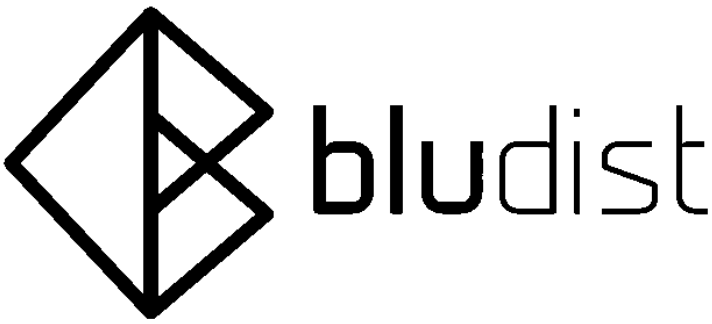

PRODUCT SPECIFICATIONS

DOCUMENTS

v1.0

dst-0

Contents

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Summary

This is a technical specifications document for the product *BluDist*. This document specifies the product from the perspective of the user, with a technical and engineering context. It "communicates the requirements of the customer to the technical community who will specify and build the system(1)".

Introduction

BluDist is a combined product of an analog distortion pedal and a smartphone app to allow remote controllability of pedal settings via a smartphone. The user will be able to set the settings of the distortion pedal (Volume-Tone-Gain) remotely using their smartphones, save their favorite settings, and quickly switch between them.

Product Description

BluDist is in essence an analog distortion pedal which can digitally be controlled by a smartphone via Bluetooth. With BluDist, users will have the ability to change the parameters of the distortion pedal from the smartphone app, save their favorite options and quickly switch between them.

