Coloring Pipeline (Potrace Edition)

Overview

This project provides a high-performance pipeline for converting black-and-white PNG coloring pages into clean vector SVGs and print-ready PNG/PDF files.

Key Features:

- **New Tracing Engine:** Now uses **Potrace** directly instead of Inkscape's internal tracer. This results in faster processing, no "blank file" errors, and significantly cleaner geometry.
- **CAD/Fusion/Laser Ready:** Includes optimization to reduce node counts, making the resulting SVGs much easier to import into **Autodesk Fusion** sketches or **XTool Creative Space** for your S1 laser.
- **Plug-and-Play:** Automatically handles folder creation and file moving.

Folder Structure

The project expects the following folder structure (auto-created if missing):

```
<project folder>/
├── input_png/      # Source PNG images (auto-populated if images are next to the script)
├── cleaned_png/    # Temporary folder for thresholded black/white PNGs
├── svg/            # Traced vector output files (Optimized for CAD/Laser)
├── png/            # Exported PNGs for printing (High Res)
├── pdf/            # Exported PDFs for printing
├── process_coloring_pipeline.py  # Main processing script
├── run_pipeline.bat             # Windows wrapper
├── run_pipeline.sh              # macOS/Linux wrapper
└── README.md       # This file
```

> **Note:** Simply drop your source PNGs in the root folder next to the script; the pipeline will automatically move them into `input_png` and process them.

Usage

1. The Easy Way (One-Click Wrappers)

These scripts allow you to run the pipeline without opening a terminal manually. They also automatically detect and use a Python virtual environment (`venv`) if you have created one.

Windows:

1. Double-click `run_pipeline.bat` .
2. The console will open, run the processing, and stay open so you can read the logs.

macOS / Linux:

1. **First time setup:** You must tell the system the script is safe to execute. Open your Terminal, navigate to the folder, and run:

   ```
   chmod +x run_pipeline.sh
   ```

2. **Running:** Double-click `run_pipeline.sh` (or run `./run_pipeline.sh` from the terminal).

2. Using Python Directly (Manual)

Open your terminal/command prompt in the project folder:

```
python process_coloring_pipeline.py
```

(Note: On macOS/Linux, you may need to use `python3` instead of `python`)

- **Force Reprocessing:**

  ```
  python process_coloring_pipeline.py --overwrite
  ```

  Useful if you have changed the optimization settings and want to update existing files.

- **View Instructions:**

  ```
  python process_coloring_pipeline.py --?
  ```

Configuration & Tuning

You can open `process_coloring_pipeline.py` in VSCode to adjust these settings at the top of the file:

- `EXPORT_WIDTH_PX` : Resolution of the final PNG export (default: 3000).
- `THRESHOLD_PERCENT` : The cutoff for converting gray pixels to black or white (default: 60%).
- `--opttolerance` : (Found inside the `trace_svg` function). Default is `0.4` .
  - **Increase (e.g., 0.6)** for simpler curves and fewer points (better for Fusion sketches and faster processing in XTool).
  - **Decrease (e.g., 0.2)** for stricter adherence to the pixel data (better for artistic printing).

Dependencies & Installation

All tools must be installed and accessible via your system PATH.

1. Python 3.x

- **All OS:** Download from Python.org or use your package manager (e.g., `brew install python` on macOS).

2. ImageMagick (for cleaning)

- **Windows:** Download the **DLL version** from ImageMagick.org.
  - **IMPORTANT:** During installation, check the box **"Install legacy utilities (e.g. convert)"** and **"Add to PATH"**.
- **macOS:**

```
brew install imagemagick
```

- **Linux:**

```
sudo apt install imagemagick
```

3. Potrace (for vectorizing)

This is the new engine that handles the tracing.

- **Windows:**
  1. Download the **Windows (64-bit)** zip from SourceForge.
  2. Extract the zip. You will see `potrace.exe` .
  3. Move the extracted folder to a permanent location (e.g., `C:\Program Files\potrace`).
  4. Add that folder to your System **PATH** environment variable.
  5. Verify by opening a terminal and typing `potrace --version` .
- **macOS:**

```
brew install potrace
```

- **Linux:**

```
sudo apt install potrace
```

4. Inkscape (for exporting PNG/PDF)

- **Windows:** Download the MSI/EXE from Inkscape.org.
- **macOS:**

```
brew install --cask inkscape
```

- **Linux:**

```
sudo apt install inkscape
```

Happy coloring, scaling, and making!