Camera Calibration

Pattern calibration detection

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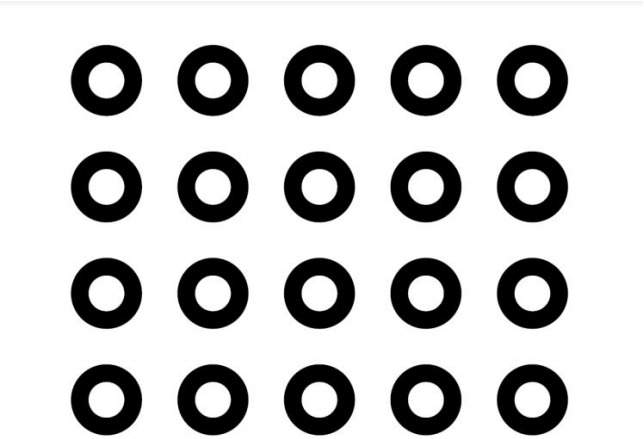
Problem

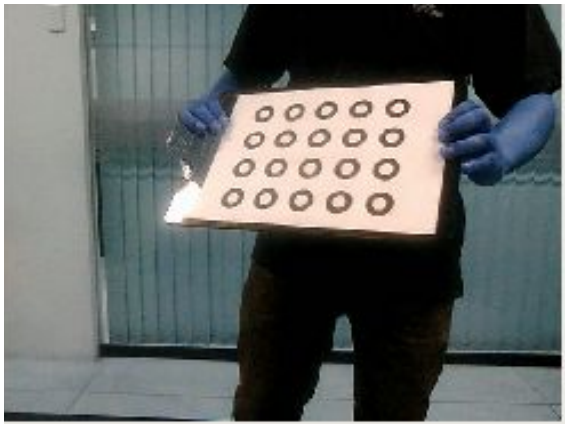
Calibration camera process requires the pattern recognition in real time. This means to process each frame of the video.



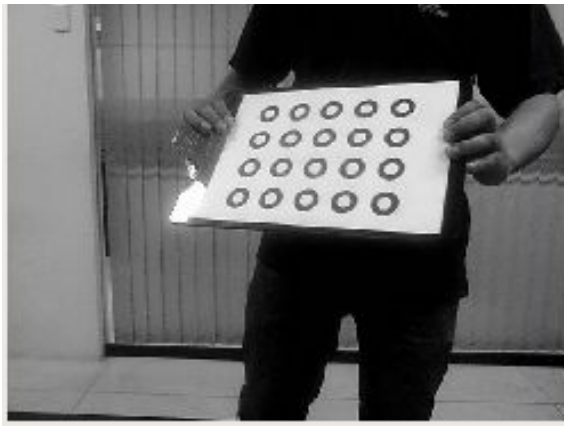
Objectives

- Image process calibration
- Select best frame to calibration camera
- Initial camera parameters
- Frontal – parallel Transformation
- Refinement of control points