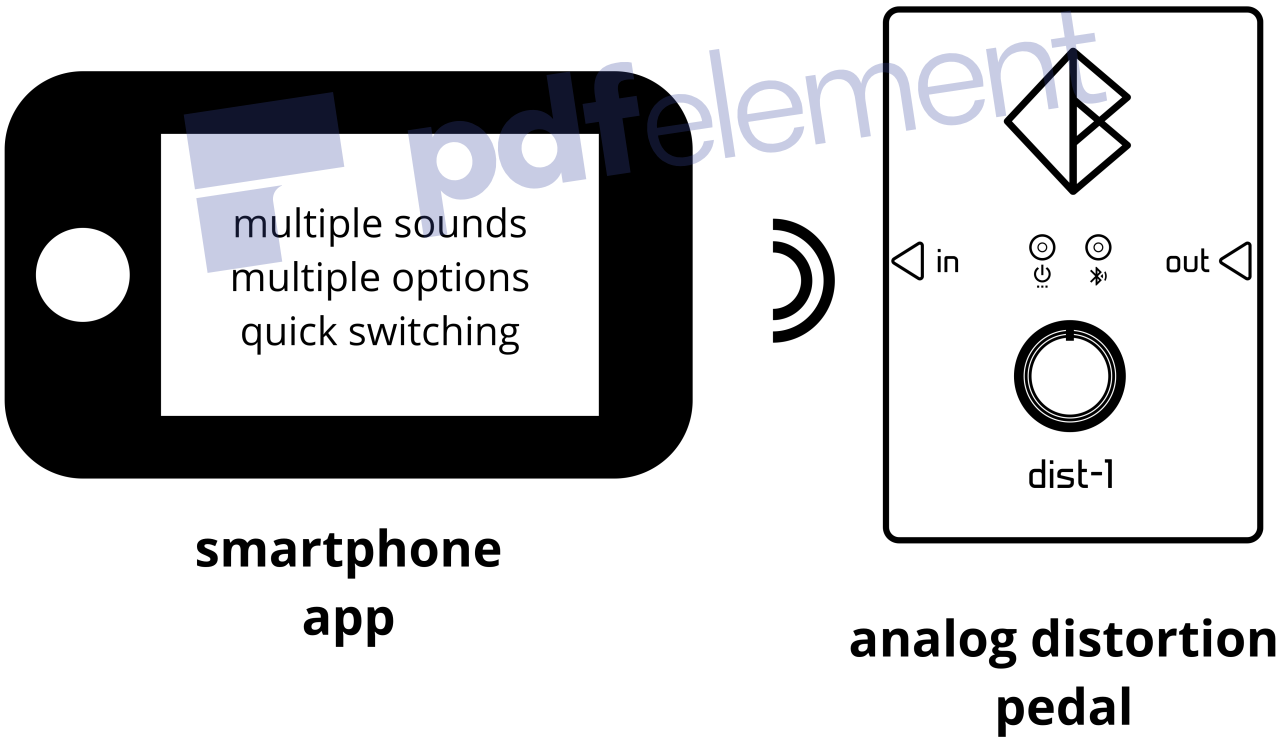

Figure 1: The schematic describing the product parts.

Product Functions

Analog Distortion Pedal

1.1 Sound Controls

The pedal must have three separate controls for *Volume*, *Tone* and *Gain*. *Volume* adjusts the amplitude of the final pedal output, *Tone* adjusts the bass/treble balance and *Gain* adjusts the amount of distortion applied to the input sound.

1.2 Maximum Latency

When one of the controls is changed via the app, the pedal must respond to this change in less than 500ms.

1.3 FX-BYPASS Switch

The pedal must have a 3PDT(Three-Pole-Double-Throw) foot-switch which must have "**FX**" and "**BYPASS**" modes to route the signal through the distortion circuit(**FX**) or bypass it(**BYPASS**).

1.4 FX-BYPASS LED

The pedal must have a status LED to indicate whether the unit is in **FX** mode or **BYPASS** mode: the LED must be ON when in **FX** mode and OFF when in **BYPASS** mode.

1.5 Bluetooth LED

The pedal must have a Bluetooth status LED to indicate whether the unit is in pairing mode, or already paired. The led will blink when the device is in pairing mode with a period of 1 seconds, and it will stay ON when the device is successfully paired to the smartphone.

1.6 Anti Slip

The pedal must have anti-slip material on the bottom so that it doesn't slip when the user presses on the foot-switch.

An example schematic of the distortion pedal unit for these requirements is below.

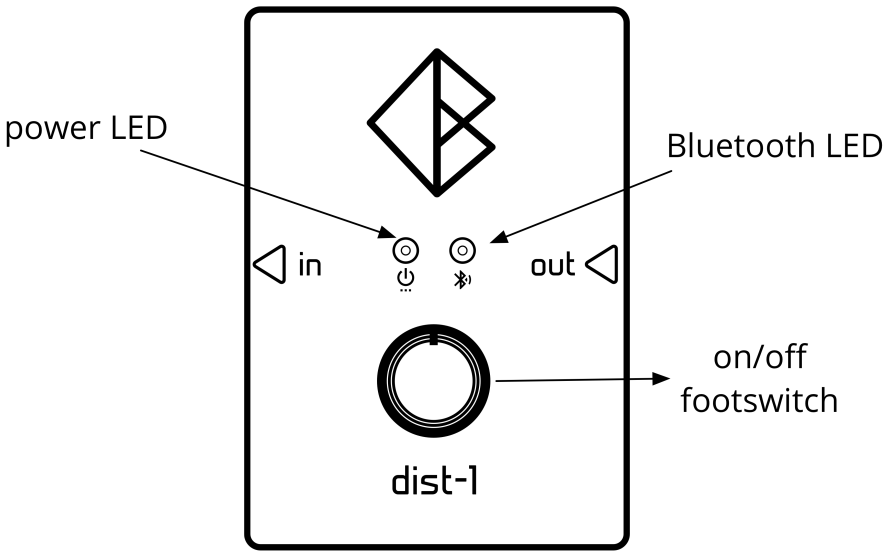

Figure 2: Schematic for distortion pedal functions.

Smartphone App

2.1 User Interaction

The user must be able to alter the *Sound Controls* using the app, save their favorite controls and quickly switch between them. These will be explained in the *User Interface Specifications* section.

Physical Characteristics

3.1 Dimensions

The size of the pedal must be less than 150x100x50mm in all dimensions.

