

# Submission Template for ACM Papers

Washed Away

Managing water waste and conservation in the modern house.

Tyler, T.G., Goch

University of Illinois Chicago, tgoch2@uic.edu

ZILE, Z.C., CHEN

University of Illinois Chicago, zchen238@uic.edu

**CCS CONCEPTS** • water management • conservation • household appliances

## ACM Reference Format:

Tyler, T.G., Goch, Zile, Z.C., Chen. 2022. The Title of the Paper: Washed Away: Managing water waste and conservation in the modern house.

Water is one of the most important resources to have, and it is crucial that we make sure that everyone has enough water to survive. Many places in the US are facing water shortages that are only projected to worsen as the climate changes. Making sure to conserve water where possible will become an important practice for families in the coming decades as more and more cities will have to face growing concerns over how the taps will keep flowing.

## 1 Introduction

Welcome to Washed Away. The purpose of this project is to raise awareness of water waste in the US, and show ways that we can help to conserve water. In addition, we will talk about a shower head that incorporates many of these solutions and measures water waste to help be conscious of water waste. While walking through the house, we have water-related objects and appliances around to interact with. Each interactable object tells either a fact relating to water waste, or information on a solution to conserve water. They will also show the corresponding amount of water waste per second. In addition, more and more water will fill the house. There is no set path or order as you get to walk around freely and interact with each water related object to learn more about the facts of each one.

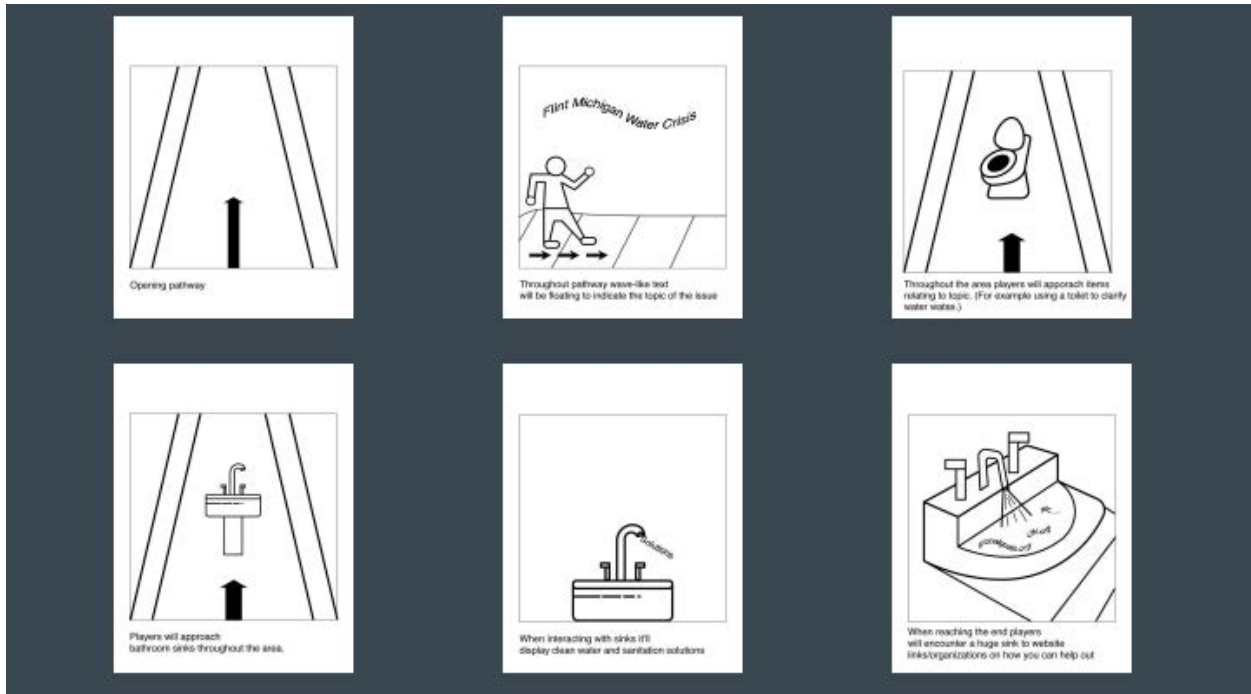
### 1.1 Concept

Every day, millions of gallons are wasted in the US because of overconsumption and wasteful practices. With climate change and infrastructure failures starting to create water shortages in areas, it's important to understand how and why conserving water is necessary. In our project, we will try to inform people of ways they can conserve water that are both simple and effective. Just subtly changing small aspects of our day-to-day lives can drastically reduce water usage and conserve enough water to offset any waste.

