Spectrum Analyzer Application User Guide

Introduction

Welcome to the Spectrum Analyzer Application user guide. This document covers all the necessary aspects to help you get started, use, and troubleshoot the application effectively. The Spectrum Analyzer Application is designed to analyze and process spectrum analyzer screens' video feeds to extract critical data like frequency and amplitude.

Overview

- **Waveform Detection:** Utilizes advanced image processing algorithms to detect and analyze waveforms in each video frame accurately. The tool can handle various video qualities and waveform types, ensuring broad applicability across spectrum analyzer models.
- **CSV Output:** Analysis results are neatly organized and exported to CSV files, providing a convenient format for further analysis, reporting, or archiving. The CSV files include detailed information, making them valuable for immediate interpretation and long-term studies.
- **Graphical User Interface (GUI):** The application features an intuitive and user-friendly GUI, making it accessible for technical and non-technical users. The GUI facilitates easy navigation, setting configuration, and control of the analysis process.
- **Image Processing with OpenCV:** Leveraging the power of OpenCV, a leading computer-vision library, the application offers high waveform detection and image analysis accuracy. This integration ensures the reliability and precision of the results.

The Spectrum Analyzer Application is an end-to-end solution for spectrum analysis, from video processing to data presentation. Its design caters to telecommunications, signal processing, and electronic engineering professionals, providing them with a vital tool for spectrum analysis.

Final Deliverable Documents

The project's essential documents include:

1. **Project Plan:** Download Project Plan
2. **Design Document:** Download Software Design Specification
3. **User Guide:** Link to User Guide PDF *(This Document)*
4. **Source Code:** View on GitHub

Getting Started

Prerequisites

Before you begin, ensure you have:

- Python 3.x
- Required Python packages as listed in **requirements.txt**:
    - numpy
    - opencv-python
    - scipy
    - tkinter

Installation

To install the application:

1. Clone or download the code repository.
2. Navigate to the project directory.
3. Install required packages:

$$pip\ install\ -r\ requirements.txt$$

4. Run the application:

$$python\ SpectrumAnalyzerGUI.py$$

Configuration

The **env_vars.py** file contains configurable settings like video folder path, color threshold values, analysis parameters, and keybindings. These can be modified directly in **env_vars.py** or through the Settings page in the GUI.

Usage

The main interface allows you to:

- Start analysis on video files in the configured folder.
- Open settings to customize parameters.
- View help documentation.
- Exit the application.

Clicking "Start Analysis" will begin processing videos and output CSV files to the **Completed** folder. The Settings page provides options to configure analysis span, center frequency, video folder path, color threshold values, keybindings, and erosion/dilation iterations.

Code Overview

The application's codebase is divided into several key components:

- **SpectrumAnalyzerGUI.py**: Main GUI application code.
- **main.py**: Core logic for analysis and multiprocessing.
- **utilities.py**: Utility functions for image processing and analysis.
- **env_vars.py**: Configuration settings.

The analysis process involves the GUI calling **main.py** to execute the analysis, which then utilizes multiprocessing to distribute video processing across workers. Each worker processes video frames using functions from **utilities.py**, and the results are saved to a CSV file in the **Completed** folder.

Troubleshooting

Common issues and their solutions include:

- **Video Folder Not Found:** Ensure the path in **env_vars.py** is correct.
- **Threshold Value Warnings:** Adjust the color threshold values according to your video.
- **Analysis Not Starting:** Check for errors during **pip install** of dependencies.
- **No CSV Output:** Ensure multiprocessing is functional and the **Completed** folder exists.

Additional Resources

For more information and the latest updates, visit the Project Website.