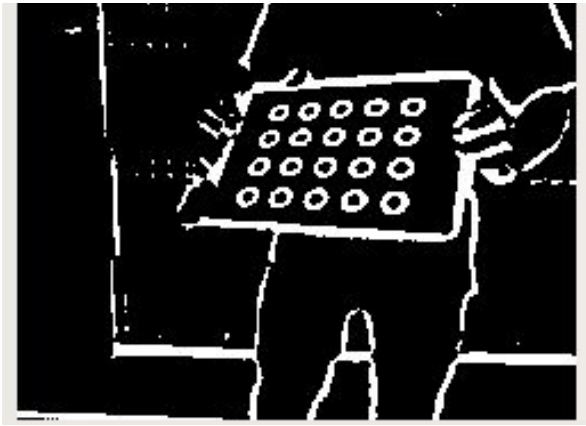
Image process calibration



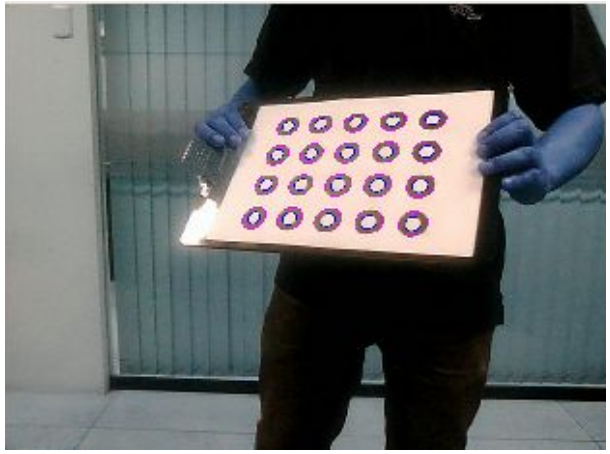
Original image



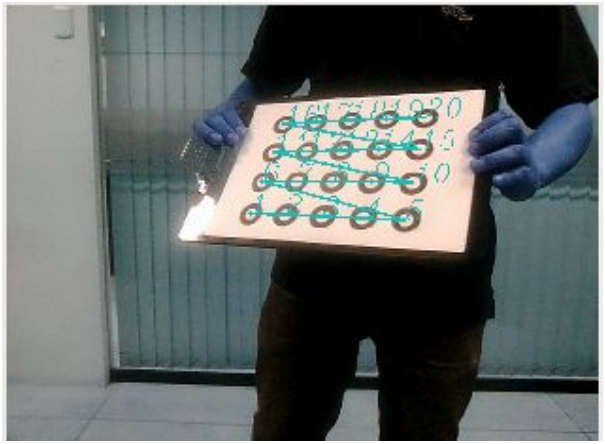
Grayscale



Thresholding



Contours



Matrix identification
(Result)

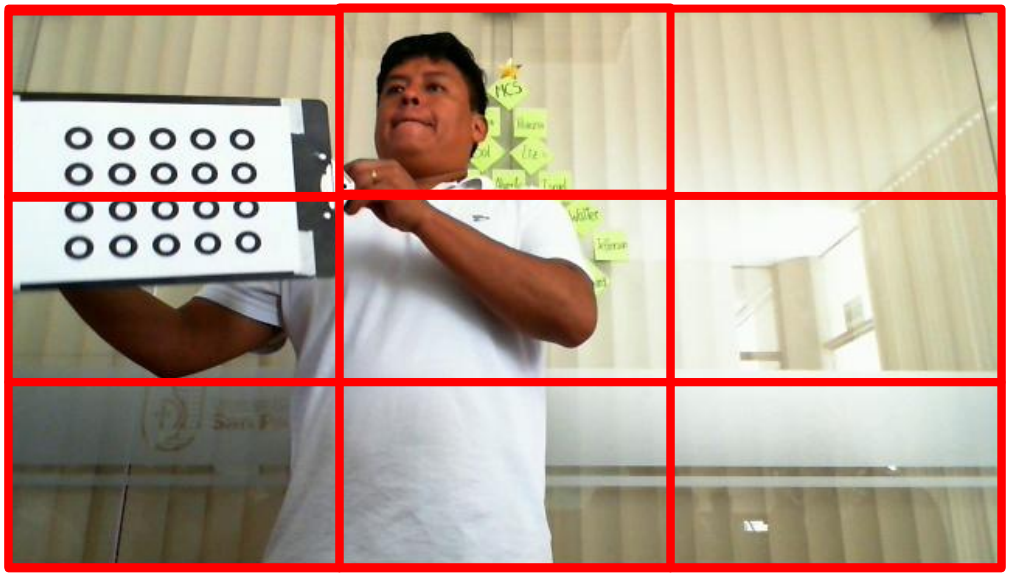
Image process calibration - Time execution

Video (.avi)	FPS	Dimensions	Circle Pattern	# frames	# Recognized frames	# Not recognized	%	Average (mili.)
cam1/anillos	30	640 × 480	4 x 5	3195	2823	372	88.36	4.6023
cam2/anillos	30	640 × 360	4 x 5	3336	2811	525	80.39	4.4553

