Motivate Homeowners To Change Their Energy-Consuming Habits Through Visualization Of Environmental Impact

By Christy Chan | December 7, 2021

A Thesis Proposal Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Fine Arts in Visual Communication Design School of Design | College of Imaging Arts and Sciences | Rochester Institute of Technology

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Abstract

People can't physically see the damage that is being done to our environment and are unaware of how much water and electricity they consume. With growing technology, accessibility to personal data on water and electrical usage is becoming more available, however, options of how to view this information in personal spaces are scarce. My goal is to help users become more aware of their usage within their household and show how their utility usage impacts the environment through an elegant display of real-time data that summarizes breakdowns of water and electricity consumption throughout their home. This will be done through interactive ecosystems that act as art pieces projected on virtual screens throughout the home. People will be able to interact with these art pieces while learning about their own habits and how to better themselves at the same time.

Keywords

Interaction Design, User Interface, User Experience, Data Visualization, Environmental Impact, Energy Consumption, Virtual Ecosystem

Problem and Solution Statement

Today, visualizing consumption of energy are in terms of bar charts, numbers, and how much you will be paying this month. It is hard to wrap our head around how numbers and charts affect the environment. Most homeowners are interested in saving money while maintaining their living habits to be environmentally friendly (Chetty, 2008).

Here's a big potential of eco-feedback/eco-visualization to encourage homeowners to implement better usage habits by visualization and providing useful feedback that users did not have before (Froehlich, 2009). This surfaces hidden energy data, such as kilowatts of electricity or carbon loads, etc. Thus, increase conversation behavior in society (Holmes, 2007). Man-made damages to the environment also do not have an immediate effect, hence we don't correlate our bad actions to the damages we make.

My goal is to design a virtual environment reflecting real-time data will help homeowners to be more aware of their energy usage and educate them how their utility usage impacts the environment with real-time data that breaks down their energy consumption.

Main Body

From tracking gallons of water used and wattage of energy used, people are able to see cost-savings accrued based on time, from months to years. This system will also offer future projections of cost savings based on current usage habits. With

more sustainable water/electric usage, the digital environment will become lusher and growth will increase. Whereas with overindulgence, the environment would become drier and less dynamic.

The main key feature of this system is the aspect of an interactive environmental space, where people will see their behaviors and habits directly affect their own personal ecosystem. This procedurally generated ecosystem will act as a virtual "window/wallpaper" display that people experience throughout their home. Behaviors will directly correlate with the visual content that is being shown on the interface.

Findings from an experiment used *FigureEnergy,* an interactive visualization platform, to allow users interact with their own energy consumption data thus helped make sense of their consumption and understand how energy was used (Costanza, 2012). The results of this experiment were very successful, it pointed out what appliances were consuming unnecessary energy.

To further enhance motivation for the user, additional factual information on actual elements of the ecosystem that the user chooses. Users will be saving water and energy, growing more aware of their consumption, and seeing their aesthetic needs fulfilled, all at the same time. Regardless of user habits, we imagine this system will always present beautiful visuals, never discouraging the user to turn off the experience and disengage with the product.

Conclusion

We all know human behavior plays a crucial role in energy consumption, thus we need to target ways to change our behaviors to save the environment. Research has shown that consumption feedback helps reduce energy use by 10-15% on average (Froehlich, 2009). With my design solution, visualizing a virtual environment reflecting real-time feedback will help users be more aware of their energy usage and how that impacts the environment.

Appendix A: References

Chetty, Marshini, David Tran, and Rebecca E. Grinter. "Getting to green: understanding resource consumption in the home." In Proceedings of the 10th international conference on Ubiquitous computing, pp. 242-251. 2008.

Costanza, Enrico, Sarvapali D. Ramchurn, and Nicholas R. Jennings. "Understanding domestic energy consumption through interactive visualisation: a field study." In Proceedings of the 2012 ACM Conference on Ubiquitous Computing, pp. 216-225. 2012.

