa has its own unique environmental characteristic as stated in table 1. below:

Table 1.:   Goa District and Characteristic

District Name	Characteristic
Dolopo	Central capital district, oldest and largest cave.
Mustang	Second largest district, mainly soil surface for farm, frequent rain.
Rajumla	Power district, hottest cave with lava flowing for power.
Helion	IT Center, Server Room, Hi tech, the coldest district.
Everest	Holy district, main structure filled with great tree and root.
Hymla	Mining district for minerals, highly unstable and dark cave
Ranesh	Workshop district for metal and mineral forging.

1.2. Goa Construction

Goa construction in ASCENDER was build based on actual cave in its natural form. Figure 1 below shows that the location of real-life cave is usually located between the surface and the underground river. The Cave divided itself into small caves surrounding the main cave that are connected by the caves surfaces and by underground river. Goa construction was built following the actual cave shape and location. The difference is that in the concept story, the Goa cave location is placed between different zone of underground ice river and lava river.
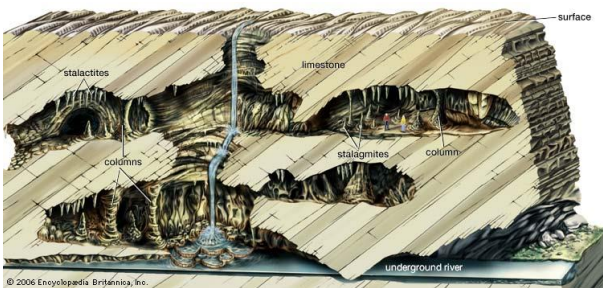

Figure 1.: Cross-Section of an Actual Cave
Encyclopedia Britannica, Inc.[3]

The placement of Goa's district and location distributions were design with the condition of cave foundation zone between hot and cold area as the main consideration. The cold area emerges from underground ice river and the hot area emerges from underground lava river. Therefore, every district has its own unique environment base on which zone the district is located. The hierarchy of Goa's construction and district distribution is shown on table 2. Below:

Table 2.:   Goa Cave Hierarchy

Surface (Ataran)	
Air system	
Forging district	Dolopo (Central Capital District)
Mining district	Dolopo (Central Capital District)
Everest (Holy District)	Mustang (Farm District)
Helion (IT Center, Server room)	Rajumla (Energy-Power Distric)
Cold District	Hot District
Underground Ice river	Underground Lava River

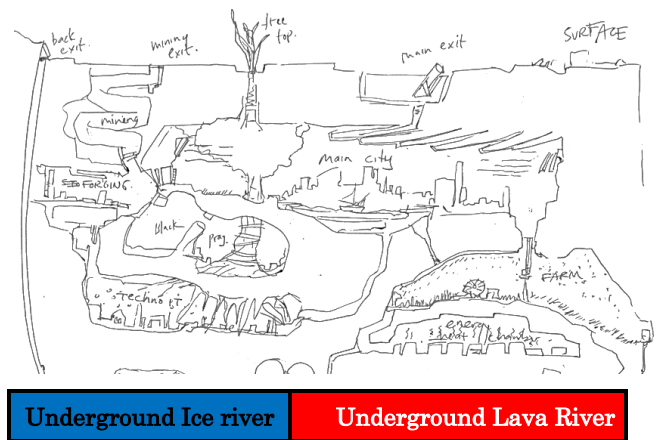Following table 2 above, on figure 2 below is the visualization planning map of Goa's district distribution:

Underground Ice river	Underground Lava River

Figure 2.: Goa's District Distribution Plan

2.   Design Process

2.1. Concept Art

The role of visual design takes the first part to help builder translates the story into visualization, before any game designer and game mechanics got involved. The first step on that process is to make concept arts of each district correspond to Goa's district distribution plan on figure 2. Concept art [4] is a rough drawing on paper to visualize environment and any material and building ideas as much as possible to generate the most suitable environment for the game. After rough drawing, the chosen art was colored by the artist as a color guide for

game background and props. Concept art was colored digitally based on visual references of caves that is suitable to the visual concept of Goa. By doing the concept art, game builder could enrich visual artist experience about what kind of building design, topography of physical feature of area, ambient, and corresponding colors.