Select best frame to calibration camera

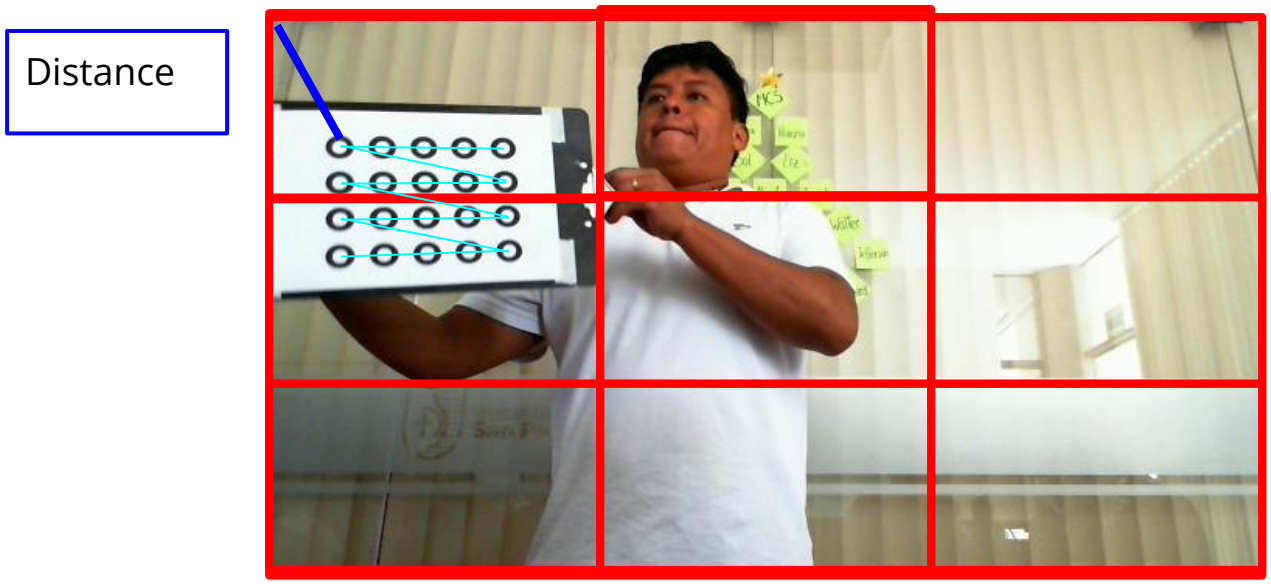
Select the best frame to calibration

1. Divide size of frame in 9 areas



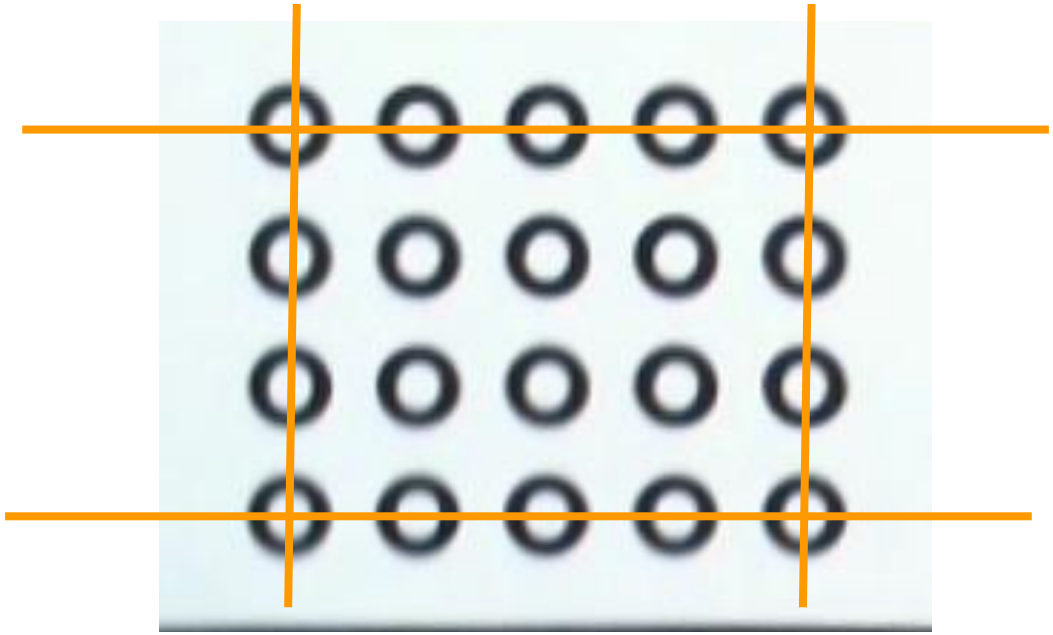
Select best frame to calibration camera

2.- Calculate and evaluate distance to each pattern to corner of area.



Select best frame to calibration camera

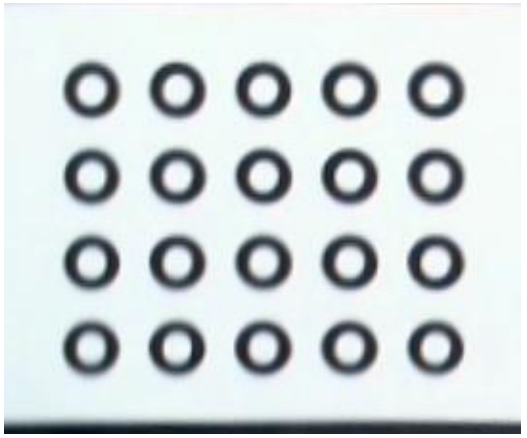
3.- Evaluate pattern



Initial calibration Initial camera parameters

	Pattern	Reprojection error	Fx	Fy	Cx	CY	Distortion
Cam 1	Anillos	0.3951	762.862	763.581	338.458	224.176	-.483719 0.549061 0.0060905 -0.00380015 -1.25465
Cam 2	Anillos	0.218348	618.412	615.811	365.783	132.811	-0.116966 0.493057 -0.110557 0.0131758 -0.636063

Fronto-Parallel Transformation



Green points: Initial centers
Blue points: Correct points

Results iterative calibration

	Num iter	Reprojection error	Fx	Fy	Cx	CY
Cam 1	10	0.326947	766.418	767.304	328.222	224.722
	25	0.327643	766.561	767.401	330.745	224.02
	50	0.328716	767.267	768.199	329.075	224.171
Cam 2	10	0.195714	614.693	612.494	365.294	132.361
	25	0.195665	612.501	610.254	365.098	132.3
	50	0.195245	613.953	611.702	365.444	132.291

Thank you.