Clean Pineapple Products

Highlighting the benefits and simple production of natural cleaners

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Our project focuses on the United Nation's Sustainable Development Goal of Clean Water and Sanitation, by offering the solution of teaching viewers how to make their own safer cleaners with pineapple scraps. Many conventional cleaning products use harsh chemicals that contaminate our drinking water. Fortunately, more alternatives are being produced with fruit scraps. These natural detergents lessen damage to our drinking water due to being made up of enzymes. In our VR project in the CAVE2™ Virtual Environment in the Electronic Visualization Lab at University of Illinois Chicago [1], each industrial detergent interaction worsens the surrounding water, as seen in Figure 1. Conversely, the pineapple cleaner interactions demonstrate the steps for creating detergent with pineapple scraps, with a cleaner, livelier body of water as a result. The simplistic, familiar design of these interactions illustrates that, while it is easy to accidentally exacerbate water degradation, it is also easy to help secure sanitation and clean water.

Figure 1: 'Clean Pineapple Products' on the CAVE2

CCS CONCEPTS • Interaction Design • Human Computer Interaction • Visualization

Additional Keywords and Phrases: Detergent, Pineapple, Natural cleaners, VR

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1 INTRODUCTION

The United Nations has a long history of addressing the global water crisis, recognizing the challenge of balancing human, commercial, and agricultural demands for this essential resource. As part of the effort to meet the Millennium Development Goals, between 2005 to 2015, the 'Water for Life' International Decade played a pivotal role in improving access to safe drinking water for around 1.3 billion people in developing countries, while also making significant strides in sanitation advancements [2]. Coordinating the United Nations' work on water and sanitation is UN-Water, with over 30 United Nations organizations carrying out water and sanitation programs through all the United Nations' focus areas [3].

Despite all these efforts, access to clean water is still a major struggle: "Decades of misuse, poor management, overextraction of groundwater and contamination of freshwater supplies have exacerbated water stress" [4].

One lesser-known source of water contamination comes from the typical cleaning products that many use daily. As cleaning products like laundry detergent and soaps carry contaminants like 1,4-dioxane and nitrogen into our sewage systems, many wastewater treatment plants are ill-equipped to remove such hazards, which are then sent into our waterways, often to end up in our drinking water [5]. In addition, the phosphorus and nitrogen from these cleaners cause algae to bloom to environmentally destructive proportions, as algae layers deprive aquatic life of oxygen as they cover rivers [6].

Fortunately, new alternatives for these polluting products have risen in the form of fermented fruits, with a major contribution in this field coming from the company Fuwa3e Biotech. Fuwa3e, founded by Le Duy Hoang in Vietnam, uses pineapple scraps, along with sugar for fermentation and other ingredients, to create cleaning products containing enzymes that help fight bacteria, while also lacking the harsh chemicals found in other cleaning products that can cause conditions like eczema and asthma; Hoang's wife/CEO of Fuwa3e developed eczema partially due to industrial detergent use, which pushed Hoang to find a safer alternative to traditional cleaners [6]. Beyond industrial production, fermented fruit-based cleaners can be created at home with easy-to-follow steps [7].

2 SOLUTION

Because lowering the amount of industrial detergent use can severely reduce contamination in our drinking water, but many people are either unaware of the damage traditional detergents can bring, unaware these novel alternative cleaners even exist, or unsure how to procure them, it make sense to focus on introducing the process of alternative cleaner production as a VR project, so that others can both create their own safe cleaners, and teach other about these cleaners.

This project highlights the harm that traditional cleaning products can have on our waterways by taking the user through a seemingly harmless list of tasks. The purpose of this project is to expose people to the devastating effects that many traditional soaps and cleaners can have on our water quality, while also promoting our main solution of creating safer, home-made alternative cleaning products (in this case, made from pineapple scraps) to help ensure access to both sanitation and clean water for all; hence the title of our solution, "Clean Pineapple Products".

With VR technology, users are immersed in an environment that demonstrates the real-world consequences of their cleaning choices. The user will be tasked with completing various household chores, such as washing dishes, bathing a dog, and washing clothes. They will also learn how to prepare a cleaning solution using natural ingredients (in this case, pineapple scraps and sugar). During each interaction, the user will witness the negative effects of using chemical-based cleaners on the water system in real time. Meanwhile, the final interactions will highlight the positive impact that using natural cleaning solutions can have on the water system.

3 PROJECT DEVELOPMENT

3.1 Storyboards

3.1.1 First Storyboard

The first storyboard in Figure 2 emphasizes both the destruction that many artificial cleaners can have on the planet's waters and on the creatures that reside in said water, as well as the benefits that creating our own natural cleaners can have on the environment.

