Camera Calibration with OpenCV

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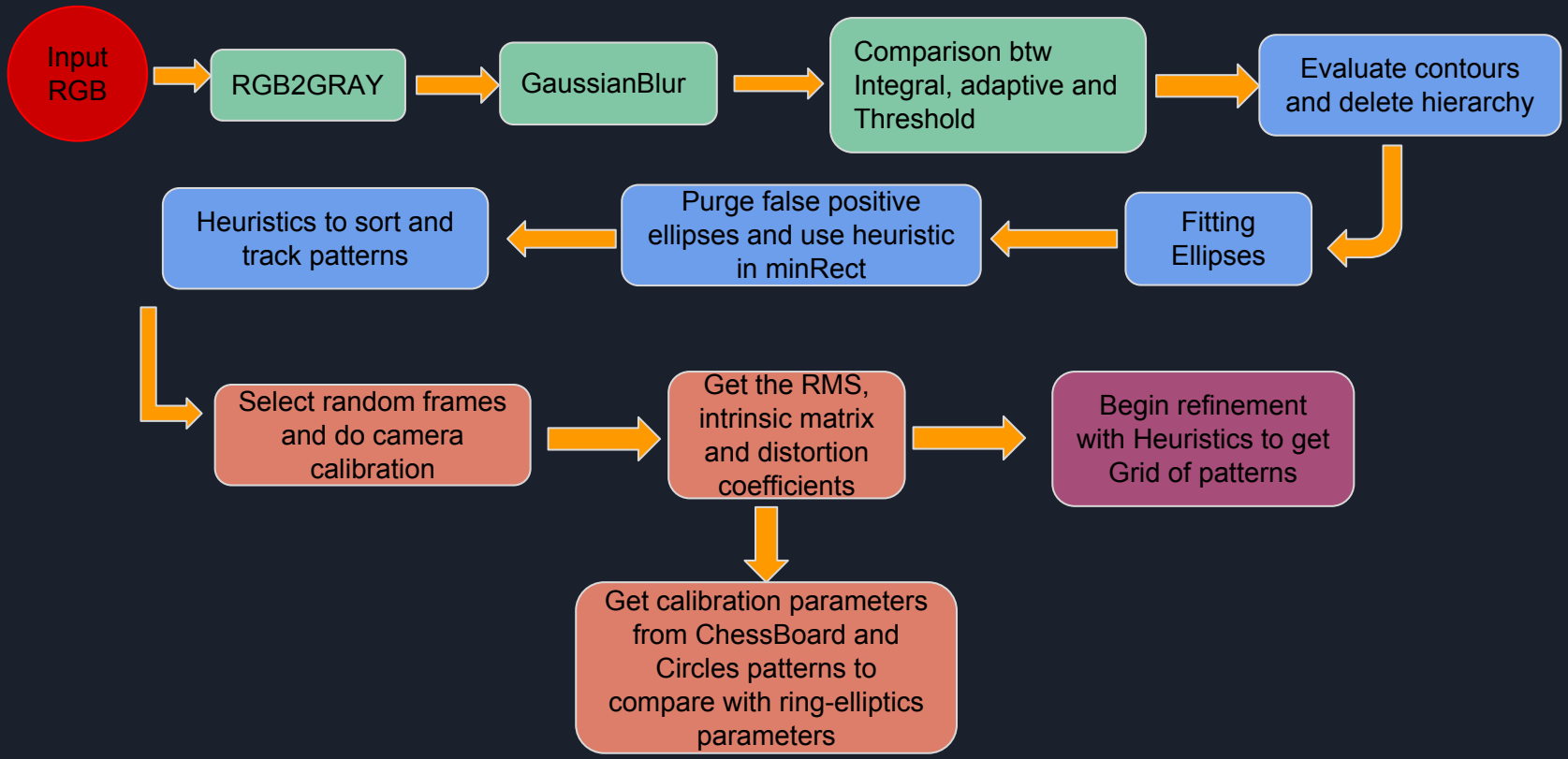
