Module: IS 5110 – Digital preservation and promotion of Cultural Heritage

Student ID: 220031464

Practical 2 – Exhibit Prototype: Game

Word Count: 3013

1. Introduction and Motivation:

Heritage offers communities a wealth of natural, cultural, and environmental value to explore. The global preservation efforts of cultural and natural heritage sites are jeopardized by the impacts of climate change. During Covid-19 pandemic, when people were unable to step out of their homes, use of digitization including smartphones, computers, video games, social media, and online virtual events to interact with the heritage increased on a multifold level. This report outlines a prototype for a planned exhibit that aims to raise awareness and spur response to the threats posed by climate change on heritage sites. The proposed prototype for the exhibit is a downloadable game called "The Vanishing Summits". The game's objectives include exploring the landscape of Sagarmatha National Park which consists of Mt Everest, raising awareness of the impacts of climate change, and displays adaptation and mitigation strategies in the future release to conserve nature and biodiversity. The game features snow-capped mountains, a freshwater lake, some native animals, and forest areas with local pine trees to recreate the landscape digitally around Mt Everest region. In the game, a player can go through the water and summit a mountain to reach the ruins of a Buddhist monastery. There is also an information website developed to make the users engage with the heritage here. This website contains a link to download the game. After downloading the folder, the game can be accessed through going to Production/Windows folder and clicking on TheVanishingSummits.exe file. A social media page on Instagram (@everest_digital_hiker) has been created for digital promotion of the landscape [11].

Link to Download the Game

2. Value of the Heritage:

The world's tallest peak, Mount Everest, is in Sagarmatha National Park. The 1,148 square kilometers park is a UNESCO world heritage site with cultural and ecological importance [1]. It includes some of the rarest flora and fauna found on earth [3]. With thousands of visitors every year, the park is a popular tourist site. Tourism supports the livelihood of many people and contributes significantly to the local economy [6]. The sherpa people and their cultural values are still predominant in the region. The area's unique cultural experiences attract tourists and aid in improving the economic and living conditions of locals. Sagarmatha National Park has a significant scientific value also as there is scope for researchers to investigate many environmental and geological aspects in the region like effects of climate change and glaciology.

3. Climate Change Threats, Mitigation, and Adaptation Strategies:

Sagarmatha National Park is threatened by several climate change issues, including melting glaciers, changing weather conditions, and natural calamities like floods, avalanches, and landslides [5]. The biodiversity, cultural heritage assets and tourism of the park are under risk due to these threats. To mitigate these threats, greenhouse gas emissions which are responsible for increasing the heat in the atmosphere should be reduced. Also, the use of fossil fuels should be reduced and alternative sources of sustainable green energy like solar and wind power should be utilised. The authorities should discuss adaptation strategies like implementation of early warning systems in flood prone areas and frequent landslides regions to warn the local sherpa people [4]. There should be funding allocated to build infrastructure like flood barriers and to implement landslide mitigation strategies. In the game, the players will come across various issues caused due to climate change. The game makes the players aware of changing weather conditions

like rising temperatures which causes melting of glaciers, death of animals, and wildfires in the forests and motivates them to act towards tackling the challenges caused by climate change.

“If the current rise in global temperatures continues, half of the glaciers will be vanished by 2100.” [12]

4. Context of Previous and Related Work:

The digital technology has become crucial in preserving and promoting the legacy of Sagarmatha National Park. To improve the popularity of the park, the committee has taken measures to improve digital infrastructure by displaying the park’s attractions and services on websites and mobile applications in detail [2]. The tourists can use this information to plan their journey in advance. The 360-degree videos enable users to have an immersive experience and explore the world heritage site from anywhere in the world. Currently, camera traps and other digital techniques are installed in the Sagarmatha region to track animal movements and behaviors of rare and endangered species which helps in conservation strategies and policies.

There are several educational programs and tours to explore the beauty of this site. Everest Base Camp Trek and Sagarmatha Next Centre provide insights to the tourists to understand more about the history, nature, and culture of the Sagarmatha National Park and Mount Everest. But there are very few exhibits that focus on climate concerns of the park and adaptation techniques. Also, there are no games to explore this region. The proposed exhibit seeks to close this gap with gamification while highlighting the significance of climate action. The prototype exhibit “The Vanishing Summits” game is developed by taking inspiration from these previous digital works of the park and with an aim to provide unique experience to the users to engage with the landscape of the Sagarmatha National Park and Mount Everest in a fun and interactive way. The game is also intended to educate people about the adverse effects of climate change. This approach to promote the heritage in a computer game is unique and provides an engaging experience to the users.

