ENSE 405 Project report-out & lessons learned

Project name
Electroflux by Hasaan Toor

Project sponsor & course facilitator
Dr. Tim Maciag (ENSE 405 professor)

Business need/opportunity
- I believe that by creating this game and covering SDG 7 Affordable and Clean Energy as well as SDG 12 Responsible Consumption and Production, I encourage users to educate themselves about the future of energy and how we can consider the more widespread use of sustainable energy production sources. At the same time I hope it teaches the users about responsible power consumption and ways to reduce unnecessary it in our daily lives.

- As for the why/need of the project idea, while there are a few games out there that are similar in terms of power management, those games are more meant for entertainment purposes as they usually consist of fictional simulated cities with extravagant events and circumstances as again they focus on being a lot more fun than focusing on the educational aspect. So I believe my idea will be a good balance of fun and educational content to get the user to think about the future of our energy situation.

Reflections on project planning (3-5 pages)
- State and discuss the United Nation's (UN) Sustainable Development Goals (SDGs) selected and your "why" for selecting the one(s) you did

1: Affordable & Clean Energy (SDG 7), I believe access to affordable and clean energy to all is an important and almost necessary thing in the modern day and age.

2: Responsible Consumption & Production (SDG 12), I believe that for those of us with access to energy, we should be responsible in how we use it and the same goes for production of energy, currently with the rise of global warming, the Earth is being damaged day by day and it may not last several more centuries at the current pace.

- Discuss key findings from your community research and understanding/requirements gathering (Community characteristics and technology configuration inventory)
    - Discuss your professional opinion of the processes and documentation used in this course for project planning. Did they help/hinder and how?

The UN communities involved under SDG 7 and SDG 12 are well established so far. With the community regarding Responsible Consumption and Production aiming to accomplish a plethora of goals around the year of 2030, including reducing food waste, waste generation and increasing awareness on the topic to name a few. At this stage, the communities would benefit from newer tools, more funding and more backing from larger companies, aiding them to accomplish their worldwide goals in an easier fashion and making them accessible to as many areas as possible, integration of new tools would depend of the funding received and the tools acquired, if highly professional tools are received from high paying funding, the integration should be seamless. This community can be considered worldwide or

international as there are people and organizations all over the world attempting to solve the problems that these SDGs try to solve, however I would say most countries outside of North America are more involved and aware of the SDGs and their goals.

As for my opinion on the documents, there were a few that I think were unneeded and did not help my project and instead acted as a barrier. however there were also some that I have not worked with before that aided me, and as well there were some basic ones that provided me with the goals I wanted to achieve with my project such as scope requirements and MVPs. Overall I think focusing less time initially with these documents and providing more dev time would be a benefit for the class going forward, as some of the documents do not help with the project and use precious time.

- State selected north star & carryover customers. Why are these customers important to your project's golden circle (why, how, what)?

Northstar - Teenagers in highschool

These are my main customer as this age group tends to play a lot of video games, and at the same time they are in the peak of their learning as their brains are forming and they tend to learn a lot of new things and habits, by exposing them to my game I aim to encourage good power consumption practices and enabling curiosity into the world of sustainable energy.

Carryover - Adults, Younger Children (10+)

Many of the same reasons from above also apply here, younger children are even more likely to play games and a game could be a way to get information across in a fun engaging way. Adults are also always learning something everyday and why not find a way to learn about sustainable energy or how to reduce their power output and power bills at the same time.

- Summarize assumptions made and constraints uncovered, re: drafting an emerging picture

As my community of choice is a broad one, the tools and orientations that they encompass and utilize can vary drastically, as of currently I doubt that the members involved in the communities of trying to achieve the SDGs 7 and 12 have access to tools such as browser games to help aid them. Rather they are more likely to have the platforms and tools I outlined in the Technology Configuration Inventory with features such as communication, collaboration, knowledge growth and learning, project management and more. There are indeed big gaps as there is nothing too similar to my specific idea within the community, there may be publicly accessible (albeit paid) games that are similar in concept but nothing like my game which is free and aims to be more educational. I would aim to move to a more asynchronous approach, where members do not have to necessarily meet up to discuss and make progress, additionally I would focus more on having knowledge that is accessible to more people. Finally I would want for slightly more individual tools however with projects of this scale groups make sense. This is something that my game does.

