

Battleship Table Display

ECE 445 Spring 2017

Proposal

Group #80

TA: John Capozzo

Date: 2/8/2017

Jonathan Rakushin-Weinstein

Elizabeth Roels

Colin Lu

1. Introduction	3
Objective	3
Background	3
High-level Requirements	4
2. Design	4
Block Diagram & Physical Design	4
Functional Overview	5
Block Level Requirement	5
Risk Analysis	6
3. Ethics and Safety	6
4. References	7

1. Introduction

Objective

Originating in the 1930s as a rudimentary pen-and-pencil game[1], the game Battleship has grown into what is known as one of the most popular and prolific board games the general public enjoys. It has spawned countless spin-offs, including video games, movies, and electronic reimaginations. However, throughout all these various forms, there is a main issue Battleship failed to address: the idea of portability. The current standard design of Battleship includes two large plastic boards, 84 white “miss” pegs, 42 “hit” pegs, and five ship pieces[2]. As a result, Battleship is a hassle to take out, set up, and play. Furthermore, many pieces get everywhere, leading to a mess where the pieces are prone to get lost. The tedium of taking Battleship off the shelves, setting up the game board, and marking coordinates with pegs each turn has made it near impossible to play on the go, an important aspect of a game the public values greatly in an era where mobile apps and handheld games are an arm’s reach away.

Our goal for this project is to bring back the fun of Battleship through a fun new medium: a portable wireless display. In order to do so, we will create a battery operated digital display, complete with visual and audio elements that will be simultaneously controlled by a microprocessor. We will implement a chip into each device as well so they can wirelessly interface with each other, removing the need for wires or any other interconnection. We hope that with the completion of this project, we could reignite the joy of Battleship in people of all ages while minimizing the hassle its setup has become associated with.

Background

It can be difficult to keep people, especially children, occupied on the go. It is why handheld and mobile games are so widespread and prevalent -- the convenience of having a portable distraction to entertain themselves while traveling or waiting around has led to the public spending increasing amounts of their income on mobile apps or video games[3]. However, both of these forms of entertainment have certain drawbacks associated with them. For mobile games, many require internet access or a mobile carrier, two things people may not have or want access to. Furthermore there are relatively few mobile apps which support multiplayer functionality. On the other hand, video games do not from these same problems, but instead from having a complicated set of controls. The user interface for handheld video games frequently include a wide variety of controls. Although this leads to varied gameplay, it can be difficult for the public, especially younger children, to learn. Furthermore, small features like buttons or styli are prone to get damaged or lost.

In order to address these issues in our project, we plan on implementing a sleek, simple user interface that is easy to understand yet engaging. We will also include multiplayer support because we believe that including a social aspect to a game is key to making it enjoyable and memorable. We hope that our device will be able to be enjoyed anywhere, at any time, for audiences of all ages.