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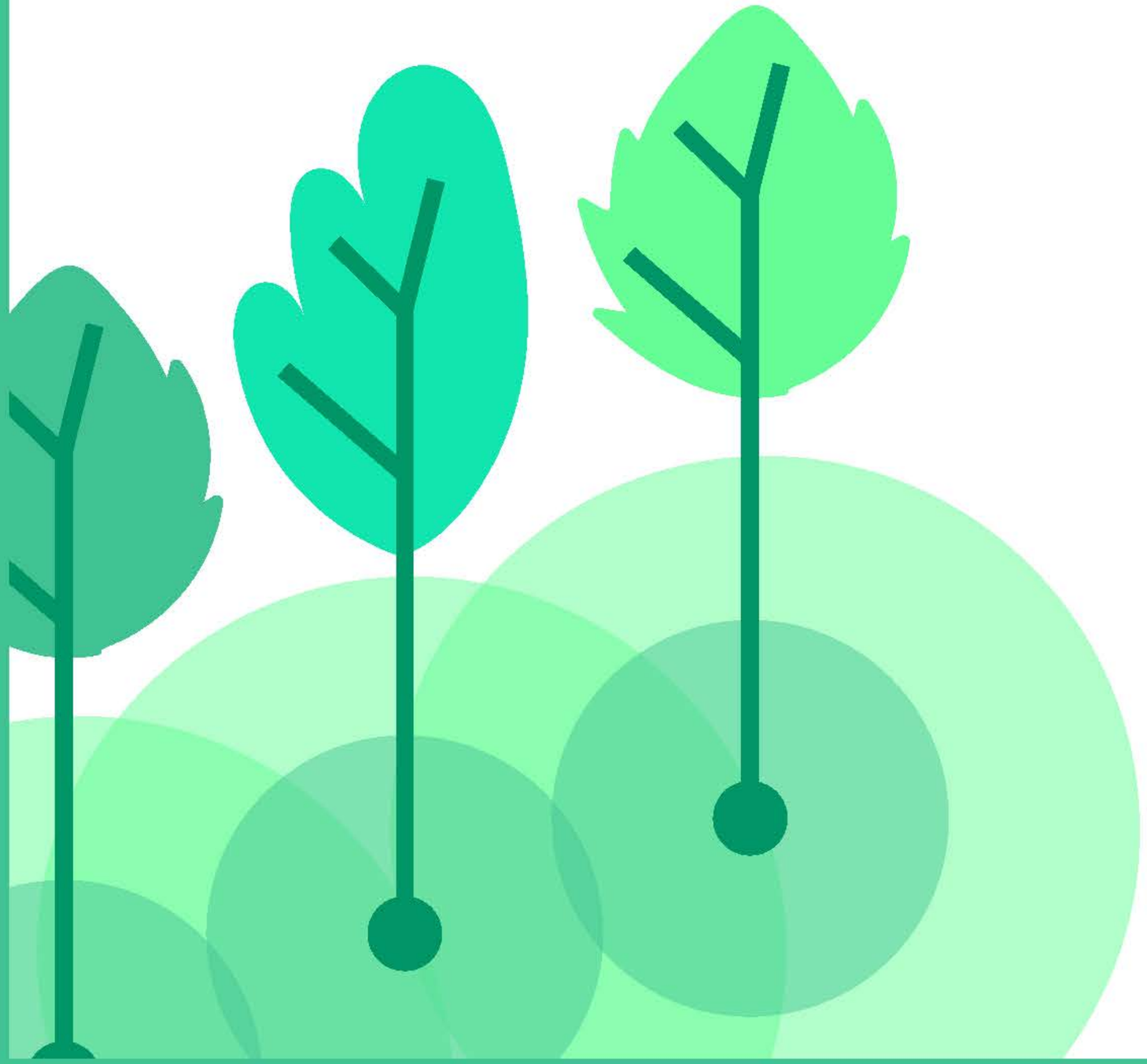

Sprout

Christy Chan | Thesis | Fall 2021

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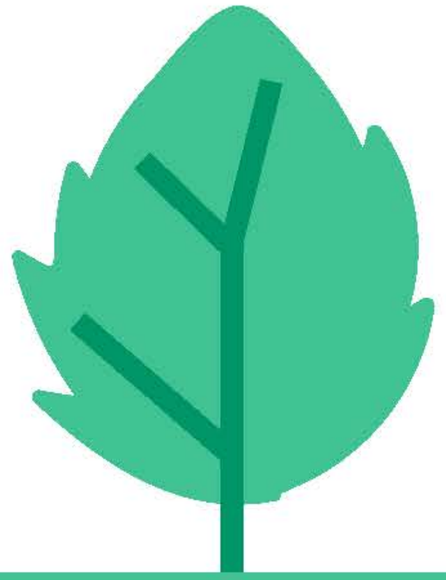
Part 1