Figure 3.: Dolopo District Concept Art

The concept art is basically bind your approach on ideas of visualization concepts with shape, values, color, texture, and composition to give a good looking and matching visual presentation of the game environment. Figure 3 above is the example of a chosen concept art in Dolopo district as Goa's main capital center. The concept art above shows the area of the great cave and also the population density of Dolopo. It also shows details on the cave's topography and river, the main stone ship terminal of Goa's transportation system and the artificial light at the cave ceiling.

2.2. Storyboard

After every district concept art is chosen, the next step is to focus on game art. First step was to make focus ground based on the design curve level plan, provided by game designer. The game designer was using a drawing of basic element as simple as possible so artist could understand and build the set environment corresponding.
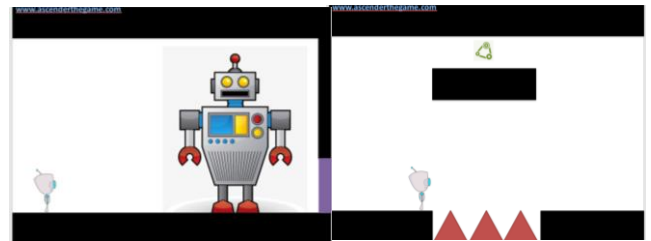

Figure 4.: Simple Level Design Drawing by Game Designer

On the figure 4 above, the picture on the left as example, the main robot character is the little one on the left, and the big robot as a non-playable character (NPC) is on the right. The interaction between main character and NPC can trigger a quest. This scene is located at the big workshop in a warehouse called AIR where all the Artificial Intelligence robots get their operational license after they completed the tasks. The Warehouse is quite big and packed with rusty high tech materials. To visualize this scene, environment artist created a storyboard that focusing the main ground (focus ground).

Storyboard is the most important tools in visualizing preproduction on any project, including game [5]. Making the game storyboard not only helps the visual artist to organize and improving game assets, but also enable the entire game production team to organize and improving all the element of the game design.

Game storyboard was drawn scene by scene with pencil on A4 size paper sheet. This A4 size represents one block map area which game designer use in Microsoft Office Excel format to determine the length total area for every district and where they connected to each other. The length of every district varies depending on the concept.

In Excel format map, each district was separated by different color, see figure 5. Visual artist then connected those storyboard in A4 paper according to excel map and post it on the wall, so the visual flow in storyboard can be seen and optimize. The storyboard also coated with separate transparent paper for drawing action and quest planning by game designer.
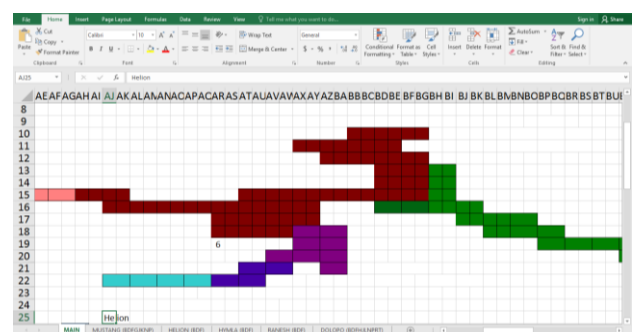
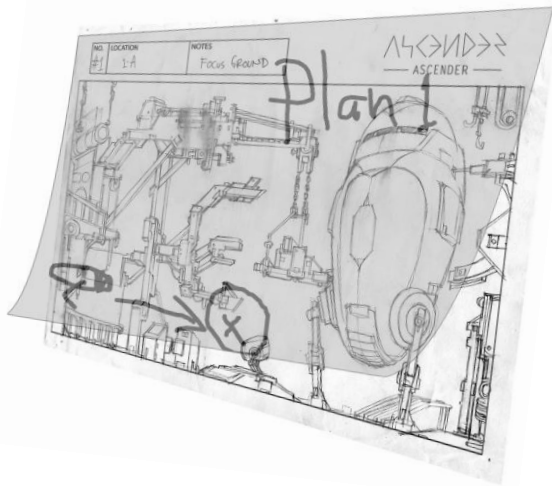

Figure 5.: Microsoft Excel Map Format

Figure 6.: Storyboard in A4 Size paper sheet with separate transparent paper.