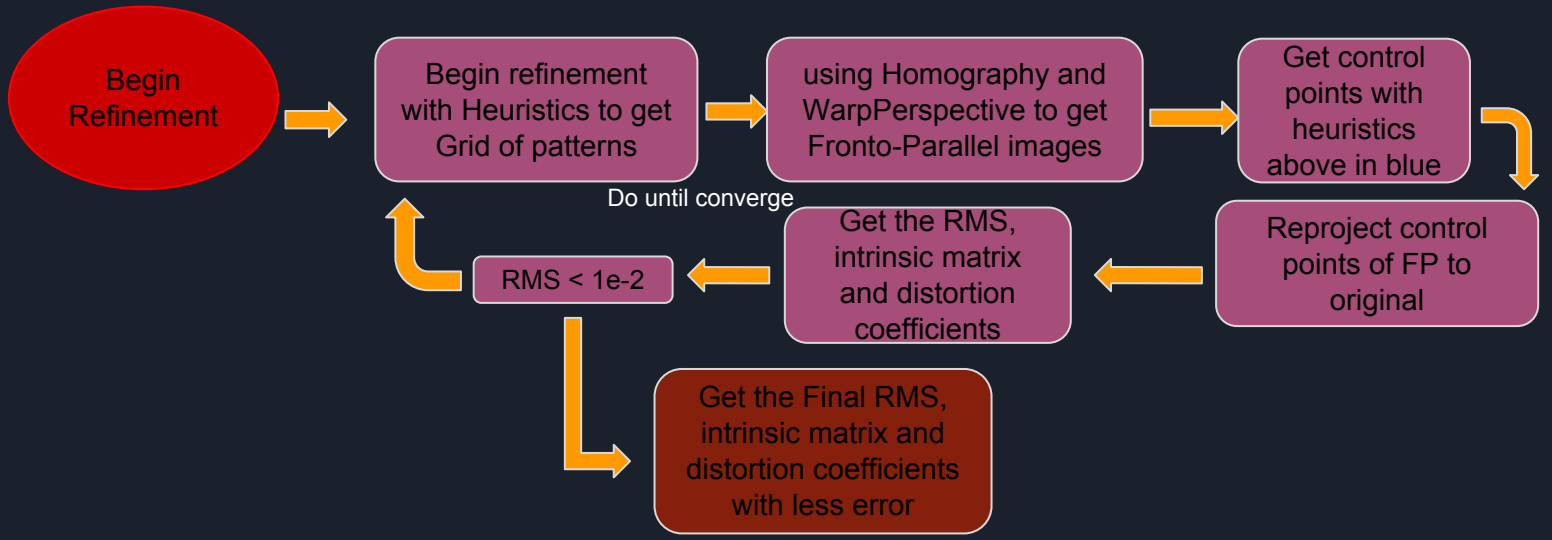
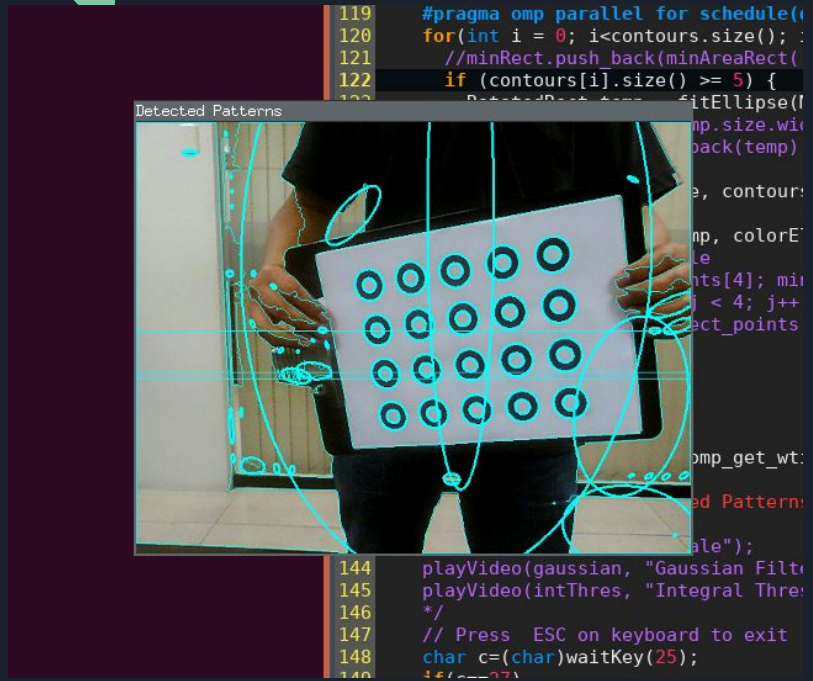
Pipeline of Detect patterns