5. Exhibit Design:

The Vanishing Summits is a third person game designed to explore the Himalayan region of Sagarmatha National Park and Mount Everest, raise awareness about climate change, and emphasize adaptation and mitigation measures to protect the heritage. The game is accessible from anywhere in the world using a computer with some graphics rendering capability. A player will be able to explore a realistic game environment consisting of a lake, snow-capped mountains, forests with local pine trees, and ruins of a Buddhist monastery which consists of an idol. To develop this game, research was done to understand the places in the region and a few of them are included to give an engaging and educational experience for the users.

5.1 Design Decisions:

The game has been designed for users with limited game playing experience. The main idea is to make the player explore the landscape and engage with the adverse effects of climate change in the Sagarmatha National Park region. The gameplay is designed to be simple and easy to navigate for the users to make it more appealing to audiences of all ages. The goal is to educate the players about the impacts of climate change while giving them an interactive gaming experience. The decision to create the game in third-person mode was taken to make the user assume they are in the mountain region by looking at the player character and imagining themselves moving around in the park. To make the world in the game appear natural, realistic terrain data is 3D modelled in the environment to include mountain topography, flora, and fauna found in Sagarmatha region.

The player character is defined as a robot who loves to explore the world and travel around. The player mannequin is a default third person character provided by Unreal game engine [7]. The game starts with greetings from the local animals, Himalayan Reindeer, and a Doe Deer. The player's starting point is in an elevated zone with some vegetation all around the animals with a

spectacular view of the lake and far away mountains. The animated reindeer character (slightly blurred in the figure 1 below) can be seen jumping with excitement by looking at the player.

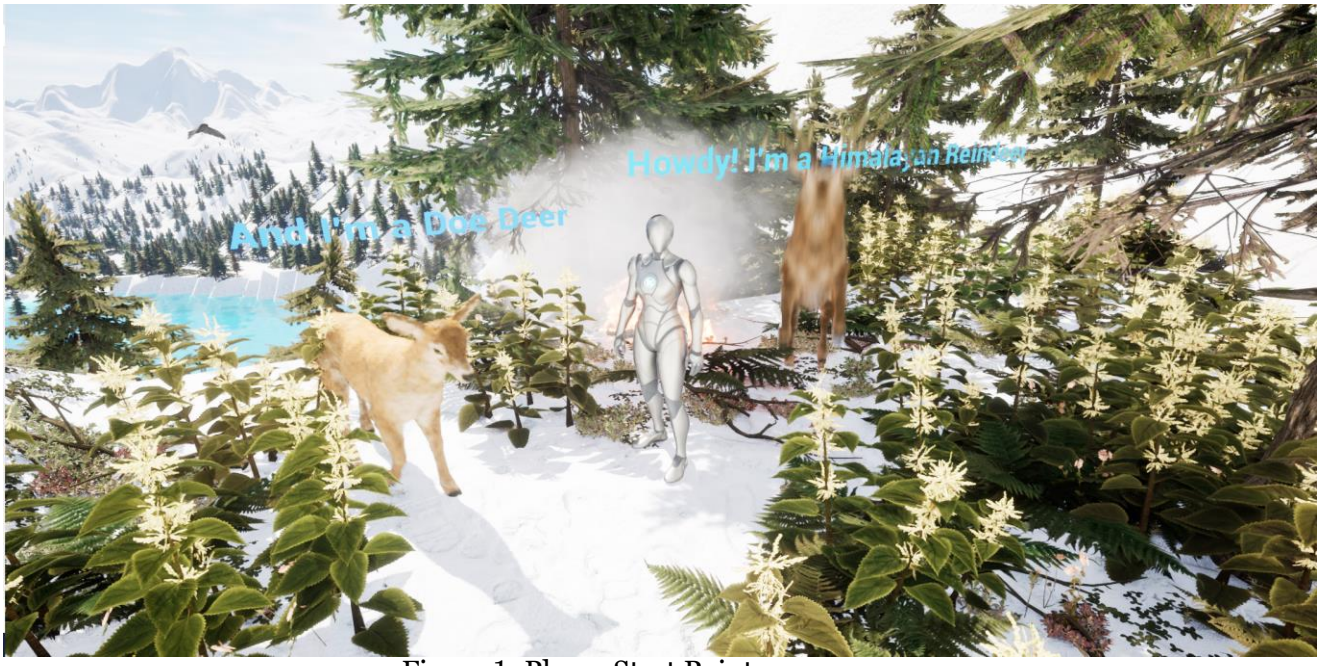

Figure 1. Player Start Point

Then the player can start exploring the park and run across the trees and plantations, looking at the few animals in the region. On the way, the player will be able to see wildfire at some places near the pine woods indicating deforestation and wildfires happening in landscape due to increase in the global temperatures. This scenario is implemented to educate the player about the frequent occurrence of wildfires in the region which is a climate threat to the people and animals present in the national park.