Most notable constraint is time with about a month of development time to establish several MVPs, may not end up with what I initially envisioned in terms of polish as game development is a brand new experience for me as well.

- Discuss initial & the evolution of your technology stack selection, drafted prototypes, and initial Minimum Viable Products (MVPs)

I initially wanted to go with Godot game engine as at the time the preferred choice of Unity was pushing heavy monetization policies, pushing many people away from Unity. Initially through research I discovered Godot can use C#, C++ and GDScript. At the time I didn't know what GDScript was so I assumed I would go with C++ as that is what I am experienced with, however as I begun development, GDScript was super easy to use (similar to Python) and a lot of the built in functionality depends on GDScript so I went with that for the entirety of my project. My initial MVPs were too ambitious for the time period so eventually I had to scope those down. My initial idea can be seen here:

"My plan is to make a game that is inspired by mini motorways and city skylines, I haven't worked out all the specifics yet but it's going to be something along the lines of this, there will be a grid like map on which houses/building tiles will spawn in periodically or they may be preplaced, I might do a few preset levels or I may make the levels randomly generated still haven't decided on that yet, but your goal is to strategically place power production buildings (such as windmills or hydropower plants that have to be next to water tiles for example) to accommodate the power requirements of the houses, the game will end if you fail to power the houses for a predetermined amount of time or if there is no more space on the map, again haven't quite figured out the specifics, but the games I mentioned earlier kind of go on infinitely but get harder over time. There will be a points system, earning you points proportional to the amount of time that houses are powered successfully, and I may add a special production building which costs points to use and provides a large amount of power but may damage the land/water tiles around it making them unusable for the remainder of the level, showcasing the negative effects of non-renewable energy."

From this idea I scrapped the plan to make several levels or randomly generated ones again due to time, I also scrapped the failing after a certain time mechanic and the special building that ruins the environment around it. Eventually I boiled down my MVPs to the following:

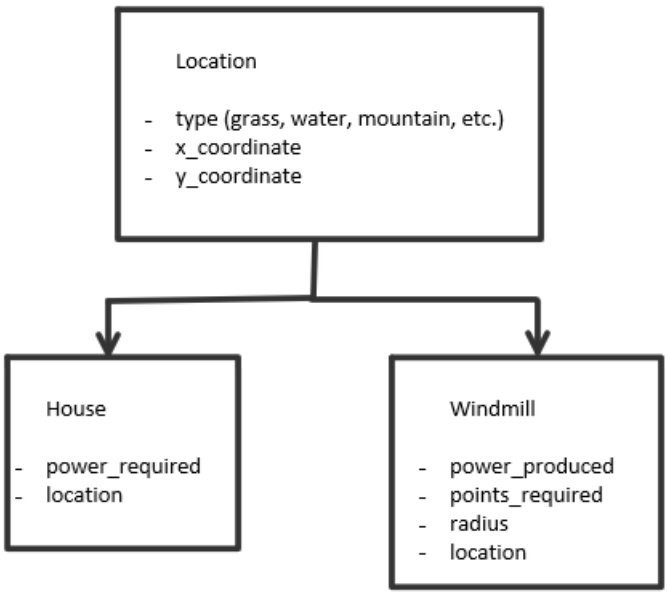
MVP 1 - Initial Start-up - Basic Tiles and Map
Press Start - A new user will see the main landing page, and be prompted to press start to begin the game
Place Tiles - The user should be able to place tiles/buildings of their choosing on the grid-like map (may be a pre-made map at this point)