3.2 Weight

The device must weigh less than 600 grams (batteries excluded).

3.3 Ruggedness

The device must be able to endure the harsh settings of a live performance environment, and also being constantly pushed with a foot. Therefore, it must be made of sturdy materials like hard plastic or aluminum.

Power Supply Specifications

4.1 Power Supply

The pedal will be powered with a 9V battery inside, as well as a 9V barrel jack DC adapter.

4.2 Power Limitations

The pedal must consume less than 50mA at this voltage, meaning less than 0.45W of power.

4.3 Battery Specifications

The pedal must work with a 9V rectangular battery (also known as PP3).

Hardware/Software Interface Specifications

5.1 Hardware Interface Specifications

The pedal must connect to the smartphone using Bluetooth Specification V4.0 BLE. Also, the pedal must have audio input&output ports compatible with standard 6.35mm instrument cable jacks.

5.2 Software Interface Specifications

The software must communicate with the pedal the values of the 3 parameters (Volume-Tone-Gain), each with a value between 0-100 included. This format must be human-readable for ease of code debugging and maintenance, for example in the form:

`VXXXTXXXGXXX-`

where `XXX` is a 3-digit number from `000` to `100`, and `-` is the delimiter.

User Interface Specifications

6.2 User Interface

The UI must have two "modes": **EDIT** and **LIVE**. In **EDIT** mode the user must be able to change each of the 3 parameters (Volume-Tone-Gain) using knobs. These parameters will be instantly sent to the hardware pedal so that the user can hear the effect of the parameter to the sound. Also, the user must be able to save and organize the *sounds* (the values of 3 parameters) they have created, in a hierarchy of *songs* (a set of different *sounds*) and *setlists* (a set of different songs).

In **LIVE** mode the user will be able to quickly switch between different *sounds* as well as different *songs*.

Also, as the first screen of the application, the user will be prompted to pair with their distortion pedal via Bluetooth (if not already paired) by scanning the devices and choosing the desired one.