Figure 2. Wildfire in the Forest

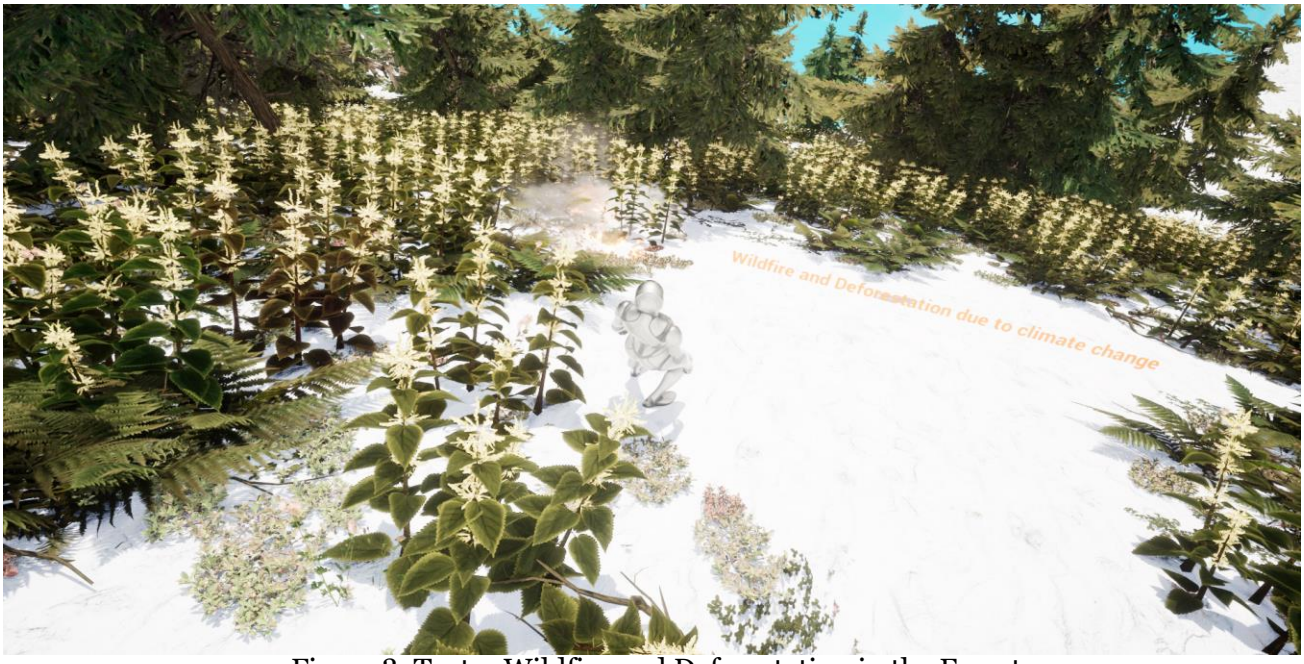

Figure 3. Text – Wildfire and Deforestation in the Forest

The primary objective of the game is to climb a mountain and reach the ruins of a Buddhist monastery. Players must transverse through risky terrain, including steep slopes, narrow edges on the cliffs and glaciers to complete the arduous climb. The players will discover the impacts of climate change and the difficulty of climbing on the alpine landscape as they move higher.

5.2 Gameplay, Functionality, and Structure:

As mentioned above, the game is designed to be easy to play and quite simple to adapt for any first-time gamers. The arrow keys can be used to move around the landscape and spacebar is used to jump. During the exploration, players will encounter more than 40,000 foliage assets in the landscape which consists of fallen leaves, grass twigs, pine trees, flower plants and small stones. They will have to maneuver around all these obstacles to accomplish the mission. Along with arrow keys, the following alphabet keys can also be used to explore the landscape.