Overview



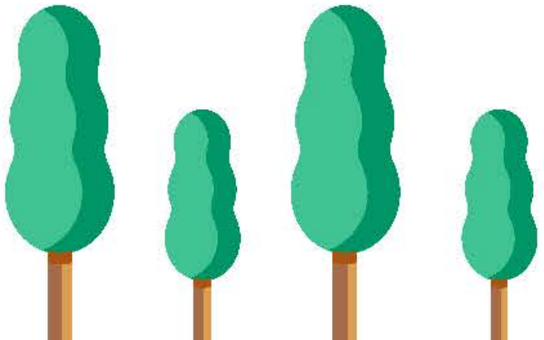
Topic

What’s the current problem?

People **can’t see** 👀 **the damage** that is being done to our environment and is unaware of how much **water** 💧 and **electricity** ⚡ they consume.

Design a system to...

Motivate homeowners to change their habits through **visualization of environmental impact** by developing a product that analyses and keeps track of their consumption to improve their habits with real-time feedback.



Concept

How to visualize environmental impact?

Creating a **virtual ecosystem**, which allows users to directly observe their **water** 💧 and **electric** ⚡ usage and will be able to view in app for details.

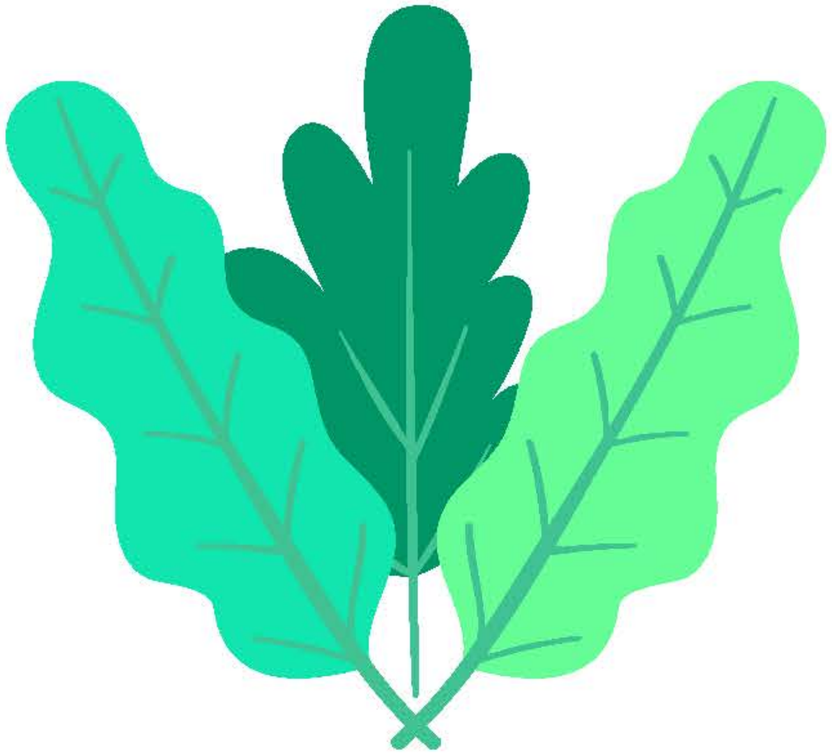
Concept

How to visualize environmental impact?

A **interactive ecosystems** that act as art pieces projected on virtual screens throughout the home.