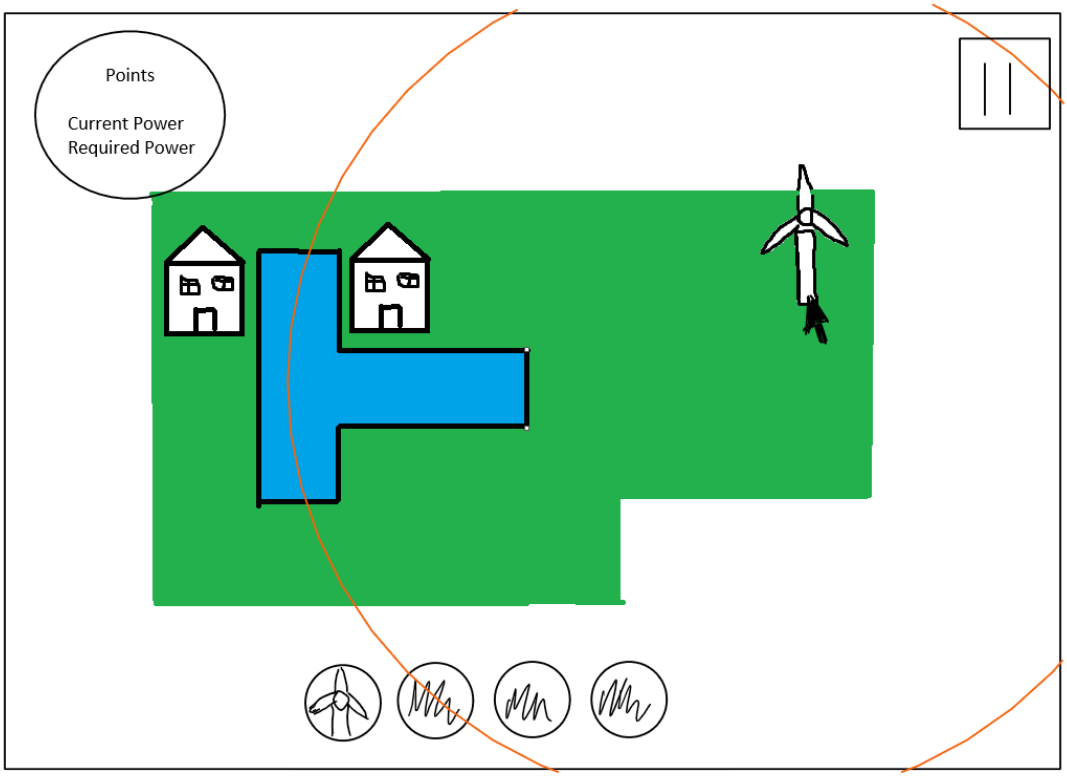
MVP 2 - Power Management - Additional Game Logic
Manage Power - The user should at this point see houses that require power and buildings that produce power, and should try to match the requirement with enough production, the buildings should interact with each other and have a radius of effect, as well as specific places they can or can't be placed

MVP 3 - End of Game Logic - Tidbits/Facts
Game End - The user should be able to end the game via a pause menu or by meeting the lose condition
Power Consumptions Reduction Facts - At the game over screen, a user should be able to see facts about reducing their own power consumption in their daily lives

And I did accomplish all of these 3 proposed MVPs in the final solution.

And here are some screenshots of my very basic class diagram (that was pretty much very close to what was actually achieved) and my initial prototype.





Various Power Production Buildings
ex: Windmill, Hydro-plant, Nuclear etc.

Reflections on project results (4-5 pages)

- Discuss what you created. Provide key images/screenshots illustrating core functionality
    - Review your initial “Planning and initialization” video created for the first deliverable. How close did you come to realizing the solution/product you initially envisioned?
    - Summarize software design activities and findings. Ensure you discuss how you/your team either linked or envision links to design ideas back to topics discussed in class lectures