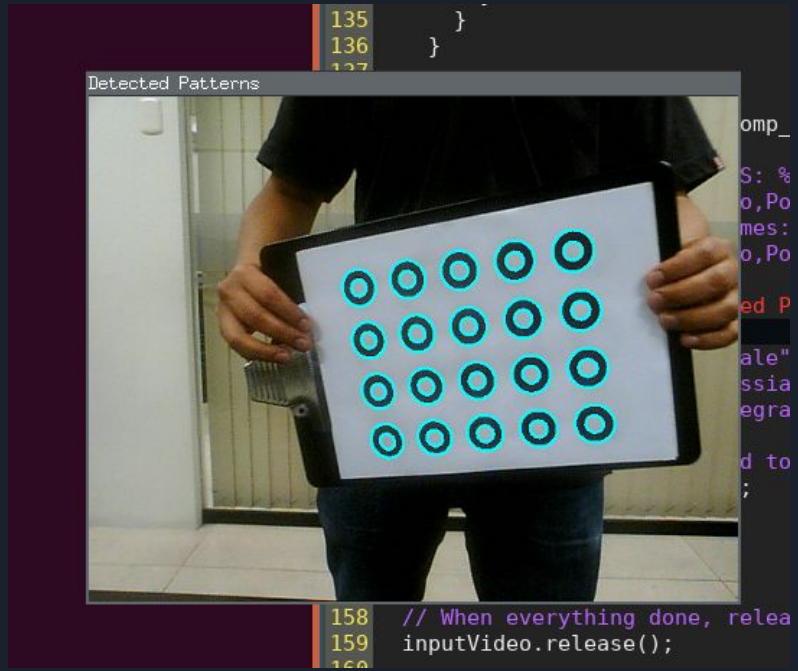


Pipeline of refinement based of Ankhur iterative method

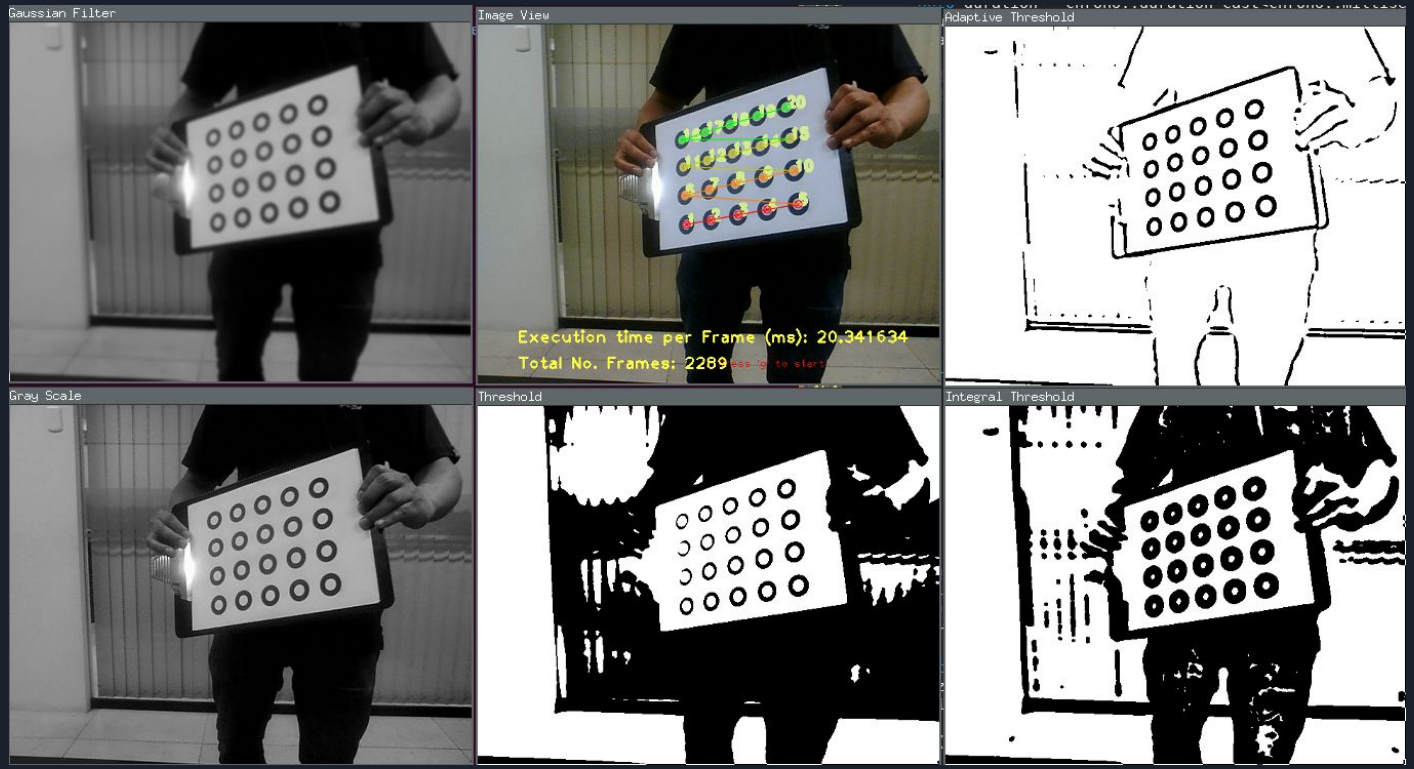


Heuristics to remove noise from images

