XO-Balance

Introduction

Figure 1 XO-Balance Boards.

XO-Balance boards are designed to estimate a user's center of gravity in real-time based on the pressure distribution of their feet. Two boards communicate with the XO-Balance app, which was designed by XO-NANO, to show both the pressure distribution and the center of gravity (blue dot in the Graphical User Interface (GUI). The GUI shows the pressure reading of each XO-Balance board's 12 pressure sensors.

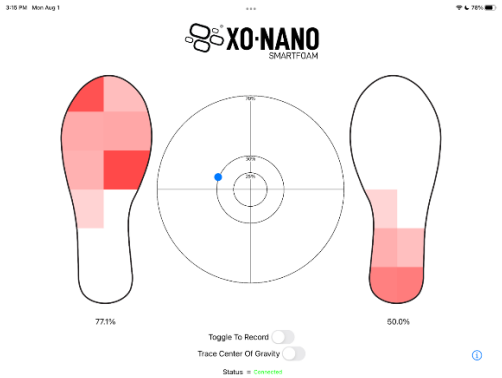

Figure 2 Example of XO-Balance GUI with a random weight distribution shown in the intensity of red. The blue dot represents the center of gravity. The percentage number below each foot outline is the battery level of the corresponding XO-Balance board.

This document walks through the setup required to run XO-Balance boards and includes various hardware and software specifications of the XO-Balance boards.

Instructions

1. Download the XO-Balance app ( ) via the Test Flight app ( )onto an iOS device with Bluetooth functionality: https://testflight.apple.com/join/Eqkdescj.
   - Note: follow this link to be able to download Test Flight and then click the link again to download the XO-Balance app.
   - Note: the graphics are designed for iPads but the app will function with iPhones and other iOS devices.
2. Open the XO-Balance app.
3. Place the XO-Balance boards flatly on the floor. The two boards are labeled "Right" and "Left" and correspond to the right and left foot, respectively.
4. Turn both boards to the "ON" position.
5. The app should show a green "Connected" message beneath each foot when connected.
6. Apply pressure as desired to explore XO-Balance board performance. Troubleshooting the app instructions are below the final step of the instructions.
7. Charge the XO-Balance board LiPo batteries by turning their power switch to the "ON" position and then plugging the board into a 5V power source via the XO-Balance board's micro-USB port.

Troubleshoot App

If the app does not connect correctly, try leaving the right foot on, turning off the left foot, restarting the app, and then turning on the left foot. Retry this again if necessary. The app is connected correctly when the blue center of gravity dot follows the user's intuitive sense of their center of gravity.

Battery Charging Notes

The current design does not have a long battery life (1-2hours). Future updates will be made to the hardware to fix this issue.

5V power sources include computers and 5V wall charging sockets. The batteries must be charged when the app reports 0% battery life (3.9V), or the pressure readings may not be accurate. The battery is totally charged when the yellow LED inside the case turns off completely while the 5V power supply is plugged into the USB port and the power switch on the XO-Balance board is switched on. If the switch is left in the "OFF" position when the USB cord is plugged in, the microcontroller's yellow LED will continually flash to indicate that the battery is disconnected and therefore not charging. The XO-Balance board can function properly while charging the battery as long as the 5V power supply can supply enough current (1A is recommended for the most reliable results). Note that if both XO-Balance boards are to be run off of 5V USB power, the USB power overrides the power switch, and the XO-Balance board begins working immediately when the 5V USB is plugged in regardless of the switch's position.

Warnings

- On the bottom of the boards there are screw heads that could scratch the floor.
- There is no static-discharge protection for this prototype, so discharge the user before use to avoid damaging the electronics.
- Our product uses a LiPo battery which—if damaged—can start a fire, explode, or emit toxic fumes.

Technical Specifications

Table 1 Technical specifications for a single XO-Balance board.

Attribute	Value	Units
Board Dimensions	11 x 6.25	in
Individual Pressure Pad Dimensions	2.75 x 1.75	in
Current draw	25-30	mA
Battery Port Voltage	3.9-4.1	V
USB Port Voltage	5	V
Maximum Pressure	10	psi
Sampling Frequency of a Single Sensor	17	kHz
BLE transmission rate	6.4	Hz

Further Troubleshooting

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