W – Move Forward

A – Move Left

S – Move Backward

D – Move Left

Space Bar – Jump

Arrows – Same functionality as W, A, S, D

Hold Left Click Mouse – Move Camera Angle and Direction

Animations included in the game are in loop mode. So, the animals will be performing the same actions repetitively.

The game's structure is designed to enable users to explore the region and engage with the natural heritage of Sagarmatha National Park. To give enriching and comfortable experiences to the users, the game is set to be explored at one's own pace without any time restrictions and leaderboards as it is a single player game. Even though the main goal is to reach the top of the mountain which consists of Buddhist monastery, the journey to get there is equally important.

The starting scene is described above, and screenshots have been provided. After receiving greetings from the Himalayan Reindeer and Doe Deer, the player descents the hill and explores animated wildfire in the forest occurring due to the impacts of climate change. After this the player reaches the starting point of lake Dudh Koshi. There will be an animated flying bird near the lake to make the user aware of the rare bird species existing in the region.

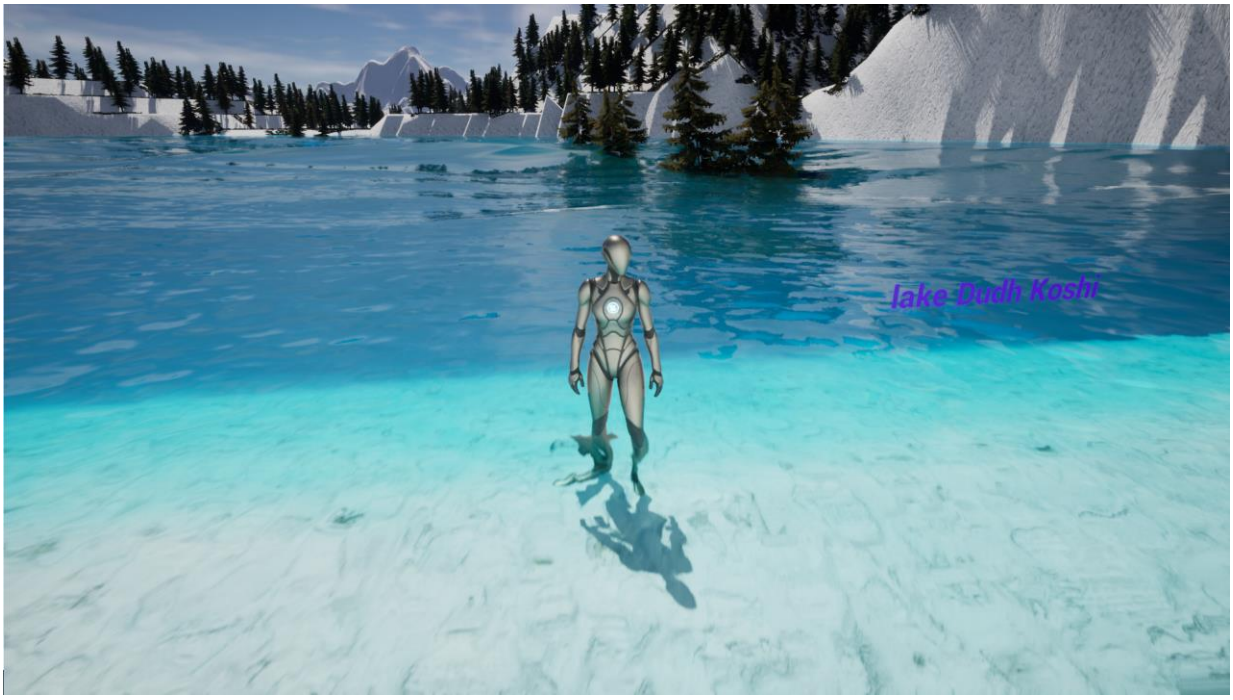

Figure 4. Lake Dudh Koshi

Then if the player navigates to the left, there will be a sight of snow wolf and fox fighting with each other. This scene is to make the players engage with the wildlife present near the Mount Everest region.

Figure 5. Animals fighting near Lake Dudh Koshi

Next adventure involves going into the water and the player needs to reach the other side of the lake. The game is designed to make the player to be fully submerged in the water while running to the other side. This way, the player will be able to explore the underwater trees as well and can move to the other end by looking at the shadows of the far away mountains. An example of this scene can be seen in the picture below.