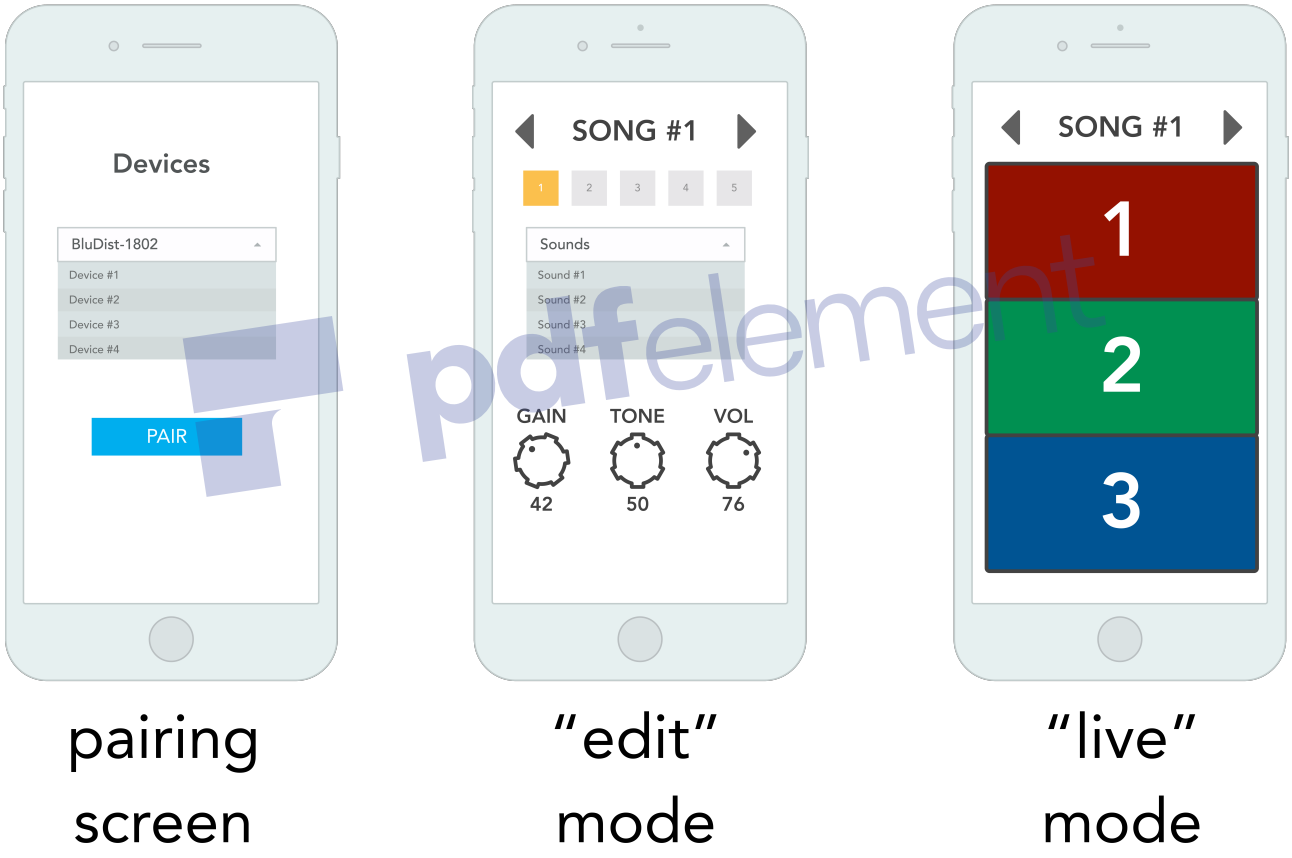

Figure 3: The UI screens for the application.

Operating Conditions

Environmental Operating Conditions

7.1 Temperature

The device must continue operation on the temperature range $-10°, 50°$.

7.2 Humidity

The device must continue operation on a maximum relative humidity level of 70%.

Technical Operating Conditions

8.1 Bluetooth Connectivity

The device relies on a smartphone with Bluetooth connectivity to work.

Conclusion

Product Requirements Document was an initial solidification of the product idea. In that document the product was described in less detail and the main parts of the designed product were identified including the hardware and software approaches. Then the components of the product were explained. This detail, as well as the targeted users are not mentioned in the technical specifications. In the technical aspect not many changes were made between the "Product Requirements" and "Product Technical Specifications" but many of the parameters and details for the product are decided. In "Product Requirements", the number of controls including knobs and switches and the number of LEDs for informing was given. However, in this document the switches are specified and the controls are named. In addition, an anti slip bottom for the pedal is added. The initial dimensions of the pedal is changed from 18x12x18 cm to 15x10x15 cm and the weight& material of the pedal are specified. There were no changes done in terms of software aspect of the product but both software and hardware interfaces are specified. The designed app is discussed in further details. The initial requirement of 3 x 1.5 V batteries are changed to a single 9V battery to power the pedal. Also, the power limitations were calculated and added. In addition, the operating conditions of the product are discussed in detail in terms of temperature and humidity. The main issues with the transition from "Product Requirements" to "Product Technical Specifications" are due to the ambiguities of the product due to not having a prototype. This creates problems with physical specifications since the values are not well known and mostly close approximations. Another difficulty arose from the lack of information in the "Product Requirements" document. Since this document was before the main feedbacks for the product and before working on important aspects hardware laboratory work, it didn't account for the real life problems thus it didn't set a great bottom line for this document.

There were different tests designed for the product including the delay of the music after the applied effect, the change of the sound after the applied effect, lifetime of the battery such that how many hours the pedal go on one battery and the efficiency of the battery. These tests are essentially the experiments of the specifications and their performance. The results of these test would make up the test document. Since the tests examine the specifications it is not really possible to write a complete test document based of these technical specifications. Thus lacking a prototype not only hardens the process of writing technical specifications using product requirements but also obstructs the writing of a test document.

References

[1]: "IEEE Guide for Developing System Requirements Specifications," in *IEEE Std 1233, 1998 Edition* , vol., no., pp.1-36, 29 Dec. 1998