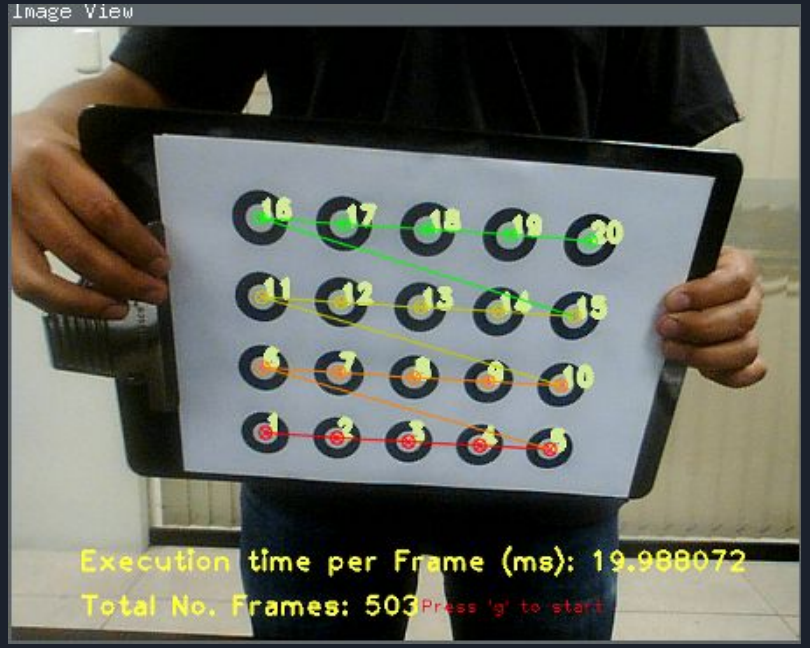




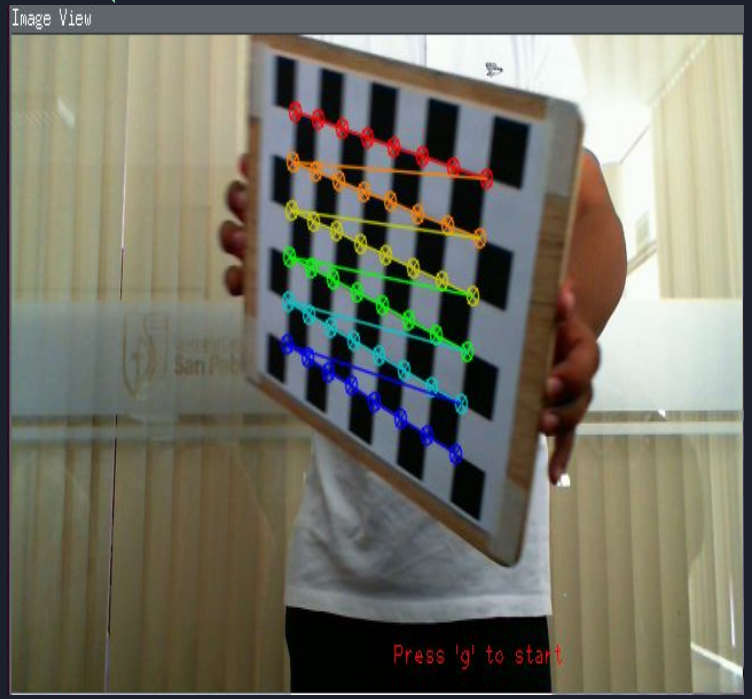
Removed noise, try threshold filters and identify patterns