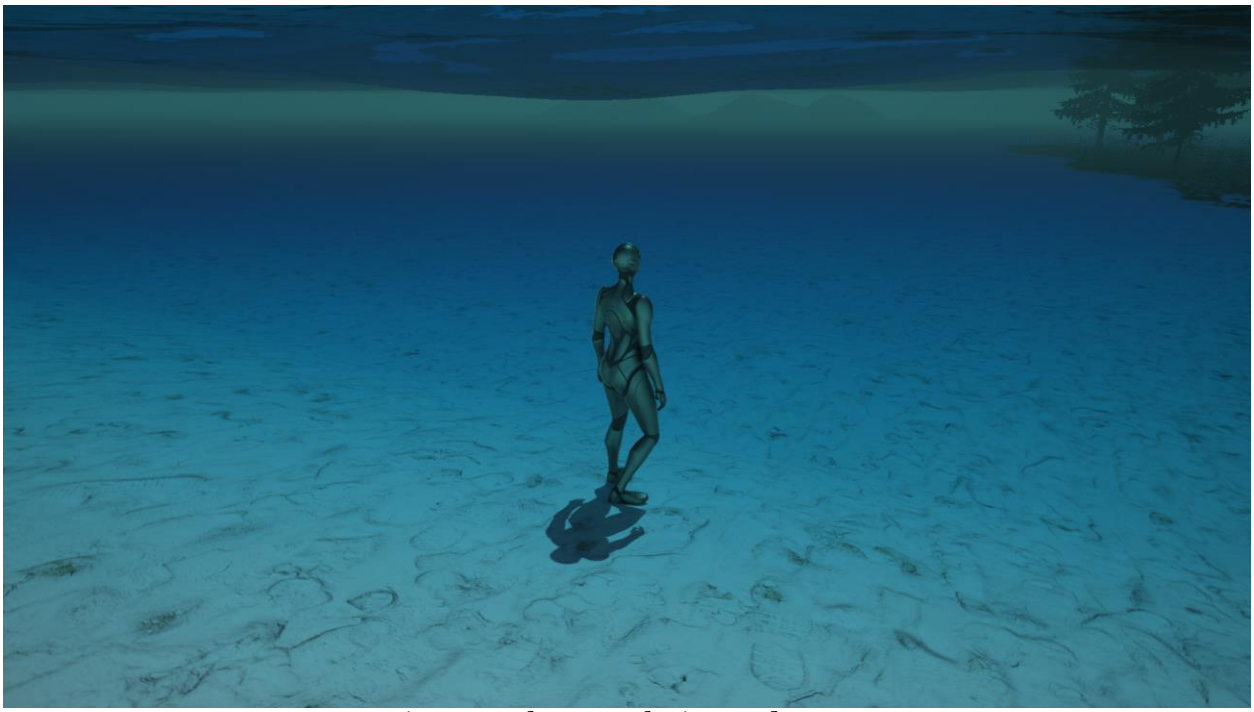
Figure 6. Player exploring underwater trees

After exploring the lake, the player reaches to the other side only to find out something disturbing. The animals in the Sagarmatha region are dying due to the adverse effects of climate change like rising temperatures. The scenario is presented using some dead birds lying around and an animation of wolf falling to the ground along with a wolf howling aloud for help.

Figure 7. Animals dying due to climate Change

Post the exploration of the impacts of climate change, the player moves forward towards the ultimate step of summiting the mountain and reaching the ruins of the Buddhist Monastery. The path from the dying animal's checkpoint is difficult to travel as it involves climbing through steep mountains and narrow edges.