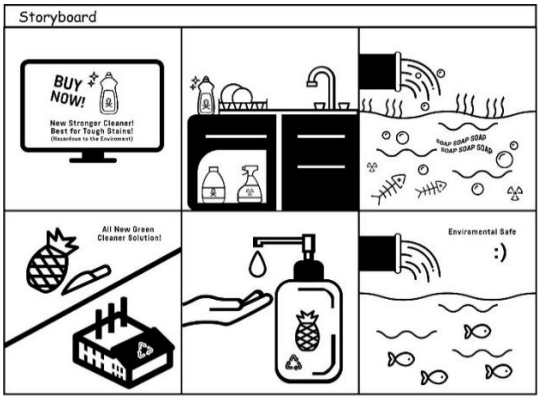

Figure 2: The first storyboard for the project (Icon Credit: Nounproject - Storyboard by: Crystal Hunter)

The user is advertised a new, strong, and environmentally harmful detergent on TV. The user, after walking to their kitchen sink, cleans the dirty dishes with the same cleaner from the TV ad. Afterwards, the user is shown how the chemicals from the dish detergent have traveled from the sink and into a body of drinkable water that also houses sealife. As more contamination enters the water, more fish die. To stop the water contamination, the user is prompted to make their own green-thumb cleaner solution out of pineapple scraps, similar to how companies like Fuwa3e are creating cleaning products. After the user creates and utilizes their new pineapple detergent to wash the rest of their dishes, the drinking water becomes clear, and the fish return to life.

3.1.2 Second Storyboard

The second storyboard focuses on the typographic design of the different elements in the environment, as well as on the design of the environment itself.

The overall concept remains the same, but the environment has been expanded to include the three main tasks involving artificial cleaning products, found in the bottom half of Figure 3 (giving a dog a bath, washing clothes, and washing dishes). This storyboard also expands on the severity of the contamination, as the surrounding walls of water are filled with both elemental contaminants common in artificial detergents, and dead typographic fish (Figure 4). The same figure showcases the steps for creating the pineapple cleaning product on the bottom sketches, from adding sugar to water, to cleaning the previously cut pineapple skins, to adding said skins to the sugar-water mixture and blending everything for the final cleaner.

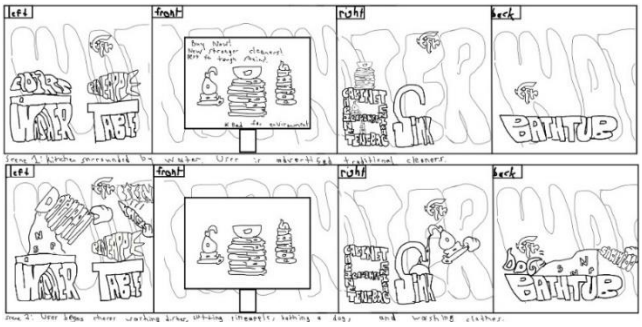

Figure 3: First portion of the revised storyboard.

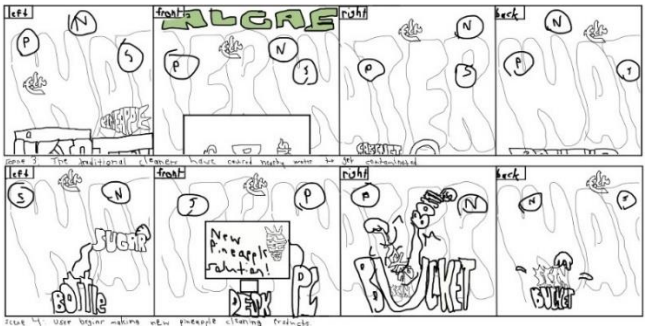

Figure 4: Second portion of the revised storyboard.

3.2 Unity Development

During the first iteration of the VR environment, it was discovered that the square room design from the revised storyboard was inadequate for the CAVE2 environment, as the user would need to split attention between all angles of the CAVE2 space; either that, or the user would turn the player camera, which could cause motion sickness. Thus, the first Unity project iteration, seen in Figure 5, utilizes a rectangular, straightforward path populated with various interactions.

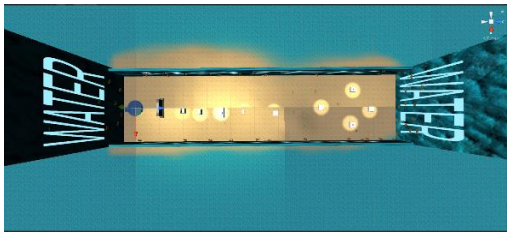

Figure 5: First iteration of the VR environment

The second iteration expands on the object designs with 3D typography (Figure 6), while the third iteration adds suitable textures to each object, along with a temporary skybox (Figure 7). The visual editions in these iterations are meant to further immerse the user in a world that, while not too similar to real life, still reflects items and creatures relevant to our message (such as fish and standard appliances) that are easy for the user to identify, so that the destruction and eventual

restoration of this VR environment can be connected with both the actual problem of water contamination and the potential benefits of natural cleaners.