Concept

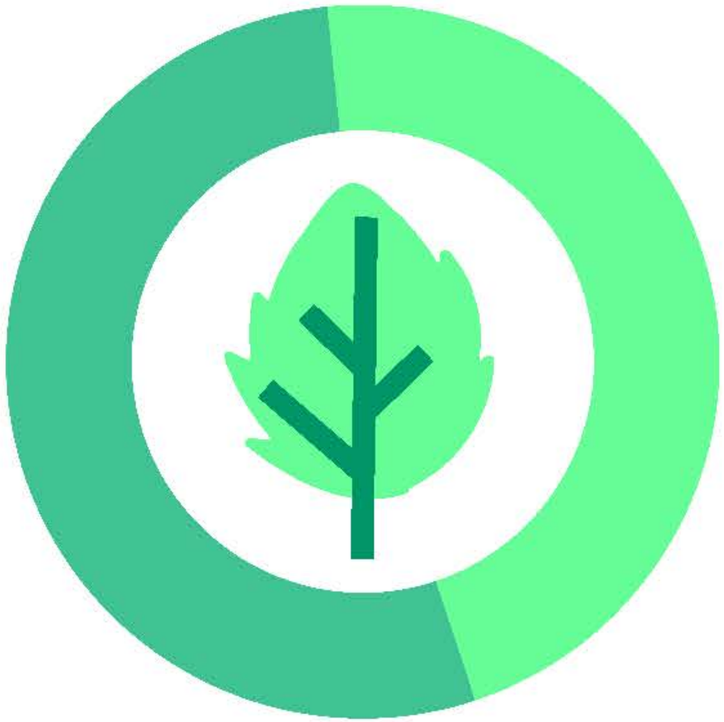
How to visualize environmental impact?



People will be able to **learn about their consumption habits** and how to **better themselves** at the same time.

Topic

Why is this topic relevant/meaningful?



With growing technology, accessibility to personal data on water and electrical usage is becoming more available, however, **options of how to view this information in personal spaces are scarce** and **not well-interpreted**.

Solution

My solutions are

1 Motivate homeowners to change their consumption habits through a virtual environment.

2 Analyze and keep track of their utility consumption to improve their habits with real-time feedback.

3 Offer device and appliance usage and generate future projections of cost savings based on current usage habits.

How to visualize environmental impact?

Behaviors and habits will directly correlate with the visual content that is being shown on their own personal ecosystem.

Part 2

Research

Current System - Smart Thermostats

👍 ADVANTAGES

- Smart devices
- Learns schedules
- Easy to use

👎 DISADVANTAGES

- Only for setting temperatures
- No additional information are given
- Doesn’t help habit forming

Key Findings/Core needs

SAVE ENERGY
Understand how much energy you are using, when and where.

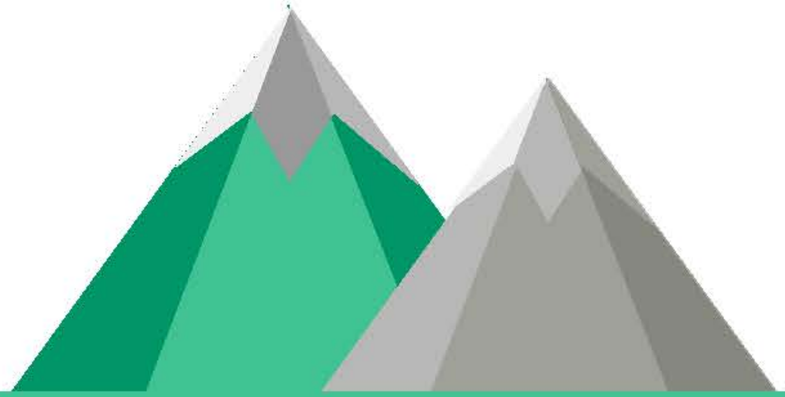
SAVE MONEY
Giving user a better understanding to break down and take action.

REDUCE CARBON EMISSIONS
Join forces to save the planet by reducing carbon emissions.

KNOW WHAT'S ON
Quick glance into knowing what appliance was left on.

Part 3

Design



Design

3D Virtual Environment

Doing good

Doing EXCELLENT

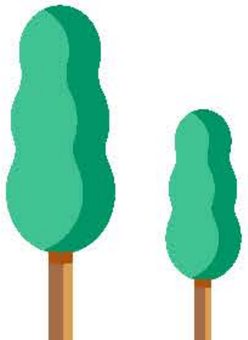
Doing bad

Design

Mockup

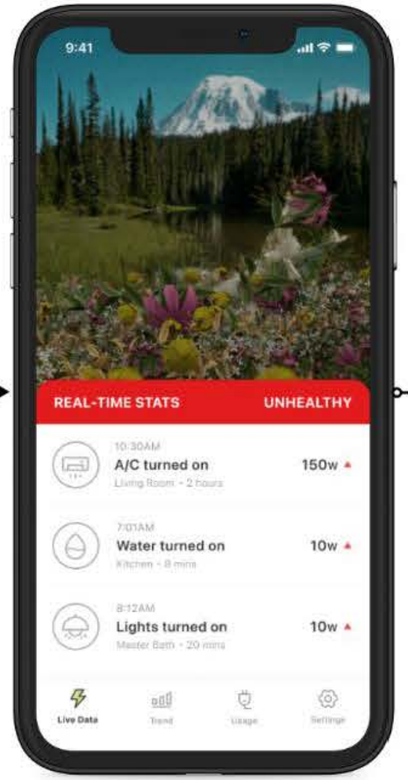
User Flow

What does overusing of energy look like?

