

**18CSE390T**  
**Computer Vision**

S9-Case Study

# Video Stabilization

- Video stabilization is one of the most widely used applications of parametric motion estimation.
- Algorithms for stabilization run inside both hardware devices, such as camcorders and still cameras, and software packages for improving the visual quality of shaky videos.
- Three major stages of stabilization, namely motion estimation, motion smoothing, and image warping.

# Video Stabilization

- Motion estimation algorithms often use a similarity transform to handle camera translations, rotations, and zooming
- Motion smoothing algorithms recover the low-frequency (slowly varying) part of the motion and then estimate the high-frequency shake component that needs to be removed.
- Image warping algorithms apply the high-frequency correction to render the original frames as if the camera had undergone only the smooth motion.

# Video Stabilization

- Image warping can result in missing borders around the image, which must be cropped, filled using information from other frames.
- Video frames captured during fast motion are often blurry.
- Their appearance can be improved either using deblurring techniques or stealing sharper pixels from other frames with less motion or better focus.

# Video Stabilization

- In situations where the camera is translating a lot in 3D, e.g., when the videographer is walking, an even better approach is to compute a full structure from motion reconstruction of the camera motion and 3D scene.
- A smooth 3D camera path can then be computed and the original video re-rendered using view interpolation with the interpolated 3D point cloud serving as the proxy geometry while preserving salient features
- If camera array is used instead of a single video camera, light field rendering approach is used to get better performance.