

Gamification of an Eco-feedback UI

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Introduction

Saving energy is important for not only the home resident but also for the environment. In order to cause a change in behavior in residents to save more energy, I created a visualization of a user Interface (UI) that had gamification elements inside of it. The area of research was low-income housing residents in buildings that all had the same Mitsubishi Ductless HVAC System.

Objective & Impact of Professor's Research

This research project is to make residents in low-income housing use their energy more efficiently and use less of It whenever it is necessary. A UI that shows information of energy usage and home temperature change averages, with a elements of gamification would make the residents more aware of how they use energy. If successful, there would be less energy use, residents would see decrease in how much their power bills cost, and just cleaner energy and power around the target area. Hopefully even around a larger area if the UI gets distributed past the lowincome housing residents.

Citations

- [1] R.Herrmann, P. Brumbry. "An empirical" investigation of domestic energy data visualizations". April 2021.
- > [2] R. Agarwal, M. Garg, D. Tejaswini. "A review of residential energy feedback studies". July 2023.
- [3] D. Kotsopoulos, C. Bardaki, S. Lounis, K. Pramatari. "Employee Profiles and Preferences towards IoT-enabled Gamification for Energy Conservation". June 2018.

Research & Learning Process or Skills Learned

During my time in SHINE 2023, I learned a lot of stuff I didn't know before and learned useful skills that I would most likely would need in my future.

I learned how to use Figma, which is where I did the UI model designing. It lets me create different screens and make stuff on the screen pressable to go to another screen.



Eco-feedback UI in the Figma design tool

I also learned how to read and look for research papers. I was also taught how to see if they are to my liking or if they are what I am looking for, so I don't waste time reading a research paper that had nothing to do with what I was researching.

Other things I learned during SHINE were things such as: soldering wires and components, being good at personal statements, how to use Mat Lab, also learned General Lab Safety for all labs, and other stuff like communications.

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Goal	and Challenges				
	Goals Challenges				
June 11 - June 17, 2023					
	Only change the house temperature twice				
+5 pts	Get on the podium for least energy used				
+5 pts	Use energy less from 4pm - 9pm for at least 5 days				
(+5 pts)	Attend virtual training and engagement events	_			
+5 pts	Save more energy				
June 4 - June 10, 2023					

Goals and challenges tab in the ecofeedback UI.



Methods & Results

For the user interface, I created a visualization of a general eco-feedback system that showed: house temperature; energy usage for the day, week, month, and year; there is also a profile and somewhere to see and add family and friends that have profiles for their homes. The gamification elements of the UI are visualized as: goals the user can set manually, challenges that the system creates that are the same for everyone for the week (you would still be able to complete them after the week), and the competition that goes on between everyone you have added on the

app.

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$\langle \rangle$	Friendly Competition		Top 3 people get a chance to win
	Rankings from your friends		surprises at the end of the year!
	This week	This Month	This Year
	1	Kateryn Simon	1230 pts
	2	Willie Clemente	1205 pts
	3	John Doe	1165 pts
	4	Jane Drow	1150 pts
	5	Daniel Morales	1095 pts
	6	Johnathon Doewry	990 pts

Competition tab in the eco-feedback UI

The user is incentivized to compete in the competition that goes on for the week, for the month, and for the year for prizes at the end of the year for top winners. To earn points, the user must complete the challenges that everyone gets, and based on how many goals the user completes, they can get a little bit more points. At the end of the year, the top winners of the city or state (work in progress) are put into a raffle to win prizes.

The results from tests shows that people would stay engaged with the UI and think it is useful for saving energy and money. For the gamification part of the UI, the results showed that people liked the competition a goal setting part of it and would keep coming back for that.

Next Steps for You AND Advice for Future SHINE Students

I hope to use this experience to continue my engineering journey through and past college and build a career. I always found and still do find engineering an interesting and brain challenging field of work. Maybe I can even come to school at USC and continue with this great research experience.

For the future SHINE students, I hope you have as good of a time as I had or even better. The kind of work in SHINE might not be as interesting or easy as you would've thought, however it will be an experience to take full advantage of. For me, it was the first kind of research I was exposed to because of where I grew up and I will be forever thankful to do something like this. So, if you do get to do research in SHINE, try the best you can and don't be afraid to ask questions. Mentors, center mentors, other SHINE members, and SHINE staff will always help or try to help. Good luck, and make sure to have fun!

Acknowledgements

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