Documentation

Extracting Vital Signs from Video Data

This Python script is designed to extract vital signs, such as heart rate, from video data captured using different devices. It employs computer vision techniques to analyze frames from the video and extract relevant information.

Dependencies:

- OpenCV (`cv2`): For reading and processing video files.
- SciPy (`scipy.signal`): For signal processing operations, such as filtering.
- HeartPy (`heartpy`): A Python library for heart rate analysis.
- NumPy (`numpy`): For numerical operations on arrays.
- Matplotlib (`matplotlib.pyplot`): For visualization purposes.
- shutil: For file and directory operations.
- time: For measuring processing time.
- logging: For logging exceptions.

Functions:

1. **`signaltonoise(a, axis=0, ddof=0)`**: Computes the signal-to-noise ratio of a given array `a`.

2. **`extract_frames_and_sampling_rate(video_filename, output_directory)`**: Extracts frames from a video file (`video_filename`) and calculates the sampling rate based on the video's frames per second (FPS).

3. **`get_image(image_path)`**: Reads an image from the specified path and converts it to grayscale.

4. **`get_mean_intensity(image_path)`**: Computes the mean intensity of an image.

5. **`plot(x, title, xaxis, yaxis, filename)`**: Plots a graph based on the input data (`x`) and saves it as an image.

6. **`get_signal_from(frames_dir)`**: Extracts the signal (mean intensity) from a directory containing frames extracted from a video.

7. **`butter_bandpass(lowcut, highcut, fs, order=5)`**: Designs a Butterworth bandpass filter.

8. **`butter_bandpass_filter(data, lowcut, highcut, fs, order=5)`**: Applies a Butterworth bandpass filter to the input data.

9. **`process_video(filename)`**: Main function for processing a video file. It extracts frames, computes the PPG (Photoplethysmogram) signal, filters it, and then processes it to obtain vital sign information such as heart rate (BPM) and signal-to-noise ratio (SNR).

Usage:

- Modify the main section (`__main__`) to specify the filenames of the videos to be processed.
- Execute the script to process each video file and obtain the vital sign information.

Output:

- For each video file processed, the script prints the heart rate (BPM), signal-to-noise ratio (SNR), and processing time.