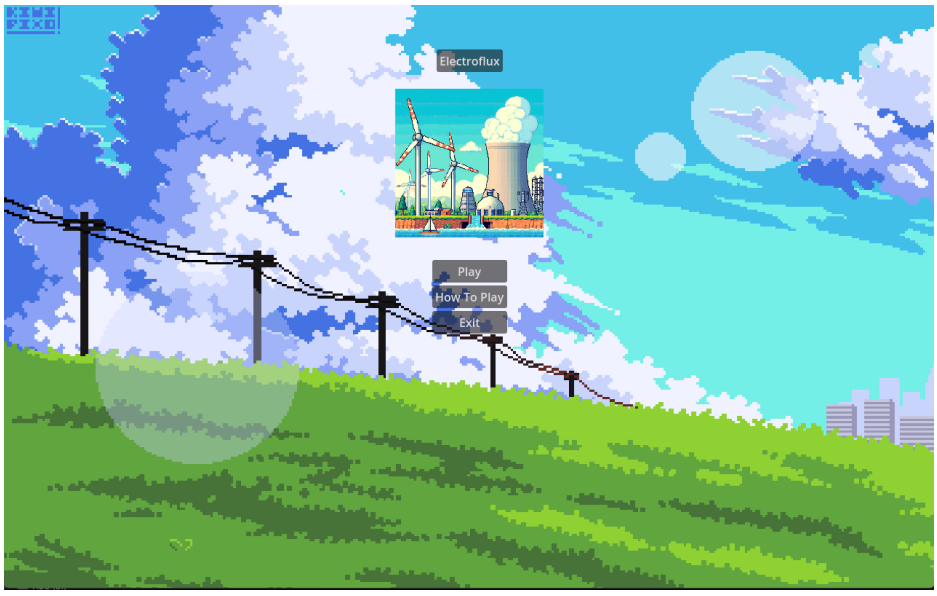
So I created pretty much exactly what I wanted to from my MVP 3 above, I am overall very glad with the outcome. As mentioned above, my very initial idea was too ambitious but once I had laid out my MVPs, I was able to achieve those as envisioned through persistence. The projected incorporated the following ideas from lectures:

Gamification - is the idea of incorporating concepts usually found in gaming to our software solutions, in the case of my project it is a game itself and thus incorporates many of these concepts. As my project is aimed for the younger audience of teenagers/children, an age group which is notorious for playing a lot of games, I hope that by engaging in rewarding gameplay and disguising what would normally be considered another boring class/lecture as a game, they consider the lessons I am trying to teach and become more curious about the SDGs relating to renewable energy and responsible consumption

Creativity - as the young mind is more susceptible to change and is more open to creativity, my aim is to provoke thoughts in these young folks minds so they can come up with creative solutions in the near and or far future as to how to improve the health of the Earth via responsible consumption and renewable production. My game will have a few facts from a few sources about improving power usage and so is considered to be a read only architecture, with the aim of once again allowing these young minds to become engaged with thoughts and ideas on how to improve themselves and how to improve the wellbeing of the planet.

And finally screenshots of the final product:

Main Menu



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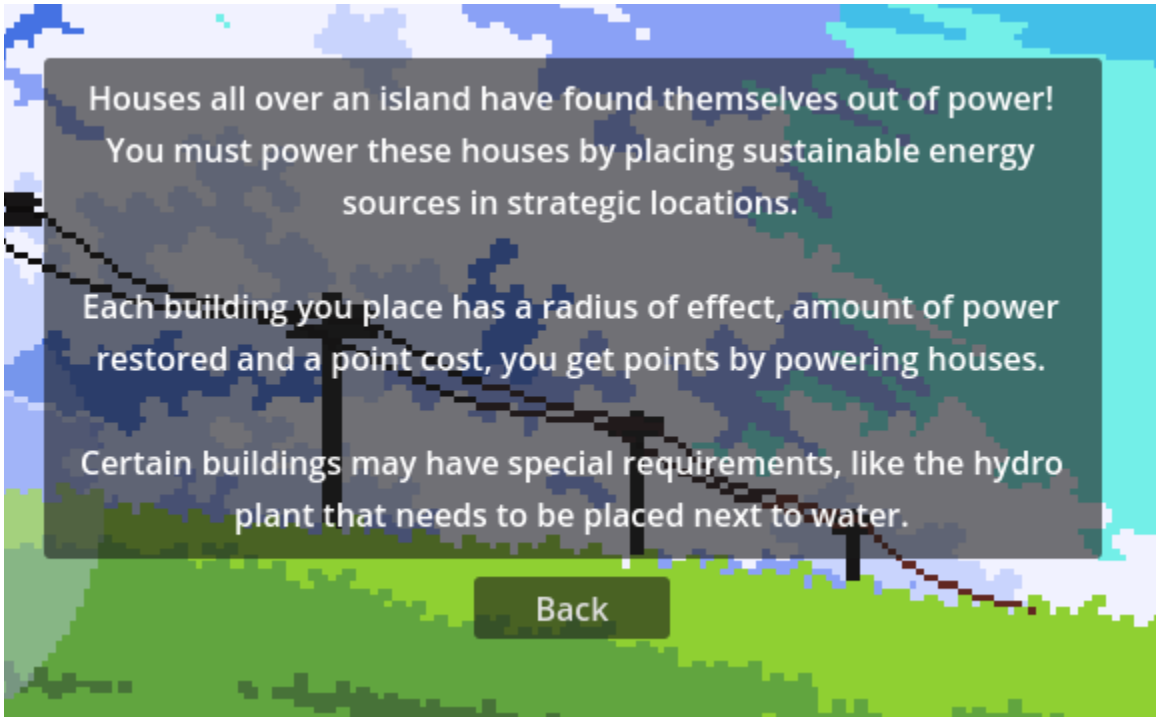
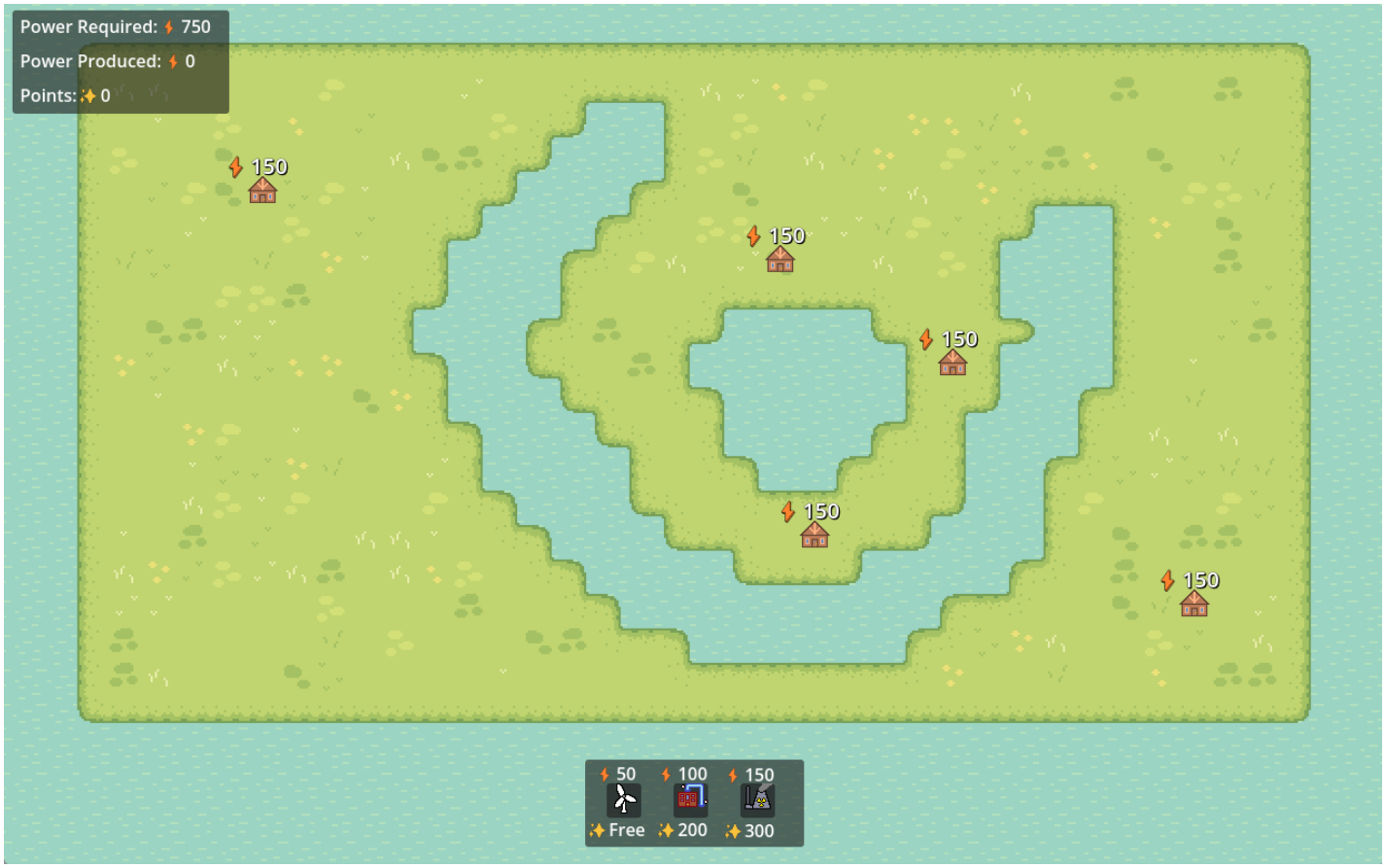
How To Play



