Team 16: Envision Gforce
Thomas Harris, Jacob Metoxen,
Eric Schulte, Seth Starr
12/06/2019

Homework 7: Test plan

1. **Hardware systems tests**

Objective: Determine all physical subsystems within design are functioning correctly (in a cumulative fashion).

Resources required:

- System components:
    - LiPo battery and charger
    - MIC5205 3.3V regulator
    - ATMega328P
    - ADXL 345
    - Neopixel LED ring
- Fixed-current power supply
- Multimeter
- Leads and probes

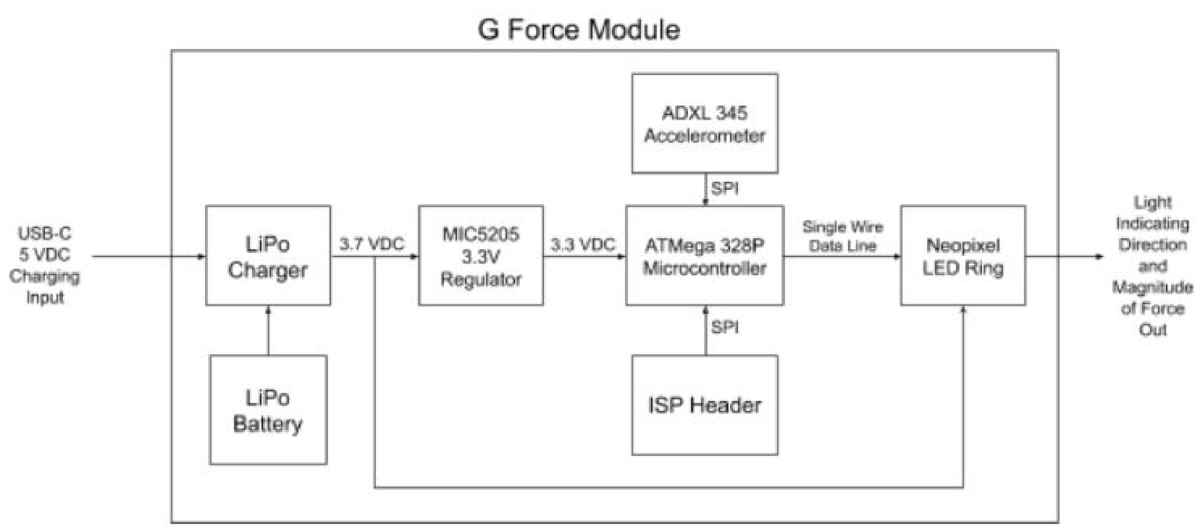

Figure 2: Next-level block diagram

Subsystems to be tested (cumulatively, and in this order):

a) Power (LiPo battery and charger)
b) Voltage regulator (MIC5205 3.3V regulator)
c) Microcontroller (ATMega328P)
d) Accelerometer (ADXL 345)

e) LED display (Neopixel LED ring)

2. **Software module tests**

Objective: Determine magnitude- and direction-determining software modules are functioning correctly.

Resources required:

- Computer
- Arduino IDE
- Arduino test board
- ADXL 345 breakout board
- Neopixel LED ring
- Copy of program under test

Magnitude module test

We need to ensure the correct color is applied to the LEDs based on the magnitude of an acceleration vector (calculated from x, y output data from accelerometer). To do this, we will feed the magnitude module a series of test inputs, and observe which color is outputted onto the LEDs. This can be done by viewing the physical LED change colors, or using the serial.print function to print the LED color. (Both types of this test were conducted to ensure functionality).

Magnitude (in Gs)	Value	Desired LED color
M < 0.39	M < 100	Green
0.39 <= M < 0.507	100 <= M < 130	Green-yellow
0.507 <= M < 0.624	130 <= M < 160	Yellow
0.624 <= M < 0.741	160 <= M < 190	Yellow-orange
0.741 <= M < 0.858	190 <= M < 220	Orange
M > 0.858	M >= 220	Red

Table 1: Ranges of test inputs, M, to test magnitude module.

Direction module test

Similarly, we need to ensure the correct LED (one of twelve) is selected based on the direction of the acceleration vector. Each LED covers 30° of angular space. Angular direction is determined in the direction module by calculating the inverse tangent of x, y output data pairs from the accelerometer. Based on the calculated angular direction, one of the twelve LEDs around the ring will illuminate. To test this, we will feed the direction module a series of test inputs in the form of an angular direction (in radians), then print which LED is to be illuminated using the serial.print function.

Angle		**LED Number**
Degrees	Radians	
A < 30	0 <= A < 0.5236	0
30 <= A < 60	0.5236 <= A < 1.047	1
60 <= A < 90	1.047 <= A < 1.571	2
90 <= A < 120	1.571 <= A < 2.094	3
120 <= A < 150	2.094 <= A < 2.618	4
150 <= A < 180	2.618 <= A < 3.142	5
180 <= A < 210	-3.142 <= A < -2.618	6
210 <= A < 240	-2.618 <= A < -2.094	7
240 <= A < 270	-2.094 <= A < -1.571	8
270 <= A < 300	-1.571 <= A < -1.047	9
300 <= A < 330	-1.047 <= A < -0.5236	10
330 <= A < 360	-0.5236 <= A < 0	11

Table 2: Ranges of test inputs, A, to test direction module. Arduino’s default angular measurement is radians, so we used radians for the test inputs. But both measurements are included here for readability.