Minimal Solvers for Single-View Lens-Distorted Camera Auto-Calibration

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github.com/ylochman/single-view-autocalib

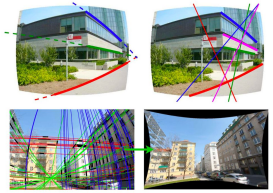
Single-View Auto-Calibration

- **Input:** a single (possibly lens-distorted) image
- **Output:** automatic camera calibration
- **Manhattan assumption:** scene contains orthogonal lines or translational symmetries **OR**
- **Coplanarity assumption:** all lines and symmetries are coplanar

State of the Art

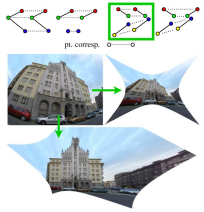
Wildenauer et al.: 5 circular arcs

Antunes et al.: 7 circular arcs



*Circular arcs are **hard to group** as imaged parallel scene lines*

Pritts et al.: 4 point correspondences



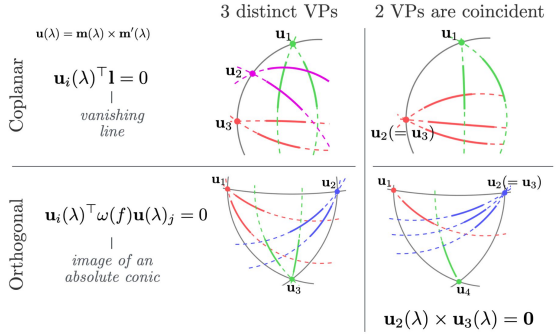
*Covariant regions are **noisy** thus provide less accuracy*

Auto-Calibration Results

Complementary Features

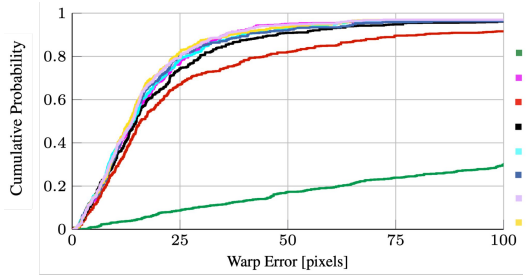
- **Ill-posed setting** — good feature coverage is necessary
- **Propose:** use **parallel scene lines** and **translational symmetries** to rectify planes and auto-calibrate cameras

Configurations of Vanishing Points

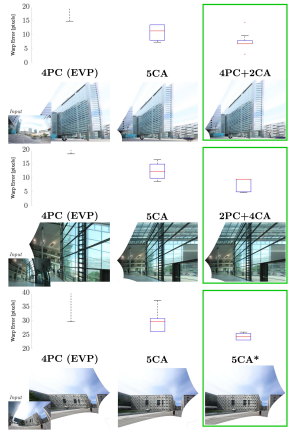


Performance on AIT dataset

	Solver	% of Top-1
SOTA	4PC (EVP)	1.5%
	5CA	10.2%
Proposed	4PC+2CA	15.5%
	2PC+4CA	21.7%
	5CA*	25.4%
	6CA	25.7%



Solver	Median RMS Warp Error
4PC (EVP)	186.51
5CA	14.02
4PC+2CA	15.86
2PC+4CA	14.9
5CA*	14.12
6CA	13.73
All	13.91
6CA & 2PC+4CA	13.35



- The solvers are **complementary**
- Combination of proposed **6CA** and **2PC+4CA** gives the best result
- **6CA** is the best individual solver
- RANSAC with **combination of solvers** outperforms standard RANSAC