Environmet Design on 2D PC Puzzle Platformer 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 has a story as base development of all game visual design assets such as characters, environment, properties, visual effects, and user interface. Environment visual design are created by game visual artist to provide a believable and beautiful set of environmental assets, props and scenery element required for game character exploration and interaction.

Designing visual game environment involving visual artist, story writer, game designer and level designer. Design process itself including 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 PC puzzle platformer game build with Unity game development engine [1] developed by Gamechanger Studio in Indonesia and planned to release at 2017 on Steam [2]. Ascender has an explorative environment set in great cave under the surface land called Goa. The main playable character is called Sky, a bipedal dog-sized robot assistance set on adventure helping it owner the teen limbless girl named Ocean and Professor Toro Hudo collecting materials to create an artificial arms and legs for Ocean.

The environment of the game is the 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 is start from Goa, the under world. This paper is describing how the environment in Goa is build 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 build their own environmental system inside Goa and providing themselves artificial light and rain, power and electricity, clean air and water system. Goa as the large structure cave system is divided into some smaller cave as a district connected to central capital city which is the largest cave called Dolopo.

Every district has its own function to supporting 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 accessible by using the hanging stone ship as transportation system via district terminal available on each district.
Every district at Goa has its own unique environmental characteristic as stated in Table 1 below:

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

### 1.2. Goa Construction

Goa construction in ASCENDER is build based on actual cave natural form. Figure 1 below show that the location of actual cave is usually located between the surface and the underground river. The Cave divided itself into small caves surrounding the main cave that connected with surface and with the underground river. Goa construction is build 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.

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**Table 1:** Goa district and characteristic

**Table 2:** Goa cave hierarchy

<table>
<thead>
<tr>
<th>Surface (Ataran)</th>
<th>Air system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forging district</td>
<td>Dolopo</td>
</tr>
<tr>
<td>Mining district</td>
<td>Mustang</td>
</tr>
<tr>
<td>Everest (Holy District)</td>
<td>Mustang (Farm District)</td>
</tr>
<tr>
<td>Helion (IT Center, Server room)</td>
<td>Rajumla (Energy-Power Distric)</td>
</tr>
<tr>
<td>Cold District</td>
<td>Hot District</td>
</tr>
</tbody>
</table>

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

![Figure 2: Goa district distribution plan](image)

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**Figure 1:** Cross section of an actual cave  
*Encyclopedia Britannica, Inc.* [3]

Goa district placement and location distribution is using consideration of the condition of cave foundation zone between hot and cold area. The cold area emerge from underground ice river and the hot area emerge from underground lava river. Therefore every district has a unique environment base on which zone the district is placed. The hierarchy of Goa construction and district distribution is shown on table 2. Below:

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**2. Design Process.**

**2.1. Concept Art**

Before any involving with game designer and factoring interaction gameplay and also game mechanic, visual design is taking the first role to translate the story into visualization. The first step on that process is to make concept art of each district based on Goa 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 is colored by the artist as a color guide for game background and props. Concept art was colored digitally with artist preference on any visual reference of caves suitable to the visual concept of Goa. Doing concept art will enrich visual artist experience about what kind of building design, topography of physical feature of area, ambient condition and corresponding colors.
The concept art is basically bind your approach on concept visualization ideas 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 chosen concept art in Dolopo district as Goa main capital center. The concept art above showing the great cave and density of Dolopo population, cave topography and river, the main stone ship terminal of Goa transportation system and the artificial light at the cave ceiling.

2.2. Storyboard
After every district concept art is done and chosen, next step is focusing on game art. First step is to make focus ground based on the level design plan provide by game designer. The game designer using basic element drawing as simple as possible so artist can understand and build the set environment corresponding, see figure 4.

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 warehouse called AIR where all the Artificial Intelligence robot get their operational license after completed the test. The Warehouse is quite big and full with rusty high tech materials. To visualize this scene, environment artist creating a storyboard first focusing on main ground (focus ground).

The storyboard is drawn with pencil on A4 paper size per scene. This A4 size represent one block map area which game designer use in excel to determine the length total area for every district and where they connected to each other. The length of every district is vary depending on the concept.

In excel map, each district is separated by different color. 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 transparent paper for drawing action and quest planning by game designer.

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

![Figure 6: Coloring Process on Everest](image)

2.4. Parallax Scrolling

To make an environment more believable and suitable for the concept, the artist use parallax scrolling and add more depth into the 2D environment. Instead of using basic 3 layer (foreground, main ground, background) the game used 5-8 layers. Parallax it self 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 the environment it self (except main ground) dynamically follow the character with different speed according to which layer the object was placed. Implementation of parallax scrolling with scaling and color adjustment can fooling the brain that image on 2D environment is seen like 3-dimensional [6].

![Figure 7: Parallax Scrolling on Dolopo](image)

Parallax scrolling with 8 parallel layer shown in figure 7 above is using foreground as first layer, main ground in second layer, and background in third to eighth layers. Designing parallel layers start with the last layer as still background image and move toward mainground then foreground as the first layer. The farthest layer in background use the lightest color and more blurry as more distance away from main ground, the same rules applied for objects scaling which is smaller when far from mainground. So the objects became smaller and appear vaguer when its position further away from mainground.

When we add movement or scrolling process, the farther objects tend to move slower than the layer closer from mainground. On the contrary, the foreground move more faster, scaled bigger and color is darker than mainground. 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 paint it traditionally. With minor retouching the water colour, adjusting level and value, it can create a distinctive feel and look from the main ground and foreground. For the foreground, the artist still prefer using digital painting.
3. Compositing

Compositing all the environment elements is done with the help of programmer as visual implementator in game where all assets is stitch together in every layer to make the beautiful environment with parallax scrolling. The minor fix and adjustment is needed from the artist to patch the hole in visual parallax or just to make the visual environment seamless in every district in Goa. The example result environment on Helion District is shown in figure 8 below.

From the figure 8 above, we can see the whole environment of Helion District as IT Center in coldest zone in Goa, where the frozen metal is dominating the main ground and the crystal stalactites and the frozen building with bluish color is shows on background with parallax layers.

4. Conclusion

The process of making environment design in 2D Platformer Game ASCENDER from concept art to final compositing using the parallax scrolling technique is quite complex process but necessary to present the good environment design for optimum game appereance and experience in 2-dimensional platformer game.

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

Properly use of visual preference, and corresponding iteration can give the artist more attention to environment details such as colors, visual composition, asset placement, and adjustment in scaling, values, and textures. The process itself is systematically starting from level designer notes, brainstorming, storyboarding, coloring, detailing, layering for parallax, compositing, and final polishing.

5. References

[1] Unity is a multiplatform game engine used to develop 2D or 3D Game for mobile, VR, desktop, Web, Console and TV platforms. https://unity3d.com/unity