## 2 Solution

Our solution is a shower head that incorporates all the water saving methods shown during the interaction. It is a device that can be installed in any shower, just like a standard shower head. It measures how much water is being used, and has features that can help reduce the water used by the device. In doing so, the device not only serves the functional purpose of saving water, but also helps keep the flow of the water to a laminar flow as it helps limit the use of water from being wasted.

## 2.1 Ideation Storyboard (Initial Idea)

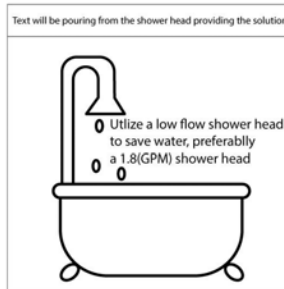
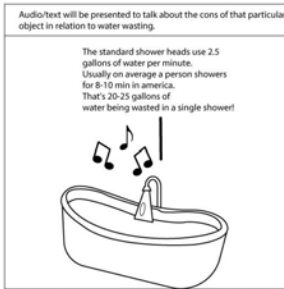
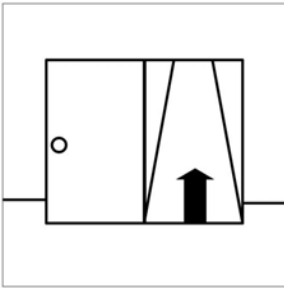
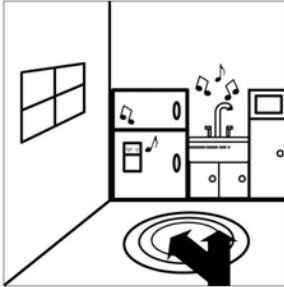


Initial sketches for our concept

When we first started off our concepts to what our ideas will look like for the starting point of what our final Unity design it's going to be like when finalized, there were different iterations that we went through that worked well with what we wanted and some didn't. One of these early concept sketches that we did was the one you can see above, where for our very first concept we put different models of water related objects as part of our sketches. Upon walking around the simulation you will hear music playing, and as the user gets closer to an interactable object the music of that interactable object gets louder to indicate that they are close by and is able to interact with that object. When you interact with that object text of facts starts pouring out of that certain object to let you read about the facts and solutions of water uses and water wasting. Even though our first iterations of sketches for our first concept was a simple sketch and approach to the overall design of the simulation, in the end we were able to still find ways to improve and was able to add more conceptual ideas to the overall Unity project to make it more intractable as well as eye catching to look at in every possible way.

## 2.2 Final Sketches

These are our final sketches that outline our initial ideas. We diverged slightly from the original idea, mostly in the technical aspects we were able to achieve, but overall we kept the same core concept in the end.