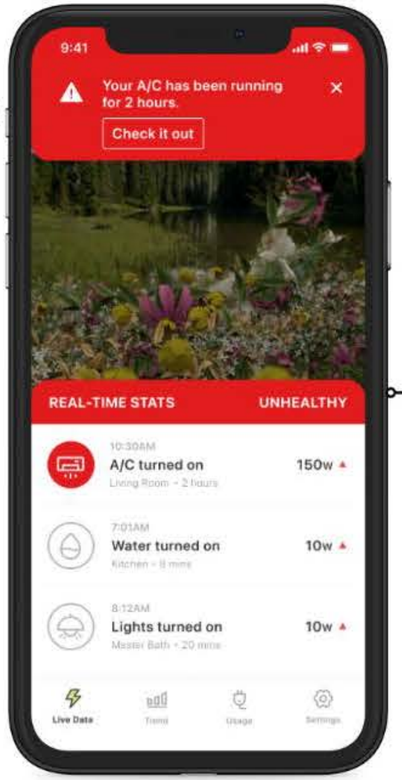


What does overusing of energy look like?

Left A/C running

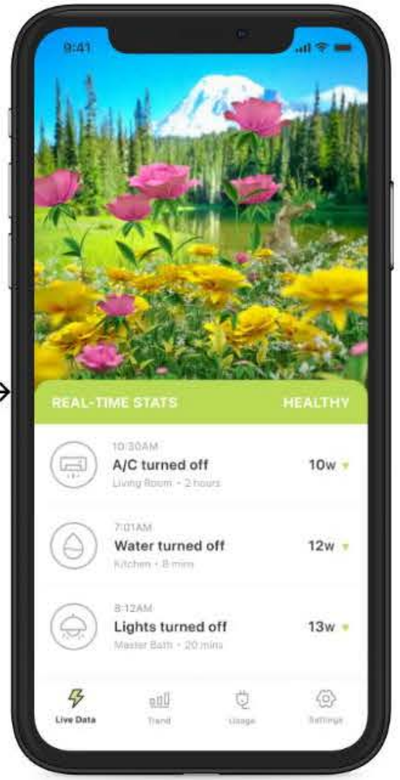


Your actions are affecting the environment



Notify users what the problem is

