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1. Overview

This script aligns multiple images based on feature matching and stacks them into a single multi-dimensional array. The output is saved in both TIFF (for general use) and ENVI (specifically for hyperspectral imaging data) formats. This is particularly useful for applications in remote sensing, medical imaging, or any field requiring image registration and analysis.

2. Requirements

- Python 3.6 or later
- Libraries: `opencv-python`, `numpy`, `imageio`, `tifffile`, `spectral`

3. Installation

To install the required libraries, run the following command in your terminal:

bash

Copy code

```
pip install opencv-python numpy imageio tifffile spectral
```

4. Usage

To use this script, place your images in the specified input directory and run the script. The output files will be saved in the specified output directory. Ensure you update the paths in the script to match your directory structure.

Example Command:

```
python align_images.py
```

5. Functions Documentation

- load_image(file_path)
    - Purpose: Loads an image from the specified file path.
    - Arguments:
        - `file_path`: A string representing the path to the image file.
    - Returns: The loaded image as a NumPy array.
- align_images(input_files)
    - Purpose: Aligns a list of images using SIFT features and FLANN based matching.
    - Arguments:
        - `input_files`: A list of strings, each representing a path to an image file.
    - Returns: A NumPy array containing the stacked aligned images.
- save_as_tiff(stacked_image, output_file)
    - Purpose: Saves the stacked images as a multi-band TIFF file.
    - Arguments:
        - `stacked_image`: A NumPy array of images to save.
        - `output_file`: The path where the TIFF file will be saved.
- save_as_envi(stacked_image, output_file)
    - Purpose: Saves the stacked images in ENVI format.
    - Arguments:
        - `stacked_image`: A NumPy array of images to save.
        - `output_file`: The path where the ENVI file will be saved.