High-level Requirements

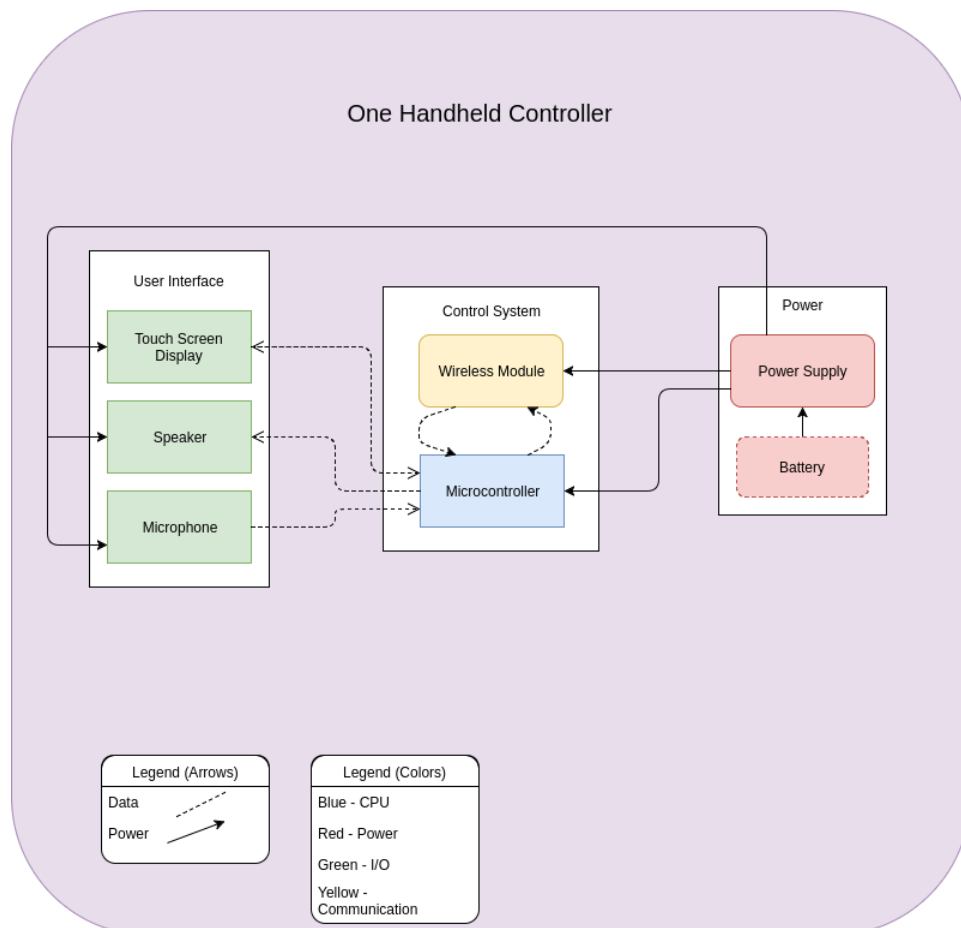
The three main goals we aim to meet for this project are:

1. The game is aesthetically pleasing
 - a. The included audio elements are interesting and meaningful.
 - b. The included visual elements are similarly interesting and meaningful.
 - c. Good simple interface design.
2. The game is light and portable
 - a. Devices can interact wirelessly through implementation of chips.
 - b. The physical design minimizes extra bulk, allowing the product to be carried easily in a travel bag.
 - c. No additional pieces needed, everything is included within the display.
3. The game engages audiences of all ages
 - a. Adding a handicap for younger children.
 - b. Adding a CPU for an audience who cannot play against others

2. Design

Block Diagram & Physical Design

Block Diagram:



Functional Overview

The main component of the design will be a centered microcontroller. This microcontroller will handle all of the inputs and outputs made by both players throughout the game. Each player will need their own handheld device, and the two devices will communicate wirelessly. The device will be powered by a lithium ion battery, which should have a battery life of at least 8 hours when playing the game. The microcontroller will also be connected to, and powering a microphone, speaker, touch screen, wireless module and LED display.

The microphone will be used for the game's voice commands. Since the old method of playing Battleship involves saying your move to the other player, we'd like to keep this in place but update it with voice recognition. The player will state his/her command and the game will get confirmation, and when approved, will "fire" at the opposing player's board, detecting a hit or not. The connected speaker will play sounds associated with the firing, including hit, miss and sunk noises.

The touch screen and LED display will be the game board in the player's eyes. The player will place their pieces on the board using the touch screen at the beginning of the game, and from then on the board will show the opposing player's shots taken.

Block Level Requirement

Requirements	Verifications
<u>Battery</u> <ol style="list-style-type: none"> Output voltage between $3.5 < V < 3.9$ volts Battery must power the game for at least 8 hours Game should be playable while charging the battery 	<u>Battery</u> <ol style="list-style-type: none"> Test battery voltage with multimeter to verify it meets requirements Test playing the game for at least 8 hours and verify the battery lasts throughout Verify game can be played while charging the battery
<u>Microcontroller</u> <ol style="list-style-type: none"> Microcontroller must be powered by the battery Microcontroller can power all connected devices 	<u>Microcontroller</u> <ol style="list-style-type: none"> Verify the microcontroller works with the battery Verify connected devices receive proper power
<u>Touch Screen Display</u> <ol style="list-style-type: none"> Touch screen is accurate to within 1 cm Touch screen recognizes someone is touching the screen 95% of the time 	<u>Touch Screen Display</u> <ol style="list-style-type: none"> Test touch screen accuracy to verify it's in range Test the touch screen 100 times, only 5 of them should not register input
<u>Voice Recognition/Microphone</u> <ol style="list-style-type: none"> The microphone and voice recognition software must register proper input 80% of the time The voice recognition should only activate when a command has been spoken 	<u>Voice Recognition/Microphone</u> <ol style="list-style-type: none"> Verify that the voice recognition software registers the proper input 80% of the time Test varying background noises at different volumes, the voice recognition should only pick up if there's a command spoken
<u>Wireless Module</u> <ol style="list-style-type: none"> The wireless module should work within 20 ft of the other device 	<u>Wireless Module</u> <ol style="list-style-type: none"> Verify the range of the module by testing the device at 20 ft