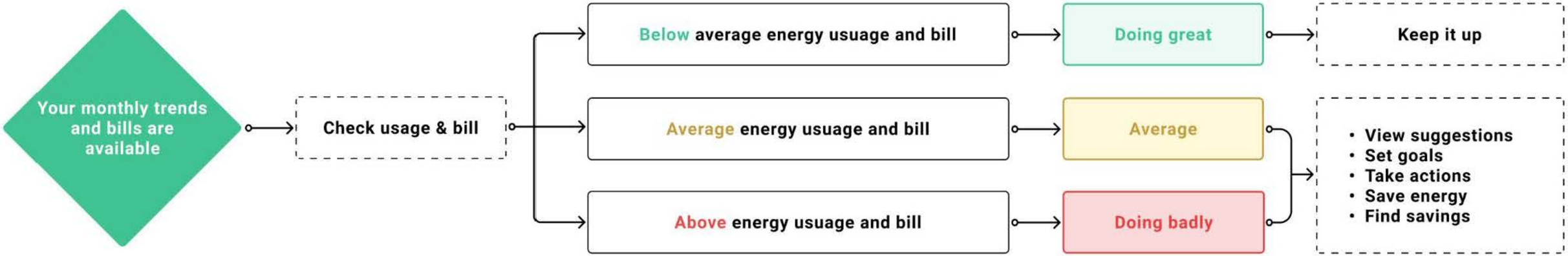
Turn off A/C



Your enironment slowly grows back and flourish

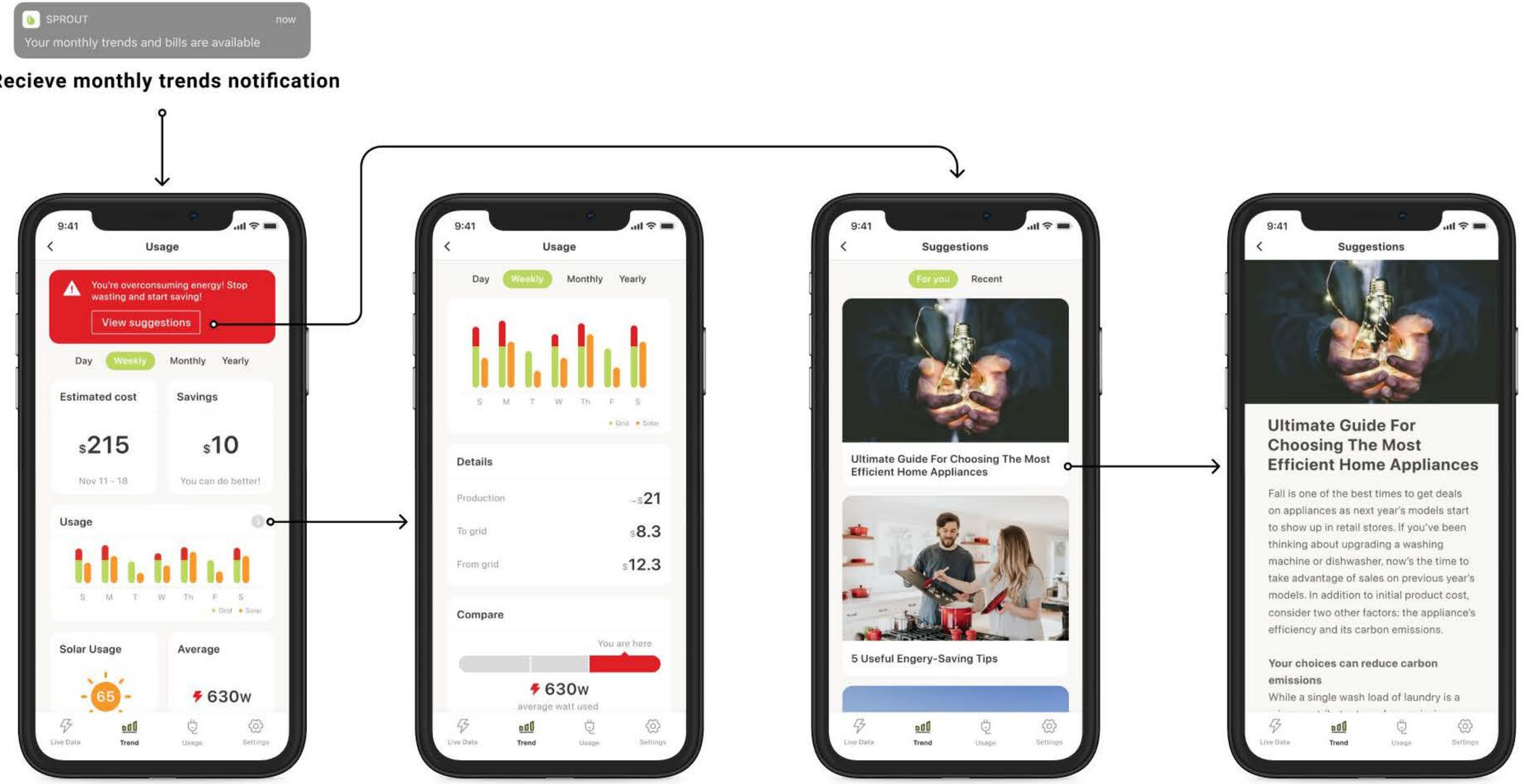
User Flow

How to view your trends?



Design

How to view your trends?