The visual storyboard in figure 6 above was supervised by the art director that has a direct and intensive dialog with game designer and story writer, so the visual gap and error can be minimized, especially for the environment and interaction.

2.3. Coloring

After all storyboards had been approved by art director, next process is coloring the main ground using color pallet which already been decided on the concept art. The main ground (focus ground) coloring process was done in digital coloring using Adobe Photoshop with resolution set at 1600 x 900 dpi. After cleaning the storyboard, artist made greyscale blocking to determine which part is dark and light before the coloring process begun. Based on that grayscale mapping the artist can start coloring.

Figure 7 show the coloring phase on main ground in Everest District. Everest is the holy district located in the cold zone, where the environment mostly dominated by giant tree roots. In consequence, the color corresponding in that area was dominate by cold color. In addition, to accommodate magical and spiritual feel in the said district, the main color used was cool pallets as purple, reddish brown, and a slight blue and green as complementary color. The tension of color relationship [6] used in this coloring process make the environment feels strongly suitable for the concept and also distinctive from other district.

A complete coloring process also gives detail about the environment condition and identification on each material such as steel rust, grass, plantation, ice, lava, etc. By applying different color tones and scheme on each district correspond to each district feature characteristic on Goa it could give a different personality and enhance game visual experience. For example, the Mustang District that mainly used for farming area, the most fertile district in Goa most suitable for growing plantation for food source is colored with brown and greenish color scheme. A complete coloring process not only detailed done on the main ground, but also on background, foreground, and each parallel layer with different depth in game that called parallax scrolling.
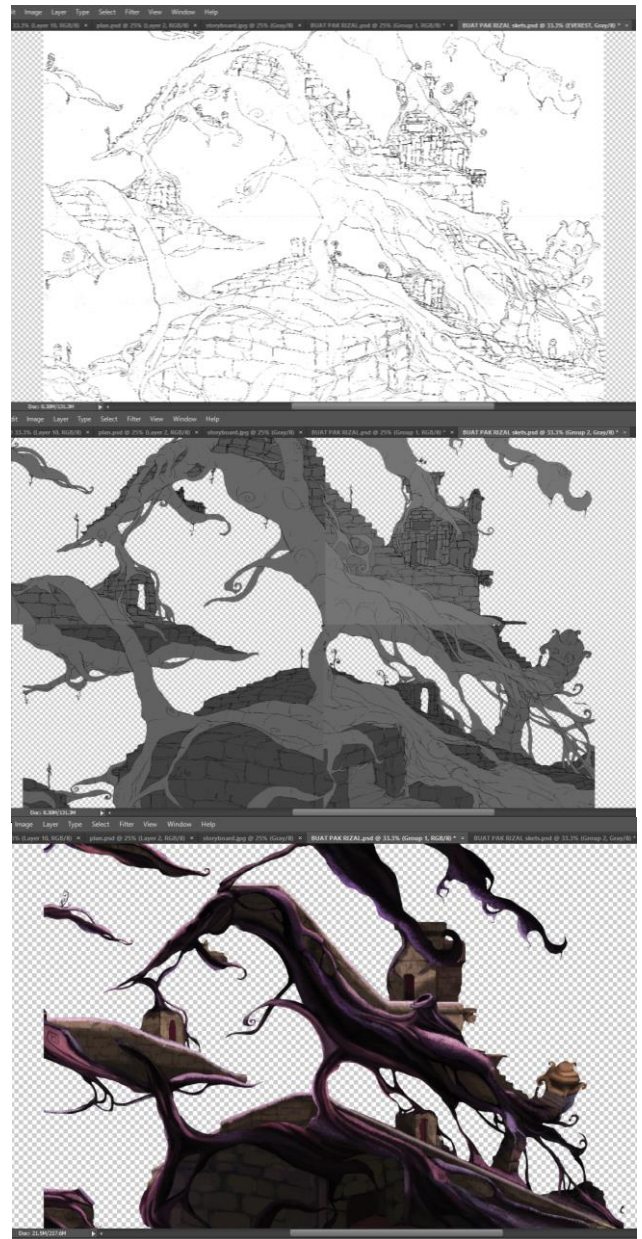