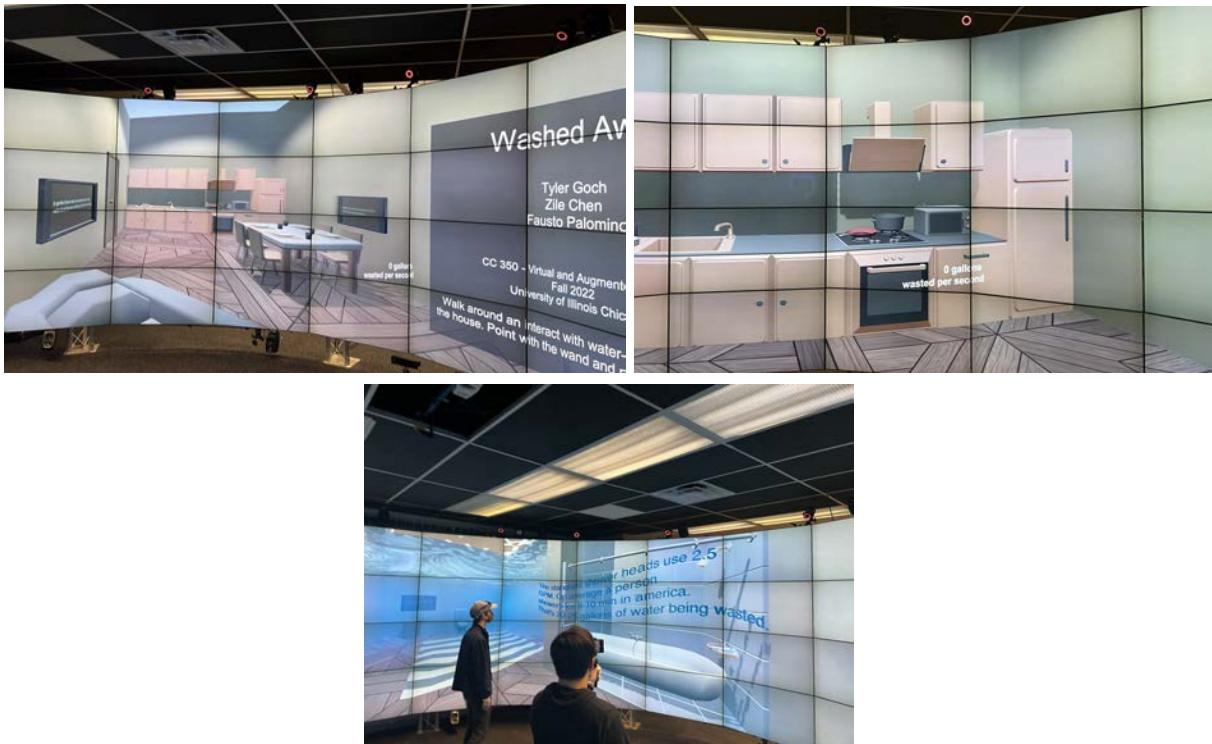


### 3 Environment

Our project is set in a modern family home, with all the standard furnishings and appliances. The player can walk around and explore the house, coming across information about water usage along the walls. The player will be able to point the wand at the interactable objects when they are standing near them. In the background, there are the sounds of a family in their daily routine. As the player interacts with the objects around the house, water will start to rise. The house will eventually flood to symbolize the water wasted.



An early screenshot of the environment



Pictures of the final environment

#### 4 Interaction

When you first start off the simulation, there are family noises in the background as you walk around the house. With each interactable object that you interact with, each object provides either a fact relating to water waste, or a solution to conserve water in different ways. With each interaction, a sound effect plays and the water level in the house rises. One example to show this would be the interactable faucet as you can see in (Fig 1). When a user clicks on the object with the controller, the object prompts either a fact or a solution to water waste or to conserve water for a few seconds before going away, and at the same time the object noise will be played at the background to let the user know that they made the interacting point upon the click with that object (Fig 2). Each time you click on an interactable object, there is a counter on the screen that adds the total amount of gallons wasted for every interactable object they clicked on. As the water level rises and slowly fills up the entire house, the environment slowly turns underwater. At the same time, the family sounds fade with each interaction and are replaced by the sounds of water running.



Figure 1: Text from sink interaction in the kitchen



Figure 2: Text from bathtub interaction in the bathroom.

## 4.1 Coding

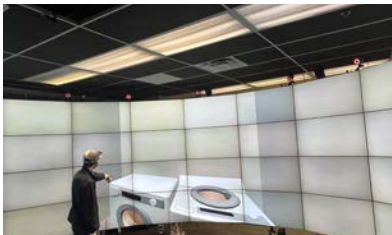
To create the interactions, first we had to have a way to detect when the player was in front of an object and what that object is. Using `OnTriggerEnter()`, whenever a player enters one of the triggers in front of each object, we check the tag of that trigger with an "if" statement. For each object, we have an individual "if" statement that triggers the "isLooking" bool for the respective animation for that interaction. The animations have a second bool that gets set whenever the player clicks, and when both are true the animation plays. Every interaction is run with this script. Here is an example of one:

```
public void OnTriggerEnter(Collider other)
{
    if (other.CompareTag("fridge"))
    {
        fridge.SetBool("isLooking", true);
        inTrigger = true;
    }
}
```

