Digital Bothy

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Abstract

Digital Bothy is an immersive 3D experience combining high-definition digital reconstruction with a narrative on the non-reproducibility of place. It is the product of a solo, 15 mile hike to photogrammetrically capture the Allt Scheicheachan bothy, a little stone building tucked away in the remote Scottish Cairngorms open to any traveler in need of shelter. The resulting 3D scan became the centerpiece for a hyperreal, first-person Highland excursion built with Unreal Engine. The final work honors Allt Scheicheachan's inaccessibility, subverting expectations of a pixel-perfect digital replica. It takes a traveler 3 hours to reach the bothy's door in real life. In-game, the journey is condensed into 20 seconds. Given the virtual hiker's minimal effort and the absurdity of shelter in the digital environment, *Digital Bothy* resists exposing the bothy's true structure upon their arrival, wobbling and tessellating as they grow closer, until it is an unrecognizable mosaic of fractured data. A field recording of Cairngorm wind blows with growing intensity as the viewer enters the cloud of swirling bothy shards, magnifying the distortion. This project was completed over the course of a year, and evolved into a personal meditation on the tension between digital simulation and the natural world.

Keywords

Photogrammetry, Virtual Environments, Simulation, Natural World, Ecologies of Place, Scottish Cairngorms

Introduction

In late 2022, I took a really long walk. I was studying at The Glasgow School of Art, and wanted to capture a unique aspect of Scotland's landscape before leaving the country.

I had never tried photogrammetry, but I was intrigued by how fickle and delicate the procedure was: the sky had to be slightly overcast, with no rain or wind to distort the images, and I needed to circle around the structure at just the right distances. I was growing exhausted by the granular control I had over my digital art practice. With infinite parameters, even the smallest choices become paralyzing. I was grateful to leave some variables to nature, so I proceeded to watch a few photogrammetry tutorials, rented out a camera and polarizing filter, and caught a 5:00 am train to Blair Atholl, where I would walk 15 miles alone through remote Highlands with a singular goal: to find and scan the Allt Scheicheachan bothy.

The Scottish Bothy

A bothy is a basic shelter, tucked away in the Scottish Highlands, and left unlocked for any traveler in need of

Figure 1. Photos taken during the journey in the Scottish Cairngorms.

refuge without payment or reservation. Bothies are too remote to access by car, and with little digital documentation, the only way to view one is to set out on a long hike by foot. Instead of spending 8 hours tied to my desk, I could spend the same amount of time moving through nature, preserving my experience in a digital artifact that could be shared with others. I didn't see a single person on the trail until the final mile, and my solitude made the experience even rarer.

Outside

It was a sunny day in Blair Atholl, which was beautiful weather to hike in, but suboptimal for photogrammetry. When I finally spotted the bothy's faint outline, clouds miraculously appeared, turning the sky into an ideal shade of gray. I started circling around the bothy with the whole structure in my camera's field of view, stumbling across the waterlogged terrain as I captured my photos. I then took a few steps forward and repeated the process. After six rotations, I ended up pressed against the bothy's mossy stone, completing the scan just as it began to rain.

Navigating Hyperreality

Many months passed since this excursion, and while I managed to align my ~200 bothy photos into a rough 3D model using RealityCapture, it sat untouched on my hard

drive. The pressure to refine this approximation into a perfect digital replica was overwhelming.

In that year, I also changed as an artist. I used to be fixated on hyperrealism, using vivid graphics to create an enhanced version of reality with every pixel in place. I have since become critical of the ways digital representations distort my own perception of reality, and I wanted *Digital Bothy* to reflect this.

Digital Process

Building the Landscape

I finally had the vision and resources to return to this project a year after the initial hike while I was staying at the Animation Workshop in Viborg, Denmark. First, I cleaned up my bothy's topology in ZBrush (Figure 2), before bringing it into Unreal Engine. I then built a grassy, washed out environment in Unreal with the help of Quixel's 3D foliage library. I had photographed the bothy's surroundings extensively (Figure 3), so I had enough reference to build a nearly identical map in the game engine (Figure 4).

Figure 2. Retopologizing in ZBrush.

A Digital Replica

By the time I was done assembling the virtual environment, I could walk right up to the digital bothy and stare at all the little cracks and marks on its surface. If I explored the surrounding grassland, I could understand the bothy's form from all angles, gaining context that photos online don't reveal. In real life, it takes a traveler upwards of 3 hours to reach the bothy by foot, so to mimic this slow passing of time, I restricted the digital hiker's speed to a slow lurch,

Figure 3. Photograph of bothy and landscape

Figure 4. Digital reconstruction of bothy and landscape in Unreal.

and there are no controls to walk faster. This makes the total in-game journey 20 seconds long, which is still trivial compared to the real excursion. I also assembled a soundscape from audio provided by my friend Georgie, who captures field recordings when she goes mountaineering in the Highlands.