Figure 7. Coloring Process on Main Ground Everest

2.4. Parallax Scrolling

To make one environment more believable and suitable for the concept, the artist use parallax scrolling and add more depth into the 2D environment. Parallax scrolling or in this term called 'parallaxing' involvies movement on foreground and background being attached on the same vanishing point [7]. Instead of using the basic 3 layers (foreground, main ground, background) the game used 5-8 layers. Parallax itself means apparent change in position of an object when it seen from different position, angle, or point of view. So when the main character move from left to right, then the environment will (except main ground) dynamically follows the character with different speed according to which layer the object was placed. Implementation of parallax scrolling with scaling and color adjustment can fool the brain that image on 2D environment is seen as if it is a 3-dimensional form [8].

Figure 8.: Parallax Scrolling Plan on Dolopo District.

Parallax scrolling with 8 parallel layer shown in figure 8 above is using foreground as first layer, main ground in second layer, and background in third to eighth layers. Designing parallel layers started with the last layer as still background image and move towards the main ground then finally the foreground as the first layer. The farthest layer in background use the lightest color and blurrier as its distance is further from the main ground, the same rules applied for objects scaling which is smaller when object placed further from main ground. So the objects became smaller and appear vaguer when its position further away from main ground.

When we add movement or scrolling process, the farther objects tend to move slower than the layer closer from main ground. On the contrary, the foreground moves faster, scaled bigger and colored darker than the main ground. Making and implementing parallax need better planning on storyboards. To make those parallel layers, the visual artist use a different method of background coloring and use the water color instead digital color and painted it traditionally. With minor retouching of the water color layer added with some levels and values adjustment, it creates a distinctive feel and appearance from the main ground and fore ground. For the foreground, the artist still prefers using digital painting.
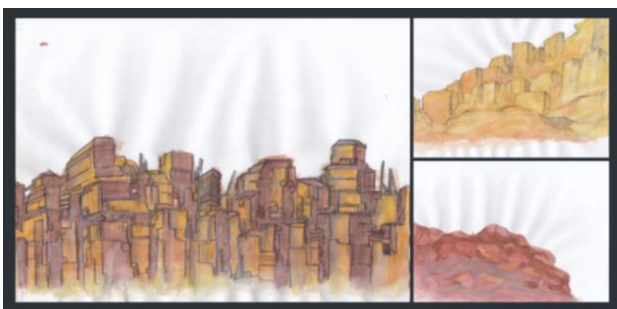

Figure 9.: Water Color Background Coloring for Parallel Layer in Paralax Scrolling.

3. Layout and Compositing

Compositing all the environment element was done with the help of programmer as visual implementation in game where all assets were stitched together in every layer to make a beautiful environment with parallax scrolling. Some minor fixed and adjustment were needed from the artist in order to patch the hole in visual parallax or just to make the visual environment seamless in every district in Goa. The example result is the environment layout on Helion District as shown in figure 8 below.

Figure 10. Helion District Final Layout.

From the figure 10 above, we can see the whole environment of Helion District that acts as IT Center in coldest zone in Goa, where the frozen metal dominates the main ground and the crystal stalactites. It also shown by the frozen building from the applied bluish color scheme that is shown on background with parallax layers.

4. Dynamic Props and Environment Assets

After completing all assets and props for the whole environment to the next compositing and lay-outing process, the final touch to making the environment believable and immersive were applied by moving some assets into the environment design by adding certain motion on assets and props in two terms:

1. Non interaction dynamics, a looping animation of assets and props that attached on each ground layer to make a natural setting and live surrounding (grass, plants, and lava). Non interaction dynamics also affected or changed by time (day or night, rain, smoke)

2. Interaction dynamics, an assets or props in environment that are dynamically reacted to the action of the player character. For example, the box floating in the water and the wooden bridge will have reacted differently against the character weight according player position and the water behavior. Interaction dynamics also includes game items, upgrades, and environment buttons and/or levers.

