

EE 445L – Lab 7 (Design Lab)  
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## 1. Overview

### 1.1. Objectives

Our goal is to design a two player, twin-stick shooter called WIFI DOGFIGHT. Our goal is to make the game have unnoticeable lag, implement peer-to-peer WIFI, have a few modes of gameplay (e.g. dogfight, death match, etc.), have sound effects and music, nice animations, and add a missile that will be controlled by tilting the controller (whose motion will be detected by the accelerometer). We will make decisions based on the issues of power, timing, data transfer/processing, clock speed, and time to write code.

### 1.2. Roles and Responsibilities

- **Justin**

- Placed the components on the PCB and started initial traces
- Initialization code (Thumbsticks, ESP, Accelerometer)
- Testing software
- ESP Server/Client Code
  - Handshake protocol
- Game Logic
  - Game clock (time steps)
  - Sound effects/music
- Enclosure/Parts layout

- **Trevor**

- Initialization code (DAC/Speaker/Amp, Buttons, LCB)
- ESP Server/Client Code
  - Data packaging
- Game Logic
  - Graphics (ships, asteroids, lasers, missiles, etc.)
  - Collision detection
- Enclosure/Parts layout

### 1.3. Interactions with Existing Systems

This project consists of two identical embedded systems communicating indirectly with each other through UART. Players will also interact with our game through the accelerometer, joysticks, buttons, and sound.

## 2. Function Description

### 2.1. Functionality

The system will be a real-time multiplayer video game. Two embedded systems will talk directly to each other through the ESP8266. The handheld user interfaces will be wireless and communicate through Wi-Fi. Music and sound effects play from both systems.

### 2.2. Performance

There are five defined project milestones. In addition to testing the outputs of our components (such as the frequency of the crystal oscillator, the voltage output and input to the regulator, etc.), each of the following will be need to be tested: 1) Each embedded system will be able to talk to the other

microcontroller (both transmit and receive). 2) The multiplayer game design will be competitive, engaging, and fun to play. The communication protocol will not cause noticeable delay between user input and visible action. 3) The system will be tested to see if dropped/out of order packets considerably affects the game's performance. If so, we will redesign the communication protocol or information processing such that each system and the server will be capable of recovering from such corrupted packets. 4) Each controller will produce sound effects. 5) The music played will be multi-melodic and will not cause significant slowdown to the foreground process.

### 2.3. Usability

The user interface consists of two analog sticks, an ESP8266 WIFI module, an accelerometer, three/four game interface buttons, an ST7735 LCD display, 32 ohm speaker, a reset button, and power switch per handheld system.

## 3. **Deliverables**

### 3.1. Reports

The report for Lab 7 will be written and submitted.

### 3.2. Outcomes:

We will submit a circuit diagram and PCB layout of our system. We will provide an overview of our software design, current consumption, and cost of the system. We will demonstrate a hardware prototype of the system to Dylan. Additionally, we will include test code and analysis of the system along with discussion as specified in the Lab document.