Figure 6: Some early 3D typography models.

Figure 7: Third iteration of project, with textures and a skybox.

During the interaction creation process, environmental audio was added to convey the sense of nature and serenity that lively bodies of water full of aquatic life exude. Meanwhile, sound effects like the washing machine activating and pineapple slicing provide feedback to the user for when parts of interactions are successfully completed.

Narration was also added at the start and end of the VR environment, as well as in-between each interaction. The narration emphasizes the cause and effect of each interaction, from the narration being frightened by the pollution after only washing their clothes, to being relieved that their new pineapple cleaning product is bringing the water back to its pristine condition.

Water-based textures were changed to animated textures that better reflected the gentle movement of water. The skybox uses the same animated texture to better reflect the water-enveloped world; for a similar reason, the walls of water in Figure 7 had their renderers removed due to their lack of immersion when compared to the new skybox. Figure 8 shows the final design of our project.

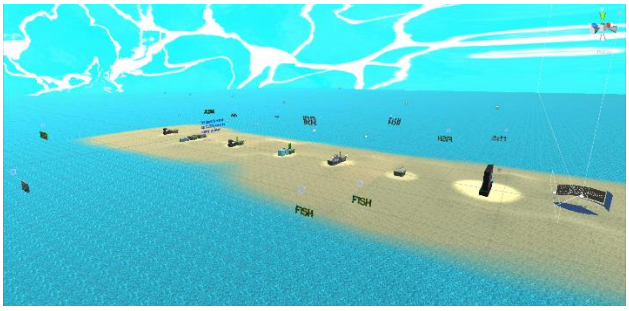

Figure 8: Final look of the Unity project

3.3 Design

3.3.1 Typography

For typography choices, fonts and textures that matched what the real objects look like were used. For the detergent, soap, and shampoo, the font was kept simple and condensed to mimic the real look of regular cleaning bottles. For objects like the table, tub, clothes, etc., the type was manipulated to also mimic the real objects they represented. For example, the letter T in ‘table’ was stretched over the other letters (as seen in Figure 6), the letters for ‘bathtub’ were curved to replicate the curve in typical bathtub designs, and the letters in ‘clothes’ were rotated to look like wrinkled clothes.

We used a modern San-serif typeface ‘Antonio’ for detergent, soap, and the pineapple cleaner. The font reflects a professional modern emotion. For the fish, we used various typefaces that were more decorative to reflect the nature of the fish. The same can be said about the textures used for the fish font, as the textures were patterns that were based on the fish’s scales. Additionally, we had a series of typographic elements hand-drawn to better reflect the VR world. For example, ‘water’ was shaped to reflect the watery waves.

One major inspiration for the typographic objects came from the series “Word World”, where most of the objects and characters are made of words that identify/describe them [8].

3.3.2 Aesthetic

The environment is meant to capture a tropical, natural feeling. Combined with the moving fish and water background noise, the project aims for a natural aesthetic that places the user in the heart of a life-filled body of water.

3.4 Interaction

The interactions in our VR project originate from our revised storyboard. At the start of the VR project, the user must grab and use a knife to cut the skin off a pineapple. Once all the skin is cut off, lively fish spawn and swim near the user. Afterwards, the user performs three interactions involving artificial cleaners.

First, the user applies dog shampoo to their typographic dog. After popping the bubbles surrounding the dog, the dog emits green spheres, with the water skybox darkening, chemical elements spawning, and the suspended algae growing. In addition, several dead fish spawn nearby the user, floating upwards in a belly-up position. The same ominous effect occurs after the second detergent interaction, as the user grabs clothes above a washer and places them inside, and then grabs the laundry detergent nearby to add detergent to the washer. Finally, the user grabs some nearby dish soap and places it against the dish object, where it begins emitting bubbles. Now the user can grab the dish object and place it under the sink faucet to rinse off the dish.

Unfortunately, this further contaminates the environment, as all visible fish die, and the algae grows to immense proportions. The user must avoid the moving algae to reach the pineapple cleaner interaction. Once at the interaction, the user must grab the pineapple skins from the very first interaction and place them inside a bucket of water for rinsing. Then, the user must grab the chemical formula for sugar and place it inside another bucket. Next, the user grabs a mixer and touches it against the sugar-filled bucket to blend the sugar and water together. At this point, the pineapple skins are now clean, and the user must grab them and place them inside the sugar water. Using the same mixer, the user mixes the pineapple scraps into the sugar water, and after 3 months for fermentation (as indicated by 2D text that spawns after the interaction is complete), the new pineapple cleaner is created.

