Study of Camera Motion in Rolling Shutter Cameras
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Rolling Shutter Phenomenon

Sensors start exposing row by row sequentially
Camera motion during exposure period causes unique distortions
Classical problems need novel approaches

Change Detection

Register a reference undistorted image with the given rolling shutter and motion blur
distorted image detecting changes between the two images simultaneously.

Super-resolution

Produce a super-resolved image without any rolling shutter distortions given
rolling shutter distorted low-resolution images without motion blur. Assume one
undistorted low-resolution reference image.

Single-image Rectification

Correct rolling shutter distortions from only a single image. Assume urban scenes.

Optimization Problem

Employ L1 norm for row-wise warp estimation and change detection to promote sparsity

Adaptive Camera Pose Search Space

Search only around the centroid of the motion estimate of the neighboring row

Image formation model

Static and moving camera

Reference image

Rolling shutter and motion blur image

Registered image

Detected changes

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Presence of Motion Blur and Rolling Shutter Effect,” ECCV 2014.

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Super Resolution,” ICCV 2015.

Vijay Rengarajan, A.N. Rajagopalan, and R. Aravind, “From Bows to Arrows: Rolling