Sorting and Tracking patterns



Sorting and Tracking patterns



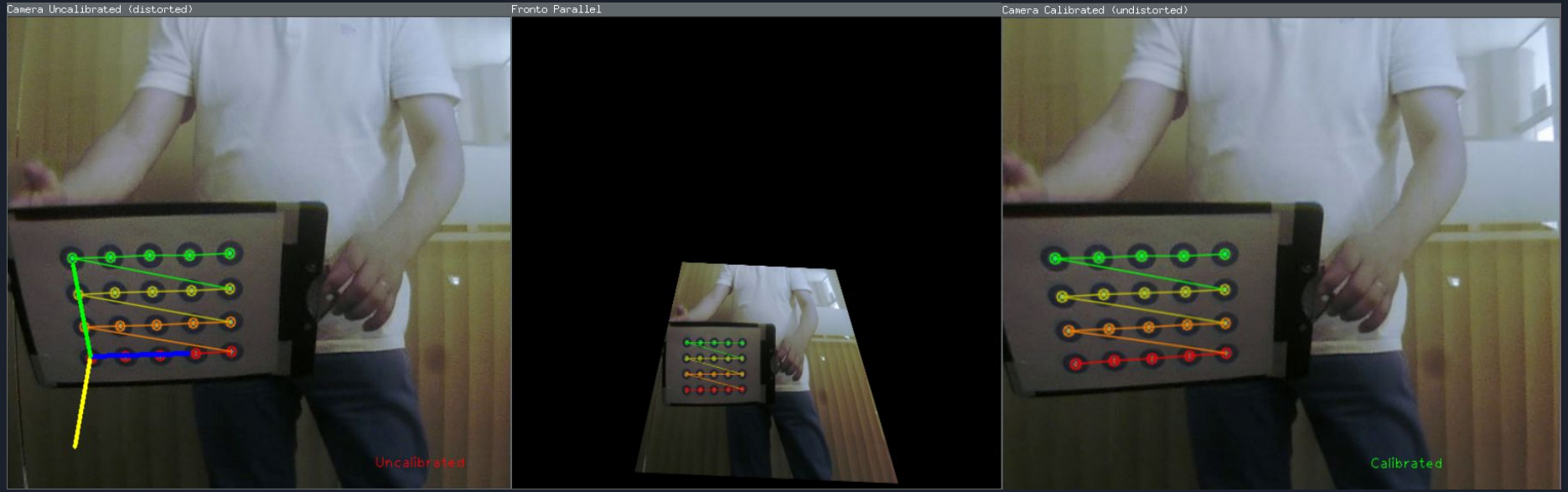
Results
Obtaining calibration parameters

Camera 1 (640x360)			
Parameters\Patterns	Rings	Asymmetric Circles	ChessBoard
fx	255.8385039893901	497.3848627129802	692.3860785658198
fy	256.7572484359887	498.4529799964733	692.9770200510819
Cx	312.3261142683546	320.0362475738945	324.5863403004979
Cy	199.4131828877674	177.6429976795606;	205.3832720933052
Re-Projection error	0.348439	0.449519	0.53702

Results
Obtaining calibration parameters

Camera 2 (640x480)			
Parameters\Patterns	Rings	Asymmetric Circles	ChessBoard
fx	709.4716628807167	692.3860785658198	665.2450383778171
fy	708.3681177131259	692.9770200510819	664.6447477543966
Cx	351.4013969361649	324.5863403004979	325.603768229559
Cy	267.4135206313173	255.3832720933052	251.9487468997013
Re-Projection error	0.323429	0.53702	0.35723

Doing Fronto Parallel



Results
Obtaining iterative calibration parameters

Parameters\Patterns	Iter 0	Iter 1	Iter 5	Iter 10	Iter 15	Iter 20	Iter 25
fx	1309,928693	665,4105195	708,6898262	705,1401215	691,3742381	683,0611491	675.4484083631678
fy	1168,793562	667,7956909	703,8800999	702,9959326	688,8151507	679,1030005	678.481389058379
Cx	347,0104134	334,6353837	293,2904425	342,8106079	324,6743947	319,4102864	338.6881020412026
Cy	507,2860439	269,9136176	272,3544074	272,2438921	261,7435702	257,5005938	242.9039863123267
rms	0,523891	0,455933	0,286075	0,350958	0,27287	0,250603	0.179749

Conclusions

- Using the iterative method of Ankhur and some additionals heuristics (fronto Parallel technique and Homography Matrix with projection error) we can calibrate camera and get diff coefficients and camera Matrix .
- We can apply this method to different patterns, just change or add method to detect pattern shape.