Risk Analysis

The included battery will need to be reliable, rechargeable and output a usable voltage for the rest of the circuit. Picking a battery will be a tough choice, and picking the wrong one can be a safety issue. The battery also needs to last for at least most of the day for long term playability. A small battery may make the product not as appealing for on the go players.

An extensive part will be the voice commands. In the original game, you must tell your opponent your move so they can tell if it's a hit or miss. To keep this component in the game, we will be adding voice recognition. It will be important for the voice recognition to accurately listen in on the players moves, and not frequently get the move wrong. There will also be an accept button added in case the voice recognition mishears the player, however we want the voice recognition software to be accurate most of the time.

The final important piece is the touch screen. The player will place their pieces on the board using the touch screen, so although it's not a frequent component, it is important that it's hassle free. Therefore, the touchscreen will need to be accurate and work correctly without much effort.

3. Ethics and Safety

One of the issues we could have is battery size. We are thinking about making the project portable, so we would probably need a big battery to do the job. One safety issue we may have is coming down to the decision of Lithium batteries. Before going forward and using the Lithium batteries, we will ask the TA assigned to us if he agrees and allows for us to use. For testing, we will make sure to use the bench if we can avoid the battery. We will place the batteries in the battery bag and ammo box before storing in the yellow locker. In the case we did look into using Lithium batteries, we did look at certain safety conditions and procedures in the case of a fire or burning[4].

When making changes to our board, the team will be sure to change the circuit when the power is off so no one will be electrocuted.

We will need to use soldering station. The team and I will make sure the station stay nice and clean. If there seems to be something wrong with the station's equipment, we will notify the TA for help.

For any case we do know where and how to use the Fire Aid Stations, Spill Kit and Fire Box if there is a chance of endangering health and safety.

What was listed so far does follow the IEEE Code of Ethics(1) and (9)[5].

Our project may evolve to obtain complexity, but we will go to our TA to be certified to make changes as well as getting advice and/or approval on materials to help make the changes necessary. This statement does show our respect and understanding of the IEEE Code of Ethics (3),(5) and (6)[5].

The team will be sure to be honest about the safety of the product for public use. When it comes down to the public, we will follow the IEEE Code of Ethics (1),(3),(7) and (8)[5].

If the occasion related to the IEEE Code of Ethics (2) and (4,) we will abide the code[5].

4. References

[1] "History of the Game." Battleship Game Page. Wordpress, n.d. Web. 08 Feb. 2017.

[2] "Battleship Rules." (1990): 1-3. Battleship. Milton Bradley Inc. Web. 7 Feb. 2017.
<<http://www.hasbro.com/common/instruct/Battleship.PDF>>.

[3] Zinevych, Sasha. "The Overview of Mobile Apps Market: Why You Should Enter Now." *Business 2 Community*. B2C, 1 Sept. 2014. Web. 08 Feb. 2017.
<<http://www.business2community.com/mobile-apps/overview-mobile-apps-market-enter-now-0994728#GPM1MphAHSbvVjpA.97>>.

[4] Buchmann, Isidor. "BU-304a: Safety Concerns with Li-ion." *Safety Concerns with Li-ion Batteries – Battery University*. Cadex Electronics Inc, 27 Sept. 2016. Web. 08 Feb. 2017.

[5] "IEEE IEEE Code of Ethics." *IEEE - IEEE Code of Ethics*. IEEE, 2017. Web. 09 Feb. 2017.