

Action Plan: Upgrades for the FSAE Signal Analysis Tool

ITU Racing - Electronics Subteam

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Overview

This document outlines the immediate updates and tasks required to prepare the Signal Analysis Tool for track testing. The focus is on fixing visualization bugs in the current build and establishing the roadmap for V2.0 (Migration to Dash).

1 Immediate Hotfix: Graph Visualization

Priority: Critical (Before next track test)

- **Issue:** The Bode plots and signal previews are overlapping in the browser view, rendering the axis labels unreadable.
- **Action:** Update `interactive_plotter.py` to fix layout constraints.
- **Specific Changes:**
 - Increase `vertical_spacing` in subplots from default 0.02 to **0.15**.
 - Hardcode layout height to 900px to prevent compression.
 - Enable `autosize=True` for full-screen responsiveness.

2 UX Improvement: “Zero-Click” Setup

Priority: High

- **Issue:** Re-entering “Sampling Frequency” and “Calibration” on every restart wastes valuable track time.
- **Action:** Implement a `config.json` persistence system.
- **Features:**
 - Auto-load last used settings on startup.
 - Add a **Sensor Preset Dropdown** (e.g., “Öhlins Damper Pot”) to auto-populate calibration values (mV/mm).

3 Strategic Shift: Moving to Dash (V2.0)

Priority: Medium (Development Phase)

- **Issue:** The current “Open in Browser” workflow disconnects the UI from the data.
- **Action:** Begin migration from CustomTkinter to **Plotly Dash**.
- **Reasoning:** Dash is browser-native, allowing sliders and graphs to interact instantly in the same window without pop-ups.

4 Deployment: Standalone Executable

Priority: Low (Post-Fix)

- **Issue:** Installing Python and Git is a barrier for mechanical team members using borrowed laptops.
- **Action:** Bundle the application using PyInstaller.
- **Goal:** A single `.exe` file that requires no installation.

Appendix: Developer Implementation Notes

Use the following snippet to patch the `create_bode_plot` function in `processing/interactive_plotter.py`:

```
1 # processing/interactive_plotter.py
2
3 import plotly.graph_objects as go
4 from plotly.subplots import make_subplots
5
6 def create_bode_plot(freq, mag, phase, time, input_sig, output_sig):
7     # 1. FIX: Increase vertical spacing to prevent label overlap
8     fig = make_subplots(
9         rows=3, cols=1,
10         shared_xaxes=False,
11         vertical_spacing=0.15, # Changed from 0.02
12         subplot_titles=("Magnitude Response", "Phase Response", "Signal
13 Preview")
14     )
15
16     # ... [Add Traces Here] ...
17
18     # 2. FIX: Force height and autosize for Full Screen Experience
19     fig.update_layout(
20         template="plotly_dark",
21         autosize=True,
22         height=900, # Ensures graphs are tall enough to read
23         margin=dict(l=50, r=50, t=80, b=50),
24         title_text="RC Low-Pass Filter Design",
25         font=dict(
26             family="Roboto, monospace",
27             size=14,
28             color="#E0E0E0"
29         )
30     )
31
32     return fig
```

Listing 1: Fix for Subplot Overlap