ENHANCING MOTION, A COMPREHENSIVE APPROACH TO VIDEO CREATION FROM STILL IMAGES

Chulliyev Shokhrukh Ibadullayevich
Shobdarov Elbek Bekkadir uli
Tashkent University of Information Technologies named after
Muhammad al-Khwarizmi

Abstract: Creating videos from a sequence of images with moving objects is a complex task that involves several key steps, including object detection/tracking, frame interpolation, post-processing, and video encoding. The thesis provides a detailed algorithm for this process, outlining the steps involved and suggesting specific techniques for each stage. The use of object detection models for tracking objects ensures that the motion in the final video appears smooth and realistic. Frame interpolation, based on optical flow estimation, helps create intermediate frames that bridge the gap between the original frames, enhancing the visual quality of the video. The thesis also emphasizes the importance of post-processing techniques for artifact reduction and visual enhancement. Overall, the thesis provides a comprehensive guide for creating videos from pictures with moving objects, offering valuable insights for researchers and practitioners in the field of computer vision and video processing.

Keywords: video interpolation, frame interpolation, object detection, optical flow, motion estimation, post-processing, video encoding, computer vision, video processing.

Creating videos from pictures, particularly with moving objects, involves a process known as animation or motion graphics. Here's a general outline of the steps involved:

- Concept and Storyboard:

Define the concept and storyline of your video. Create a storyboard that outlines each scene and the movement of objects within them.

- Gather and Prepare Assets:

Collect the images you'll use in your video. This includes background images, character images, and any other elements needed for your scenes. Ensure that the images are high-quality and appropriately sized for the video.

- Editing Software:

Use video editing software that supports animation or motion graphics. Popular options include Adobe After Effects, Adobe Premiere Pro, and Final Cut Pro.

- Import Images:

Import your images into the editing software. Arrange them in the order they will appear in the video.

- Animating Objects:

To animate objects, you'll typically use keyframes. Keyframes define the starting

and ending points of an object's movement. For example, to make a character walk across the screen, you would set a keyframe at the starting position, move the character to the desired end position, and set another keyframe. The software will then create the animation between the two keyframes.

- Adding Effects:

You can enhance your animation by adding effects such as transitions between scenes, particle effects, and text animations.

- Timing and Rhythm:

Pay attention to the timing and rhythm of your animation. Use principles of animation such as easing (gradual acceleration and deceleration of movement) to make your animations look more natural.

- Sound Design:

Add sound effects and background music to enhance the mood and atmosphere of your video.

- Preview and Adjust:

Preview your video frequently to see how the animation is coming together. Make adjustments to the timing, movement, and effects as needed.

- Export:

Once you're satisfied with your video, export it to a video file format (e.g., MP4) suitable for sharing on platforms like YouTube or social media.

Keep in mind that creating high-quality animations can be time-consuming and may require practice to master. Experiment with different techniques and styles to find what works best for your projects.

Algorithm:
Here's a basic algorithm for creating videos from pictures with moving objects:
1. Input: Sequence of images $I_1, I_2, ..., I_n$ where n is the number of frames.
2. Object Detection/Tracking: Use a pre-trained object detection model (e.g., YOLO, Faster R-CNN) to detect and track the objects in each frame. Store the bounding boxes or masks of the objects.
3. Frame Interpolation:

- *For each pair of consecutive frames I_i and I_{i+1}:*

Estimate optical flow between I_i and I_{i+1} using methods like Lucas-Kanade or Farneback.

Warp I_i based on the estimated flow to generate a new frame $I_{i+0.5}$.

Combine I_i, $I_{i+0.5}$, and I_{i+1} to create a smoother transition between frames.

4. Post-processing: Apply filtering techniques (e.g., Gaussian blur, median filter) to reduce artifacts and enhance visual quality in the interpolated frames.
5. Video Encoding: Encode the original and interpolated frames into a video

format (e.g., MP4, AVI) using a suitable video codec (e.g., H.264, H.265).

6.Output: Save the generated video file.

Note: This algorithm provides a high-level overview and can be customized based on the specific requirements and constraints of the application. Additionally, advanced techniques, such as deep learning-based frame interpolation, can be used for more accurate and visually appealing results.

List of references:

1.Baker, S., Scharstein, D., Lewis, J. P., Roth, S., Black, M. J., & Szeliski, R. (2011). A database and evaluation methodology for optical flow. International Journal of Computer Vision, 92(1), 1-31.

2.Dosovitskiy, A., Fischer, P., Ilg, E., Hausser, P., Hazirbas, C., Golkov, V., ... & Brox, T. (2015). FlowNet: Learning optical flow with convolutional networks. In Proceedings of the IEEE international conference on computer vision (pp. 2758-2766).

3.Reda, F. A., Liu, G., Shih, K. J., Wang, T. C., Tao, A., & Catanzaro, B. (2018). Video-to-video synthesis. In Advances in Neural Information Processing Systems (pp. 1199-1208).

4.Wang, T. C., Liu, M. Y., Zhu, J. Y., Tao, A., Kautz, J., & Catanzaro, B. (2018). High-resolution image synthesis and semantic manipulation with conditional GANs. In Proceedings of the IEEE conference on computer vision and pattern recognition (pp. 8798-8807).

5.Xue, T., Wu, J., Bouman, K. L., & Freeman, W. T. (2016). Visual dynamics: Probabilistic future frame synthesis via cross convolutional networks. In Advances in Neural Information Processing Systems (pp. 91-99).