Recieve monthly trends notification

Check usage & bill

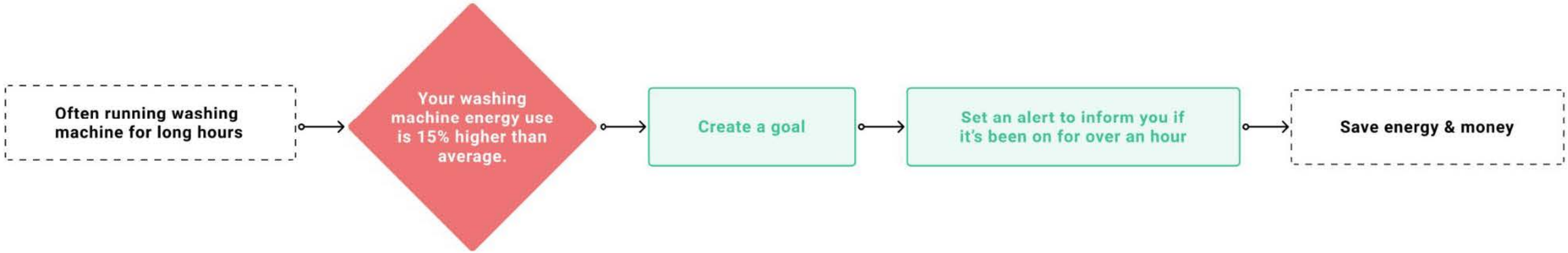
View usages in details

Suggestions

Read articles and ACT!

User Flow

How to check appliance usage to save energy?

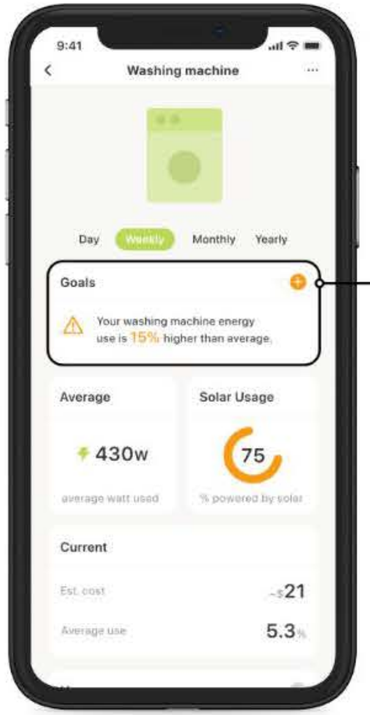


Design

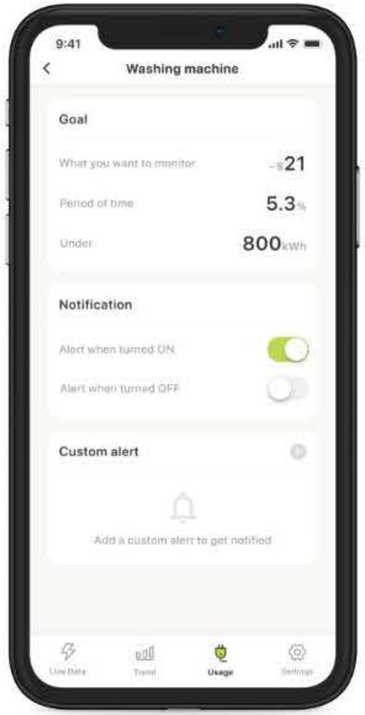
How to check appliance usage to save energy?

Often running washing machine for long hours

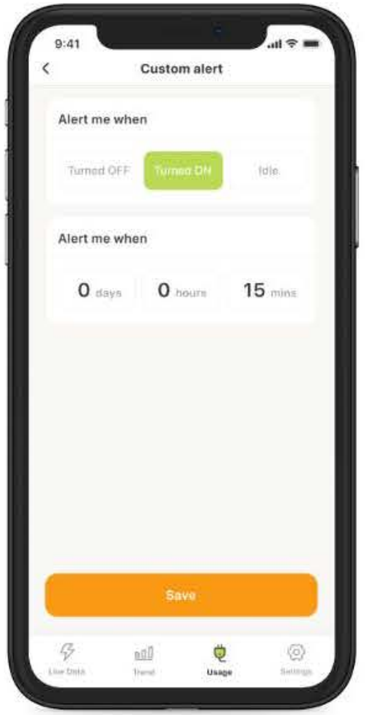
Notify users regarding their high energy consumption



View appliance usage



Create a goal



Set an alert to inform you if it's been on for over an hour

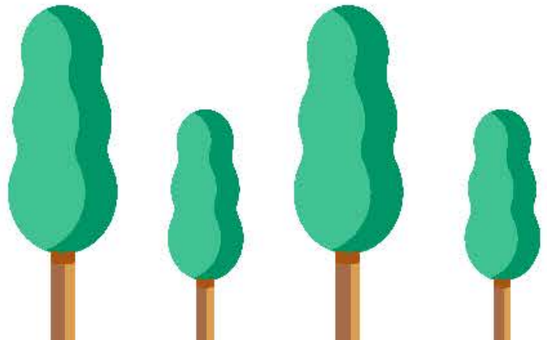
Part 4

Conclusion

To Conclude...