Fracturing the Simulation

Part of my fascination with the bothy lies in its mystery: a traveler may not know about the building's size or condition beforehand, but they can expect a weatherproof shelter and a story to tell. I embraced uncertainty on my own trek to Allt Scheicheachan; I did not know if I would manage to locate
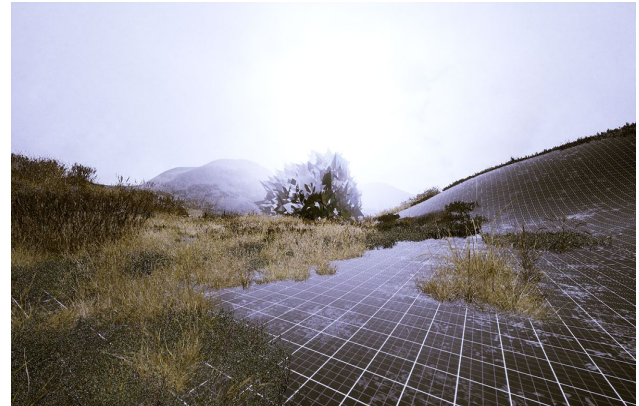

Figure 5. Exploded tessellated view of bothy.

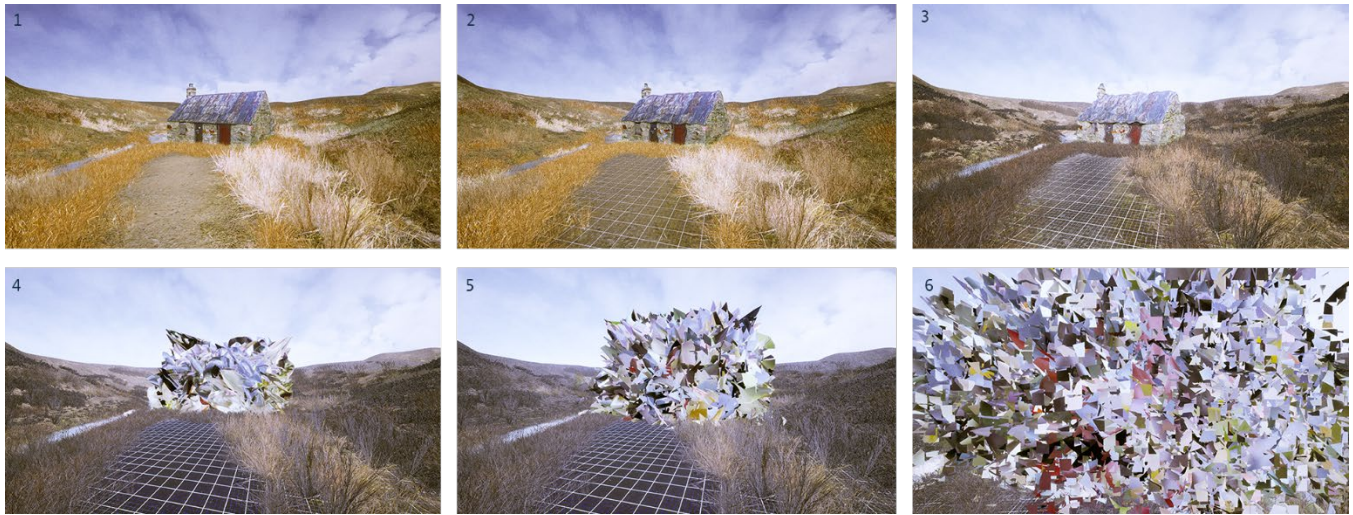
Figure 6. Alternative view of distorted bothy.

Figure 7. Stages of distortion viewed from a fixed camera.

the building, let alone scan it. If I willfully exposed the bothy to the player of my game, the most essential part of my experience would be lost in translation. To preserve the bothy's sanctity, I had to obscure its true form.

As the viewer approaches the bothy, it gradually begins to undulate and wobble, eventually tessellating into a mosaic of fractured polygons (Figure 7). The scene's shaders break and shards of bothy fly around the viewer, leaving them trapped in a swirl of mangled data. The audio also reacts to the viewer's location, with recordings of Cairngorm winds amplifying the distortion as they enter the heart of the bothy. These manipulations of real audiovisual data allow the viewer to confront the dissonance of digital reconstruction specific to time and place. If the viewer lingers inside the bothy for long enough, they will be transported back to the outer edge of the map and must start their trek all over again. No matter how many times they try, they will never be able to see the bothy up close.

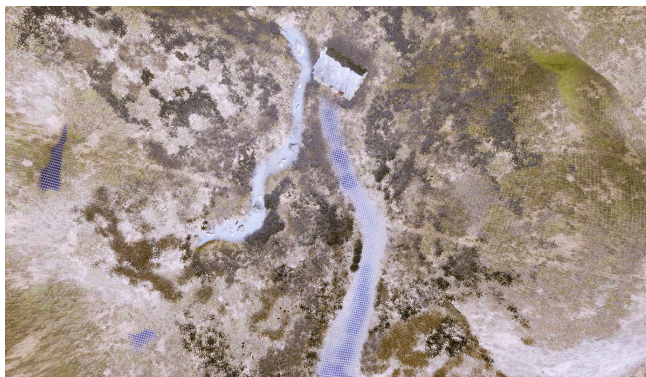*Note: Figures 4-9 are unedited in-game screenshots.*

Figure 8. Birdseye view of bothy and landscape.

Figure 9. Final view of bothy and landscape.

Author Biography

Ramya Iyer is a technical artist and undergraduate studying computer science at the Georgia Institute of Technology. In both her personal art practice and research projects, she uses a diverse range of approaches to explore how computer graphics and visual design influence virtual immersion.