AQUAMODS

Team C3
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USE CASE

A video game with a unique controller which gives users the experience of playing an arcade game with friends while being cheap and portable.

ECE Areas: Software, Circuits, Hardware

THE PRODUCT

THE GAME

2-player co-op game to pilot a submarine

THE CONTROLLER

2 controllers, 6 different control modules

Trade, disassemble, and reassemble control modules to pilot the submarine

Requirements

Portability: light enough to easily set up and carry around

- The total weight should be < 500 g
- The Nintendo Switch weighs 422 g

Cost: more affordable than an arcade cabinet

- Cost of parts required to build controllers should be < $150
- Arcade machines on the market cost around $500-$600

Ease of module switching: the act of switching modules should be natural, so as to not distract players while playing the game

- < 3 s to remove a module and replace it with another

Requirements

Controller latency: game is reasonably responsive to controller input

- < 20 ms delay from module insertion in controller to detection in software
- Xbox One controller has 5.54 ms latency
- The industry standard for gaming controller latency is < 15 ms for professional gaming

Module durability: modules are durable with repeated use

- Each module should function well past 30 games of nominal use

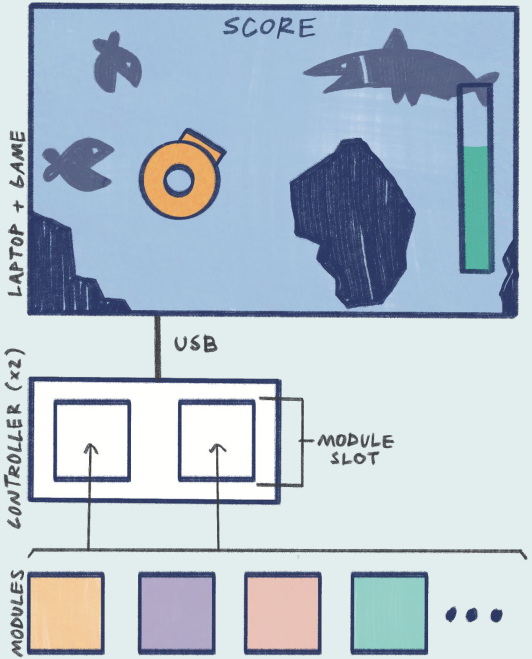
Enjoyment: game is fun

- > 85% player satisfaction
- Overcooked has 93% satisfaction, Lovers In a Dangerous Spacetime has 94% satisfaction

Technical Challenges

- **Module Ease of Use**
  - For players to enjoy the game, it is important that the hardware works seamlessly
- **Detection of Modules and Inputs from Controller**
  - Our custom designed modules need to be detected by the game quick enough
  - There should be no noticeable delay between user responses and actions in the game
- **Enjoyability of the game**
  - The game and custom controller interface needs to be fun for this product to be a viable alternative as a portable arcade game

SOLUTION APPROACH

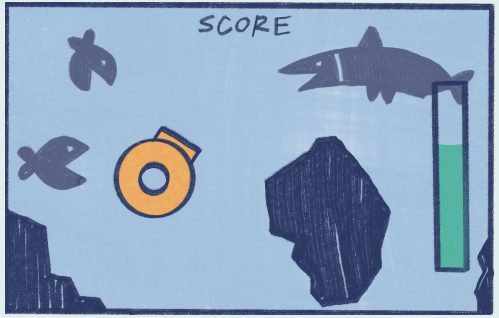


Game: built using Unity

Control panels: panels will communicate with laptop using an Arduino Leonardo, which has built-in USB communication.

Modules: modules will have 3D printed, unique designs that will house passive peripherals such as buttons and potentiometers

SOLUTION APPROACH



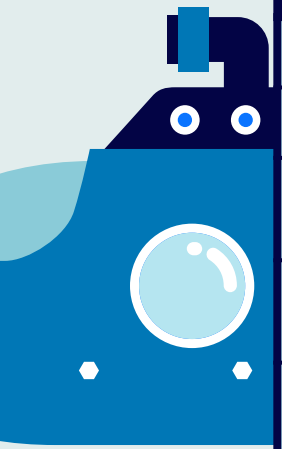
Gameplay details:

- 2 players work together to pilot a submarine descending through randomly generated terrain while being attacked by fish
- Manage the submarines battery (health) while maximizing score (depth traveled)
- 1 player controls a net gun, the other controls a harpoon

Module details:

steering: turn a wheel **/ speed:** adjust slider **/ aim gun:** turn dial **fire gun:** press button **/ charge battery:** hold button **/ shield:** turn dial to aim

TESTING, VERIFICATION, METRICS



REQUIREMENT	METRIC	METHOD
Total Weight	< 500g	Electronic scale
Cost	< $150	Track purchases
Latency	< 20ms	Measure frame delay with high speed camera
Ease of Module Swapping	< 3s each to remove and then add module	Measure average time to swap while playtesting
Module Durability	> 30 games	Check status of modules after playing a game
Fun	> 85% positive survey results	Visit playtest nights at Hunt Library to gather survey feedback

TASKS

CATEGORY	TASK	PEOPLE
Control Panels	CAD and assembly of case	Alan
	Arduino code	John
Modules	CAD and assembly of modules	Alan
	Circuit designs	Angela, John
	Connection to Arduino	Alan, John
Game	Game Design	Alan, Angela, John
	Sound, Art, Music	Alan, Angela, John
	Game Programming	Angela, John
	Controller Integration	Angela

SCHEDULE

Minimum Viable Product

- Our minimum viable product is a functional game with at least 1 level
- We also will have functioning controllers and modules
- All the interfacing to connect the hardware and software will be complete