Grabbing the new pineapple cleaner and placing it against another dish object causes bubbles to spawn like previously. However, when this dish object is rinsed off with another faucet, blue spheres are emitted. In addition, the algae and chemical elements disappear, the water skybox returns to its blue color, the dead fish lower and begin swimming, and even more lively fish spawn.

Our project takes advantage of the V.O.T.E. theater method, by giving urgency to players by the worsening environment due to industrial cleaner use, with obstacles to overcome in terms of maneuvering past contamination and the growing algae, the tactic of creating a safer cleaner, and the achieved expectation of making the surrounding water and organisms cleaner and safer [9].

3.4.1 Testing

After our first CAVE2 test, we removed unnecessary filler from interactions, such as spawning a single pineapple skin object for the user to grab, rather than multiple skin objects that the user must individually grab and place inside a bucket.

After the second CAVE2 test, we made hitboxes slightly larger to make collisions between objects easier, especially since the player cannot move and hold on to an object with a single hand, due to the form of the controller.

4 EXHIBITION

The exhibition was held on November 8th in the CAVE2 Hybrid Reality Environment, developed at the University of Illinois Chicago, in the Electronic Visualization Lab (Figure 9), in collaboration with global IBM Design + Typography + Theater Group. The audience consisted of 50 people, including classmates in CS 427/DES 350, Professor Tsoupikova, TA Farah Kamleh, and other invited guests, including guests from the Museum of Science and Industry and from IBM. During our presentation, Isaac acted as the CAVE2 user, Crystal read the introduction of our project, and Julia provided narration for the interactions. Our project was well received, with no problems running the Unity project, beyond noticeable lag. Everyone enjoyed both our presentation and our message of sustainability and how everyone can use pineapple scraps to create a clean product that benefits the environment. Our main feedback was on the quality of, and commitment to, our typographic objects and their designs, as well as on the relative complexity of the interactions.

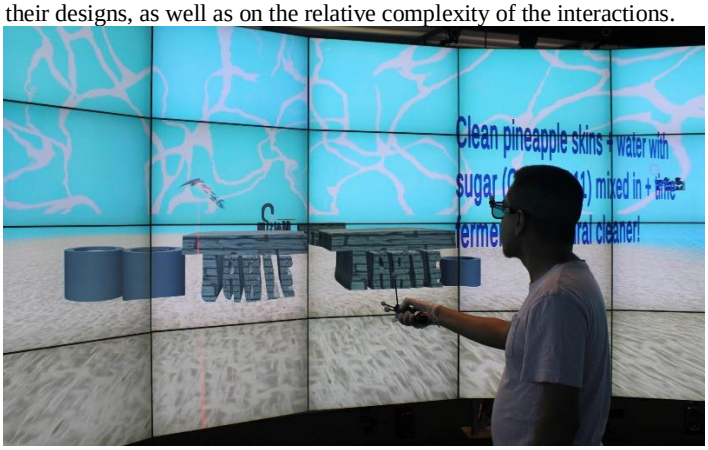

Figure 9: The VR project displayed in the CAVE2 environment.

5 CONCLUSION

Some design challenges that we faced involved iterating the design of our environment to make it livelier. We included moving fish that spawn after most interactions. We also made the environment more open, simulating the feeling of being around/in water. We also made some of the typography in the VR project more legible, and changed the materials used on some type to make it resemble their represented objects. Additionally, we changed the material on the ‘clothes’ type to a flannel pattern. We changed the material on the ‘fish’ type to replicate different types of fish scales (Figure 10). Finally, we added a description next to the pineapple cleaner interaction, so they better understand how natural cleaners are created.

Figure 10: The end of the VR project, with different fish objects of varying textures and sizes

While some portions of previous storyboards were left out of the final VR project, such as a more detailed pineapple creation interaction that would result in a better or worse pineapple cleaner depending on how well the user followed the creation steps, the final project still demonstrates the general steps for creating safe detergents with fruit scraps.

In conclusion, the end goal of our project was to bring light to how harmful everyday cleaning products are to the environment, and how we can take scraps from our fruit and turn them into an effective cleaning solution that won't damage the environment. We wanted to show people that they can create their own product that works just as well as the cleaning products that they are used to, and that they can help protect the underwater environment in the process. We are proud of the outcome of our project, and we hope it inspires others to take a closer look at the products they use, and to create their own cleaning products to use in their homes, so that we can maintain sanitation and access to drinking water.

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