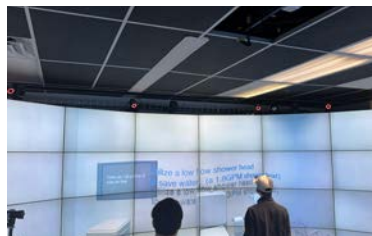
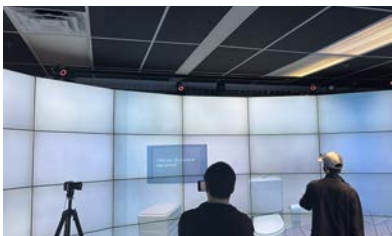
To get the text on the screen to display the number of gallons wasted, we had similar "if" statements check the same conditions, but this time it concatenates the number of gallons and the rest of the text. For example:

```
if (CAVE2.GetButtonDown(CAVE2.Button.Button3))
{
    if(fridge.GetBool("isLooking"))
    {
        gallonsWasted = gallonsWasted + 15;
        gallons.text = "" + gallonsWasted + " gallons" + "\n"+" wasted per second";
    }
}
```

**Before (Animation)**



**After (Animation)**



## 4.2 Design Challenges

Within this project, one big challenge working on this project was definitely the overall conceptual design and the way we want to place typography and arrange the environment. As we had challenges figuring out how much focus the typography should have, or if the objects should be highlighted more. Our ideas included text filling up the whole house of the interior of the environment or just being along the side of every wall as a way to indicate the solutions we are trying to show. Another idea we wanted to implement was to have the text letters fall individually like water droplets onto the ground. As for the pros of working on this project, one positive was that the coding was interesting to learn and figure out. We were able to add most of the features that we wanted. Overall, the project was definitely a challenge when it came to the errors and trials that we went through, but in the end the project of designing the overall concept as well as coding worked beyond what we expected.

## 4.3 Conclusion

In conclusion, water waste in the world is a bad ecosystem that not only is bad for the environment itself, but limits the use of water for many other home families to use water at their own household communities. As more people day by day are having limited use of water due to the millions of gallons of water waste that is being overconsumed and used overtime. In order to bring attention to these issues, our group created a VR simulation as we find ways to inform people of ways they can conserve water that are both simple and effective. Ways of reducing water such as simply turning off the faucet water once when finished, or taking less shower to save the conservation of water. Little things that our group were able to show and find ways to inform many people that are at their own homes to conserve enough water to offset any waste. Overall, this paper shows the importance of water conservation as it focuses on the solutions, pros and cons of water waste, and the surreal reality experience that we designed for users to experience for themselves as well as others who are first time users of VR. As we find ways to influence and inform people about the issues of water waste in this world through the uses of our simulation with new technology.

## REFERENCES

- [1] Mooney, Chris. "The Incredibly Stupid Way That Americans Waste 1 Trillion Gallons of Water Each Year." The Washington Post. WP Company, October 27, 2021. <https://www.washingtonpost.com/news/energy-environment/wp/2015/03/17/the-incredibly-stupid-way-that-america-wastes-1-trillion-gallons-of-water-each-year/>.
- [2] Reubold, Todd. "Stop Water Waste the Average Person Unknowingly Wastes," March 14, 2019. <https://doh.wa.gov/sites/default/files/legacy/Documents/Pubs/331-450.pdf>.
- [3] Denchak, Melissa. "Reduce, Reuse, Recycle. Most of All, Reduce." NRDC, May 16, 2022. [https://www.nrdc.org/stories/reduce-reuse-recycle-most-all-reduce?qclid=Cj0KCQjAveebBhD\\_ARIsAFaAvrEIJZT5TPrcSIQpeKzRBcKUTayqhjMR3LiJeeQdD3Jw-se4PZeeEaAlb-FAIw\\_wcB](https://www.nrdc.org/stories/reduce-reuse-recycle-most-all-reduce?qclid=Cj0KCQjAveebBhD_ARIsAFaAvrEIJZT5TPrcSIQpeKzRBcKUTayqhjMR3LiJeeQdD3Jw-se4PZeeEaAlb-FAIw_wcB).
- [4] "Water Conservation at EPA | US EPA." *US EPA*, 4 Sept. 2015, [www.epa.gov/greeningepa/water-conservation-epa](http://www.epa.gov/greeningepa/water-conservation-epa).
- [5] "Key Topics – Office of Conservation and Water - United States Department of State." United States Department of State, [www.state.gov/key-topics-office-of-conservation-and-water](http://www.state.gov/key-topics-office-of-conservation-and-water). Accessed 21 Nov. 2022.
- [6] "Statistics and Facts | US EPA." *US EPA*, 23 Jan. 2017, [www.epa.gov/watersense/statistics-and-facts](http://www.epa.gov/watersense/statistics-and-facts).