Figure 8. Climbing the narrow edges of a mountain

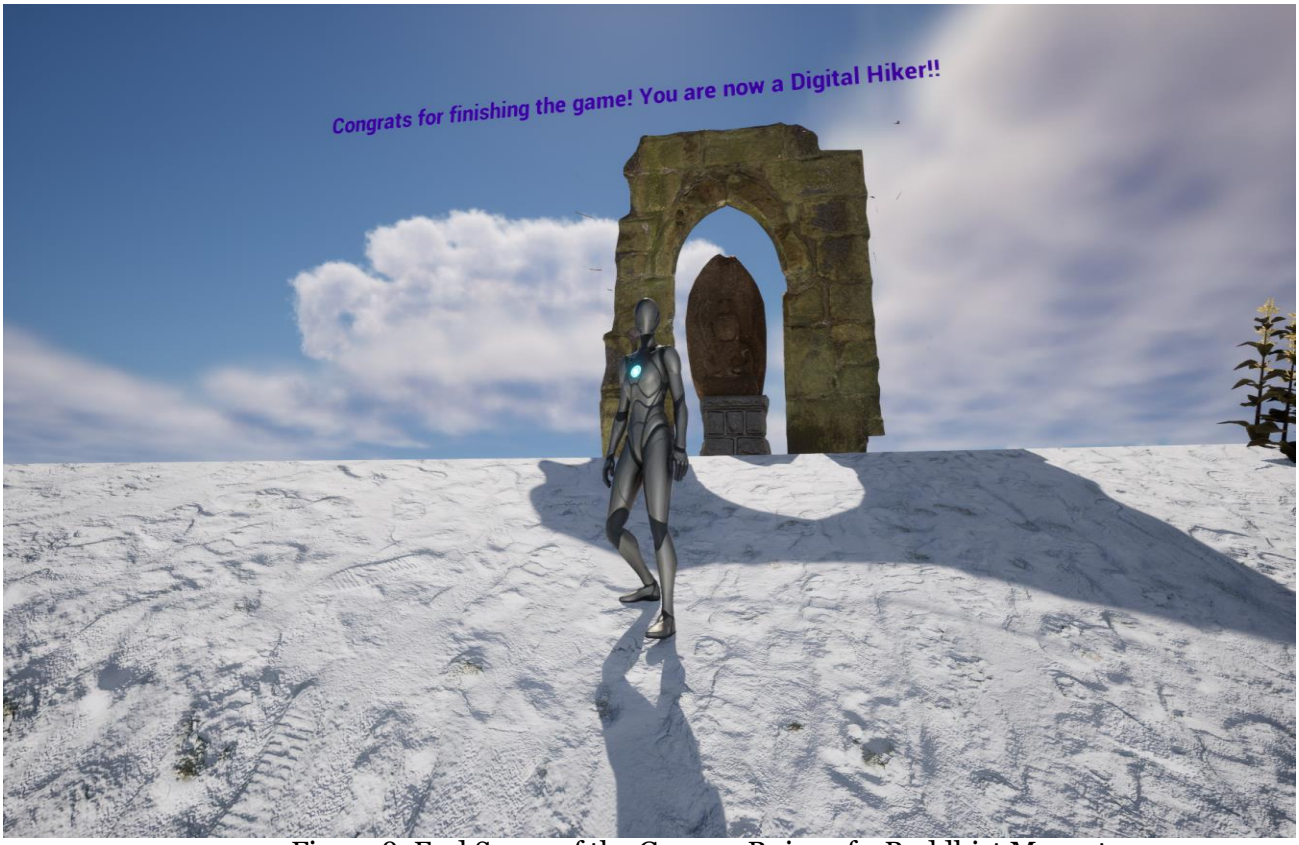

Figure 9. End Scene of the Game – Ruins of a Buddhist Monastery

The end scene of the game will be player reaching the top of one mountain and ruins of a Buddhist monastery. If the player wants to explore beyond this point, it is possible to traverse around as it is an exceptionally large landscape. The far away highest mountain visible in the image below is assumed to be Mount Everest in the game.

Figure 10. View of Mount Everest

5.3 Interactivity:

The Vanishing Summits game is developed to give an immersive and engaging experience to users. The virtual game environment is quite interactive and responds well to the player's actions. For instance, the water in the lake seems realistic due to the moving tides and reflection of mountains shadow in the lake. The player going underwater to explore the landscape further enhances the game's interactivity. Another interesting aspect of the game is the vegetation all around, which the player must move through to explore the plants and trees in the region. The game also includes interactions with local wildlife to understand the hurdles they are facing due to climate change. There is also a chance to get educated about the habits and behaviors of animals like snow leopards, deer, and foxes.

6. Implementation Challenges:

One of the major implementation challenges in the game is to replicate the natural landscape of Sagarmatha National Park in the 3-Dimensional digital format. This necessitates creation of realistic modelling of park's terrain, flora, and fauna. Additionally, the animations of animals should be realistic and provide an engaging experience to the players' actions. Currently, the landscape created is modelled using software like GAEA [8], Worldmachine [9], Tangram Height Mapper [10] and modified in Unreal 5 Game Engine. The free versions of the software have limited features and premium versions will have high licensing costs. The financial budget is one of the biggest challenges when developing a game. Another major challenge is hardware setup required to develop the game and for the players to download and play the game smoothly without any lags. It is difficult to make sure that the game is catered for a variety of devices as users with low-end computers with no graphic cards and less memory will have a tough time playing the game. Expertise in using game development engines like Unreal Engine is required and it was difficult to learn the basics of the platform. The packaging of the game was particularly challenging due to build errors, but the official documentation was helpful to figure out the issues and resolve them. Used limited 3D models downloaded from Unreal Marketplace and Quixel bridge as assets in the game.