In Ascender as a 2D game, the visual artist using 2D animation to make dynamic props and environment assets, it's important to decide what and where the props or assets that

move, and how it will have reacted to certain action from player. In Ascender, these decision is discussed between art director and game designer from environment layout and compositing [9].
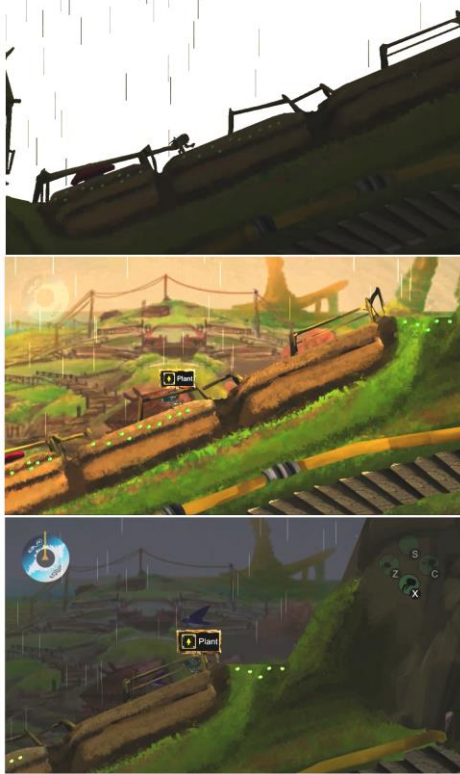

Figure 11.: Dynamic Environment: Rain Weather Day/Night

5.   Conclusion

The process of making environment design in 2D Platformer Game ASCENDER from concept art to final compositing is quite a complex process but the complexity was necessary to present a good environment design for an optimum game appearance and experience in 2-dimensional platformer game.

Designing environment visual art of 2D game platformer should demonstrate suitability for the story and concept, suitability for the game visual overall build and genre, meet practical requirement of production pipeline and able to accommodate overall game or level design [10].

With the implementation of parallaxing, 2D platformer game player can build environment *spatial awareness*[11] in their mind while relating the space between character and surrounding environment without relying much in player imagination to make an imaginary 3D space.

Attention to details and visual exploration based on concept, story, and gameplay is the key to provide an effective and efficient background without sacrificing its quality. Therefore, the communication between story writer, art director, game designer, visual artist, and programmer is mandatory to deliver great game with great visual environment.

Properly use of visual reference, and corresponding literation can give the artist more attention to the environment

details such as colors, visual composition, asset placement, and adjustment in scaling, values, and textures. The process itself was systematically started from game designer's notes, brainstorming, storyboarding, coloring, detailing, parallaxing, layouting, dynamic environment assets, and final polishing.
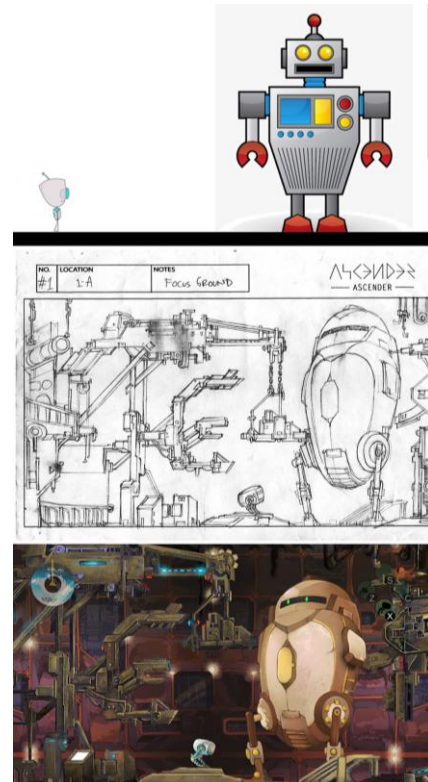

Figure 12.: Design process from game designer to visual artist.

6.   References

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