

Video to PDF converter

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Problem Statement

- Design and implement an automatic document scanner using computer vision techniques and the OpenCV library.
- The system should be capable of capturing frames from a video source, performing optical flow analysis to track and visualize the page flipping movements within the document and apply image processing techniques to extract and create the pdf document.

Objectives

- Optical Flow Analysis: Implement the Lucas-Kanade optical flow method to track feature points within the document.
- Trajectory Visualization: Visualize the trajectories of tracked points on the document.
- Page flip detection: Identify whether the frame is stable or not.
- Image Processing: Process the captured stable frame and extract the region of interest from the frame.

Video Processing

Shi-Tomasi Corner Detection (`cv2.goodFeaturesToTrack`): Shi-Tomasi corner detection is a feature detection algorithm used to identify important points (corners) in an image. In the context of video processing, it's often employed to find key points that can be tracked across frames.

- **Grayscale Conversion:**
 - Convert the current video frame to grayscale, which simplifies processing.
- **Good Features Detection:**
 - Use `cv2.goodFeaturesToTrack` to detect good quality corners in the grayscale frame.
- **Draw Detected Corners (Optional):**
 - Optionally, draw the detected corners on the original frame for visualization.

Video Processing

Sparse Optical Flow (`cv2.calcOpticalFlowPyrLK`): Sparse optical flow involves tracking a selected set of feature points across consecutive frames. Lucas-Kanade optical flow is a common method for this task.

- **Grayscale Conversion:**
 - Convert the current and next frames to grayscale.
- **Calculate Optical Flow:**
 - Use `cv2.calcOpticalFlowPyrLK` to calculate optical flow between the current and next frames.
- **Filtering and Visualization:**
 - Filter the feature points based on their tracking status.
 - Optionally, visualize the trajectories of the tracked points on the frames.

Image Processing

Our approach for processing captured stable frames is as follows:

- **Morphological Operation**

- Purpose: Enhancing document features, reducing noise.

- **Grabcut**

- Purpose: Refining document segmentation, separating foreground and background.

- **Edge detection**

- Purpose: Identifying document boundaries and key features.

Image Processing

Our approach for processing captured stable frames is as follows:

- **Contour Detection**
 - Purpose: Extracting document contours for further processing.
- **Perspective Transform**
 - Purpose: Correcting distortions, achieving a top-down view of the document.

Limitations and Drawbacks

- If the quality of the video is very poor then it affects the good feature points(in shi-tomasi method) to be detected in the video which affects the optical flow calculation.
- In image processing the ROI is stretched in the final output which in very rare cases affects the readability of the page in the pdf file.

thank
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