We all know human behavior plays a crucial role in energy consumption, thus we need to target ways to change our behaviors to save the environment.

With my design solution, visualizing a virtual environment reflecting real-time feedback will help users be more aware of their energy usage and how that impacts the environment.



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Wee, Siaw-Chui, and Weng-Wai Choong. "Gamification: Predicting the effectiveness of variety game design elements to intrinsically motivate users' energy conservation behaviour." Journal of environmental management 233 (2019): 97-106.

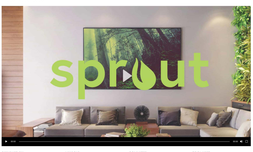
Thank You!

UX/UI + 3D DESIGN

sprout

Visualize homeowners' energy consumption by projecting a virtual environment to improve their habits with real-time feedback.

— Eco-visualization



DESIGNED BY
Christy Chow

MY ROLE
UI/Lead Development
UX/Ux Design
3D Design
3D Animation

COMMISTIZ
Adam Smith
Mike Wrobert

TOOL USED
Figma
Cinema 4D
After Effects

WHAT IS THE CURRENT PROBLEM?

Most of the energy we consume is generated from fossil fuels, which have an adverse impact on the environment causing global warming and climate change.

People can't physically see the damage that is being done to our environment and is unaware of how much water and electricity they consume as our monthly and water bills don't reflect the impact on the environment.

Our consumption habits will need to change. Even with the advancement in technology, renewable energy is not always available as it typically depends on the weather.

MY GOAL IS TO...
help users become more aware of their usage within their household,
and show how their utility usage impacts the environment through an elegant display of real-time data.

MY SOLUTIONS ARE...

01
Motivate homeowners to change their consumption habits through a virtual environment.

02
Analyze and keep track of their utility consumption to improve their habits with real-time feedback.

03
Offer device and appliance usage and generate future projections of cost savings based on current usage habits.

Sustainable energy usage =
Lush & dynamic environment

Overindulgence of energy =
Dry & non-dynamic environment

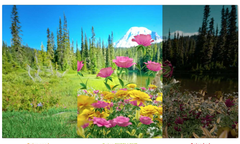
RESEARCH

The closest product with Sprout is smart thermostate. Google Nest, Amazon Ecobee, and Honeywell T5+are the most common ones.

Advantages
- Smart devices
- Learns your schedule
- Easy to use

Disadvantages
- Only for setting temperatures
- No additional information is given
- Doesn't help habit-forming

3D ENVIRONMENT + MOCKUP



Doing good | Doing EXCELLENT | Doing bad

HOME OVERVIEW

Sprout will alert users in real-time when there's an overconsumption of electricity or water. This helps users understand how much energy is consumed, when, and where in your home.

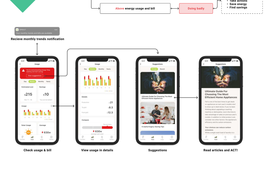
Your actions are affecting the environment.

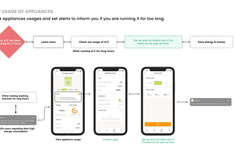
Both users are alert the problem is.

Your environment slowly grows back and thrives.

ENERGY CONSUMPTION TREND

Trends are available for users to understand their utility bills better. Know what is consuming the most energy so that users can take action to save more.





Check usage & bill | View usage in details | Suggestions | Read articles and ACT!

VIEW USAGE OF APPLIANCES

Check appliances usages and set alerts to inform you if you are running it for too long.

Alert appliance usage | Future costs | Set up alert for future appliance usage

CONCLUSION

We still know human behavior plays a crucial role in energy consumption, thus we need to target ways to change our behaviors to save the environment.

With my design solution, visualizing a virtual environment reflecting real-time feedback will help users be more aware of their energy usage and how that impacts the environment.

Thank You!

Visual
Communication
Design
BFA

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