Main Level



End Screen

- Summarize how you felt about this project (likes/dislikes), from your experiences with the technology stack selected, translating prototypes into real solutions, and the creation/realization of your MVPs
    - Summarize what went well during the project
    - Summarize what not went well during the project
    - What would you do the same on future projects?
    - What would you do differently on future projects?

Overall I liked the project, I was not a fan of the documentation phase as I found a lot of them to not be helpful during the development of my project. I enjoyed learning something completely new in game development and Godot game engine, and am ultimately proud of what I made as someone who plays games a lot. I finally got to experience the other side of games and made a game myself. Going forward I will continue to be interested in games and game development, taking a class next semester relating to game dev and perhaps even doing it as a career.

What went not so well was trying to figure out and fix bugs, as this was a new experience it was very difficult in terms of learning curve, however through help from the documentation by Godot and YouTube tutorials, there seemed to almost always be a solution to my problems somewhere.

I would establish developed MVPs and ideas early on in future projects as this was a great help in knowing what to work on for each deadline, I would not want to spend my time creating documents that did not ultimately end up helping me with development.

- Discuss opportunities and design ideas for future work

If I was to continue work on my game I would implement the following: creating more levels, potentially randomly generated levels and/or endless mode, additional building types, additional terrain types, alteration of terrain with damaging power production sources.

General reflections on the class & project experience (3-5 pages)

- Before taking ENSE 405, were you aware of the UN SDGs?
    - Yes/No – Please elaborate

No, I had never heard of the SDGs before this class.

- Typically, before taking this class, when you engineered software solutions, were you concerned with areas encompassing the UN SDGs?
    - Yes/No
        - If yes, provide some past examples and explain
        - If no, do you have examples of past engineered works that you (co)created that could address one or more of the UN SDGs

No as I did not know about the SDGs, one thing that comes to mind is the robot car self driving project I made in ENEL 351, this could be enhanced into something like automated self driving robots that help people regarding some aspects of SDGs like education or providing clean water to people.

- Did learning about the UN SDG(s) help you understand better your role and responsibility as an engineer to society?
    - Yes/Neutral/No – Please elaborate

Yes, as engineers ethics are a major part of what we learn and need to uphold, we've been learning since first year about the importance of our work as people's lives are at stake when engineers are involved. The SDGs opened my eyes more to the less fortunate areas of the world and how engineering can be a positive thing that we need to be responsible for.

- What was your experience(s) in engineering your specific software solution to address the UN SDG(s) selected?

It was a good experience, I learned something new and I feel people who play my game will also learn something new and be curious about how to improve our world in terms of energy production.

- As a future engineer, what are your thoughts on the UN SDGs as a whole? Do you think they can help or hinder our work as software engineers?

They absolutely help our work, we need to be creating solutions to problems, and a lot of the world's problems are related to the SDGs in some way or another, we need to take action and create solutions as SWE.

- Should we use the UN SDGs to guide our work or is our work dependent on customer requests, regardless of the UN SDGs?

This depends, on one hand if you are working for a company you kind of have to do what's expected of you, on the other if you are independent or part of a company that prioritizes SDGs, you can focus on those.

- Will you use your understanding of the UN SDGs in engineering solutions in the future?
    - Yes/No/Maybe – Please elaborate

Maybe, it depends on the job I get however I will never forget about what I learned and the unfortunate areas of the Earth and the people that need help.

- Will your experience learning about the UN SDGs inform your career path decisions in the future?
    - Yes/No/Maybe – Please elaborate

Maybe, I will try to get a job that benefits the Earth and the SDGs in some way however this is not guaranteed and I still need to make a living so it depends on the job really.

- Provide any other comments on the project