Introduction to Web-programming

Project work:

TTD-Tank Tower Defense

a Game with Phaser3

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Introduction

TTD – Tank Tower Defense started with the week 7 course work. Being my first introduction to HTML game development and coming near the end of the course it was a scramble to get a working game done by the deadline. Yet I still wanted to challenge myself, so I decided to make a game in a genre that is near and dear to my heart: Tower Defense. First step was to learn more about Phaser3 as a game making framework, which while fully unknown to me before the course, was vaguely familiar as I had coded Unity-games previously.

Project Details: Used languages, libraries and frameworks

Since the project is done for the course Web-programming introduction that uses JavaScript in tandem with HTML5 and CSS for assignments, they were the ones I used as well with the exception of CSS as it was not needed to style the game. Usage of any large JS-frameworks like React were forbidden, but any that were used during the course like Phaser3 were alright to use. Development was done locally using Node Package Manager npm and running parcel-bundler.

Name	Usage in project
Node.js	Javascript runtime environment
Javascript	Main programming language
HTML5	Visualization of the code
Phaser3	JS framework used to render the game by using HTML5 canvas
NPM	Used to manage the local environment and it's packages
JS.MATH	Stock JS library used for simple operations
Parcel(bundler)	Used to bundle the files to use in the localhost
Visual Studio Code	Code editor
Paint.Net	Used to make graphics for the game

Concept

Having had participated in multiple FGJ during my time in LUT, I knew that over designing was a insidious killer of any game development project with a strict time table. So, I decided early on to have the maps be small, tower types be few, and enemies be just different color variations of each other. The idea to have it be tanks vs butterflies, game about through me thinking I was going to make a Tank game originally, but I opted to switch to TD as I manage to find good tutorials for it. Originally, I thought about having the tanks fight against infantry walking on the path, but with the current political situation I decided it may have been in poor taste thus I switched the infantry to colorful butterflies.

One thing however which I did not want to give up on was having the tanks being unique in their function. I figured having 4 types of towers each with their own purpose was enough for the scope of this project. Tank type I came up with are as follows: 1. Minitank: shoots fast but deals minor damage, ammo is destroyed on impact with an enemy. Short range and fast firing speed. 2. Bigtank: shoots slowly, deals big damage, ammo continues moving through enemies. Long range, slow speed. 3. Minelayer: drops mine on the path nearby. The mine explodes on impact and stay on the road for a long time. Drops mine every so often. Meant to be a late defense against any enemies that get through. 4. Trench digger: adds a trench on the path of the enemies that add a slow effect to first x enemies that cross it. Used as a utility.

Timetable

Having had started the project late on 20.10. my timetable was rather hectic. Each day brought new challenges, not least of which was learning to use an entire framework. Here is how my time was spent.

Date	Activity	Progress/hours used
Oct 20	- Searching for tutorials and manual for Phaser 3 - Making graphics and art for the game	- Made first maps picture - Made graphics for each tank - Compiled tutorials for Phaser development **Hours: 4**
Oct 21	- Started making the game proper - Learning phaser3 development	Game map functionality and path finding for the butterflies

		• Made tank placement functionality • First tank functionality made. Tank that shoots at the enemies **Hours: 11**
Oct 22	• Continuing to make the game • Thinking of ways to expand the games features to fit the scope given in the project • Making more graphics	• Made graphics for the tank attacks: Bullet, Mine and a trench. • Made Mine tank functionality • added functionality to bullets and mines • ISSUE: collision between enemies and the attacks in non-functional **Hours: 5**
Oct 23	• Adding more quality of life features • designed the second map • Writing the report	• Fixed issue with collision. • Added the digger tank • report was written • second map added **Hours: 12**
Oct 25	• Final debugging • Sound adding	• Fixed the rest of the standing issues with the game • added music and a single sound effect for the big tank **Hours: 8**

Issues and future development

I ran into many issues while developing the game. There were multiple moments where I needed to do functionalities based on vectors and points, which was difficult as I don't really have the expertise in the subject. But thankfully I found a way around it. Phaser3 has issues with the physics of objects as trying to get an overlap between enemies and the tank attacks was difficult. Also learning a whole js framework in essentially under a week and making 2 games with it while trying to learn it was frustrating leaving the game and the code sub-bar. There were many Phaser3 features which would have made the code easier to read and the functionality of it better, but I didn't have the time to learn them. For example a scene transition was a thing I wanted to add for use in menu-to-game transitions, but had to make a ad-hoc alternative due to lack of time. I would also want to add more animations to the game. Did make the graphics for these animations but again due to lack of time, they were not implemented. Other future development things:

- **randomly generated maps.** Since the code for making a path is essentially dynamic this would only require building tilesets with pathing functionality and making a world generator
- **Upgrades:** Giving the tanks the possibility of upgrades
- **Better UI**. Making the UI a bit more responsive and adding better information widgets so player won't get confused.
- **Enemy variety:** Making other types of enemies would not take much more and having enemies that are like bosses would make the gameplay more interesting. Giving the enemies resistance to different types of damage would also be a good twist into the gameplay loop
- **Sound effects and animations:** I would add sounds to all of the event in the game and animation to all of the tanks
- **Code improvement:** The currently is a bit of a mess and I would add classes to make it more clear on what does what

Conclusion

Honestly, I now wished that I had picked one of the other project options. I would have had more time to do them, as I kind of had to wait for the last assignment to start making the game. But I did find this to be rewarding and recalled many of the FGJ weekends where it was a mad scramble to make something presentable in a short time. While I did use a almost 40 hours on the project, which is more then the time allotted to this project In the course description, I still felt the game was lacking in the code department, and while I managed to get a good amount of features to the game there still could have been more

Personally, while the effort I put in this project was vast, I don't think the score I deserve for it matches it by any metric. I would be more than happy to break the 20 point(out of 30) line, anything more would just be extra since all my other parts of the course have gone quite well.

Sources

http://photonstorm.github.io/phaser3-docs/ - used for the manual pages

Phaser - Examples - Phaser 3 Examples – used to find code snippets that explain functionalities of the Phaser framework

collision detection - Test if two lines intersect - JavaScript function - Stack Overflow – for a line of code that gives a point where 2 lines cross each other. The first answer.

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