7. SWOT Analysis:

Strengths:

- Delivers a unique engaging experience to the users.
- Players are informed about the adverse effects of climate change in the Sagarmatha National Park region.
- Promotes the history of the natural heritage site in digital format.
- Reduces the carbon footprint as the players are not physically going to the heritage site.

Weaknesses:

- May not be suitable for everyone due to high-end graphics and computing constraints.
- Gameplay mechanics are limited and may not appeal to top gamers.
- Interactivity is limited and the player may get lost in the game.

Opportunities:

- More levels can be added with a detailed navigation map to explore the whole Sagarmatha region.
- Can be used as an official educational tool to educate about the impacts of climate change in the mountain region.
- Promotes the tourism industry by making the players admire the nature of the park and instills a thought of visiting the park physically.

Threats:

- Popular game companies may produce a better game with a story outlining the Mount Everest region and become a tough competitor to this game.
- Budget constraints may pause the further development of the game.
- Hardware and Software constraints will remain as a constant threat to increase popularity.

8. Evaluation of the Prototype:

To measure the game's efficacy, it is optimum to consider both qualitative and quantitative metrics. This will include considering focused target audience, gameplay statistics, and player surveys. The survey questionnaires will act as the primary source of information for collecting qualitative metrics like players satisfaction levels, descriptive feedback on engagement levels, and suggestions on improving the gaming experience. Analytics from the graphics providers dashboard can be used for quantitatively determining the player's engagement and satisfaction levels. Real time customer feedback can be used tracked from the focus groups to enhance the features of the game.

9. Resource Requirements:

To make a major impact in the gaming industry, The Vanishing Summits requires a good monetary budget to accomplish the development of the game successfully. An initial funding of GBP 5,000 can be allocated to launch the first version. This will cover the initial cost for game development software licenses, 3D models, and music copyrights. To further develop the game, there will be a requirement of key human resources like Game Developer and 3D Artist to create the 3D models of the ancient artefacts found in the Sagarmatha National Park region.

10. Conclusion:

The Vanishing Summits is designed to give a unique gaming experience to the users to explore the Sagarmatha National Park region consisting of the highest mountain in the world, Mount

Everest. This is an interesting way to educate people about the adverse effects of climate change and acts as an inspiration to work towards the protection of the environment. Future development will include unlocking of a sherpa costume once the player reaches the Buddhist monastery and the player will be taken into a new level in the future year 2050, which will show more adverse effects of the melting glaciers and will involve the player to mitigate the impacts of climate change by performing some tasks in the game. To conclude, this game has an enormous potential to educate the newer generations about the impacts of climate change and looking forward to further enhance the development.

