

Guideline

1. Pre-Processing File: `image_adjust.m`

This file creates a GUI for image adjustment and pre-processing.

Key Features:

- Loading Images: Load images from a folder for processing.
- Adjustments: Apply brightness, contrast adjustments, and filtering.
- Gaussian Filtering: Apply Gaussian filter with adjustable kernel size and sigma.
- Median Filtering: Apply median filter with adjustable kernel size.
- Thresholding: Apply thresholding to binarize the image.

Usage:

1. Run the script: Execute `image_adjust` to open the GUI.
2. Load Folder: Click "Load Folder" to select the folder containing images.
3. Adjust Parameters: Use sliders and text boxes to adjust brightness, contrast, Gaussian kernel size, sigma, median kernel size, and threshold.
4. Save Image: Save individual images or all adjusted images to a specified folder.

2. Negative Field Calculation: `negative_field.m`

This file calculates the negative field components for a set of images.

Key Features:

- Parallel Processing: Uses parallel processing to speed up computations.
- Gradient and Magnitude Calculation: Computes the gradient and magnitude of the images.
- Lorentz Force Calculation: Calculates the Lorentz force components.

Usage:

1. Set Folder Paths: Update the `parentFolderPath` and `outputParentFolderPath` variables with your input and output directories.
2. Run the Script: Execute `negative_field` to process the images and save the results.

3. Shape Characterization and Particle Model: all_SCPM.m

This file provides a GUI for simulation and visualization of the Spring-Charged Particle Model (SCPM).

Key Features:

- File Loading: Load .mat files containing Ex and Ey fields.
- Simulation Controls: Start, stop, and save the simulation.
- Parameter Input: Enter simulation parameters through the GUI.

Usage:

1. Run the Script: Execute all_SCPM to open the GUI.
2. Load Folder: Click "Load Folder" to select the folder containing .mat files.
3. Enter Parameters: Input simulation parameters such as N, Ncycle, beta, dT, L, etc.
4. Start Simulation: Click "Start Simulation" to begin the SCPM simulation.
5. Save Results: Save the simulation results as images.

4. Ellipse Fitting and Analysis: csv_final_improve.m

This file processes images to fit ellipses and analyze differences.

Key Features:

- Image Processing: Reads and processes binary images.
- Ellipse Fitting: Fits ellipses to the boundaries of binary images.
- Difference Calculation: Computes the difference values between the ellipse and boundary points.
- Box Plot Creation: Generates box plots for visualizing difference values.

Usage:

1. Set Folder Path: Update the main_folder variable with the path to your image folder.
2. Run the Script: Execute csv_final_improve to process the images and generate results.
3. Review Outputs: The results and summary statistics are saved as CSV files, and a box plot image is created.

General Notes

Ensure MATLAB is installed and properly configured to run these scripts.

Modify folder paths and other parameters as needed to match your specific use case.

Review each script's comments and documentation for additional details and customization options.