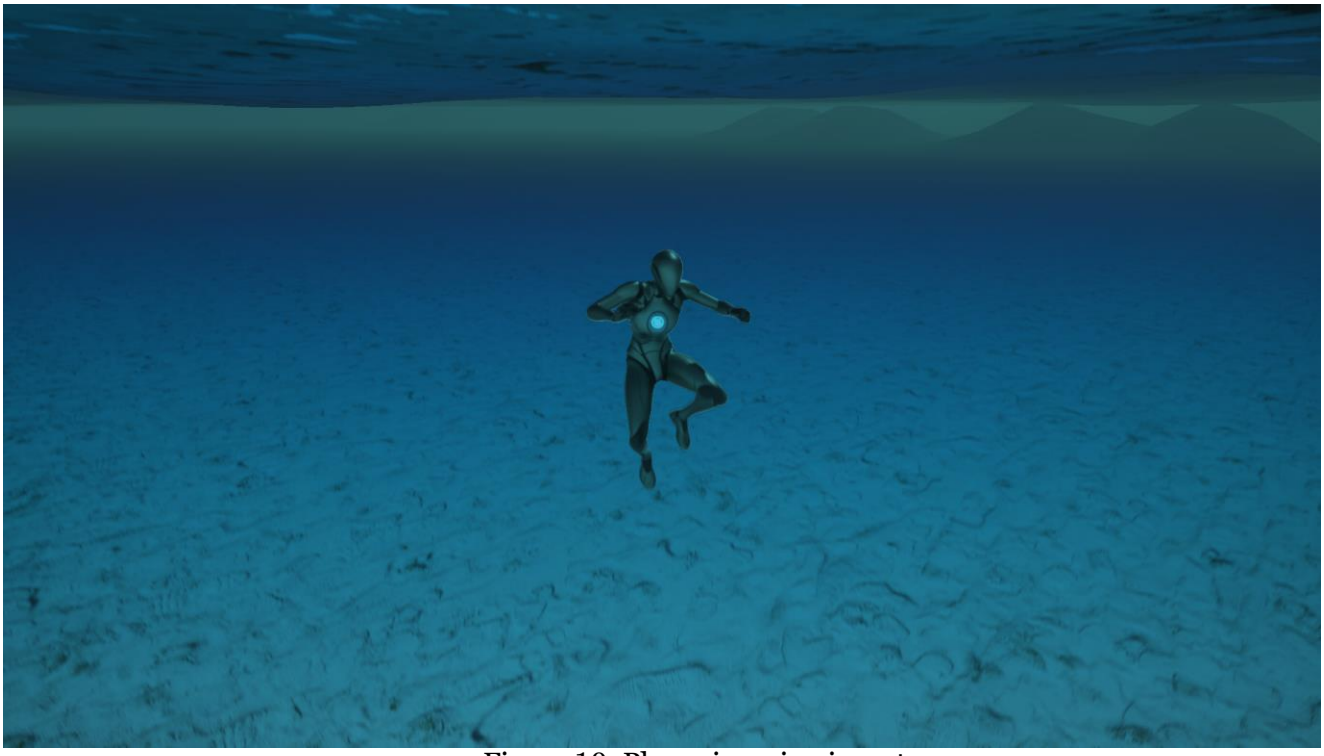

Figure 10. Player jumping in water

References:

1. UNESCO World Heritage Centre. Sagarmatha National park, UNESCO World Heritage Centre. Available at: https://whc.unesco.org/en/list/120/ (Accessed: February 21, 2023).

2. Sagarmatha National Park. Sagarmatha National Park. Available at: https://www.snp.gov.np/ (Accessed: May 02, 2023).

3. Sagarmatha National Park (no date) DNPWC, Department of National Parks and Wildlife Conservation. Available at: https://dnpwc.gov.np/en/conservation-area-detail/72/ (Accessed: May 02, 2023).

4. Hays, J. (no date) Sherpas: Their history, religion, lives, society and culture, Facts and Details. Availableat:https://factsanddetails.com/southasia/Nepal/Ethnic_Groups_and_Minorities_Nepal/entry7840.html#:~:text=Sherpas%20have%20traditionally%20been%20yak,Many%20Sherpas%20eat %20mostly%20potatoes. (Accessed: May 02, 2023).

5. Centre, U.N.E.S.C.O.W.H. (no date) Case studies on climate change and world heritage, World Heritage Centre. Available at: https://whc.unesco.org/en/activities/473/ (Accessed: May 02, 2023).

6. Musa, G. et al. Tourism Sustainability and health impacts in high altitude adventure, cultural and ecotourism destinations: A case study of Nepal's Sagarmatha National Park. Available at:

https://www.tandfonline.com/doi/abs/10.1080/09669580408667240 (Accessed: May 02, 2023).

7. Unreal engine 5 (no date) Unreal Engine. Available at: https://www.unrealengine.com/en-US/unreal-engine-5?utm_source=GoogleSearch&utm_medium=Performance&utm_campaign=%7Bcampaignname%7D&utm_id=17086214830&sub_campaign=&utm_content=&utm_term=unreal+engine+5 (Accessed: 02 May 2023).

8. Quadspinner Gaea (no date) QuadSpinner.com. Available at: https://quadspinner.com/ (Accessed: 02 May 2023).

9. LLC, W.M.S. (no date) Simulate instead of sculpt, World Machine : The Premier 3D Terrain Generator. Available at: https://www.world-machine.com/ (Accessed: 02 May 2023).

10. (No date) Tangram Heightmapper. Available at: https://tangrams.github.io/heightmapper/ (Accessed: 02 May 2023).

11. Sagarmatha Digital Engagement Project. Available at: https://www.instagram.com/everest_digital_hiker/ (Accessed: 02 May 2023).

12. McGrath, M. (2019) Climate change: Warming threatens Himalayan Glaciers, BBC News. Available at: https://www.bbc.co.uk/news/science-environment-47122641 (Accessed: 02 May 2023).