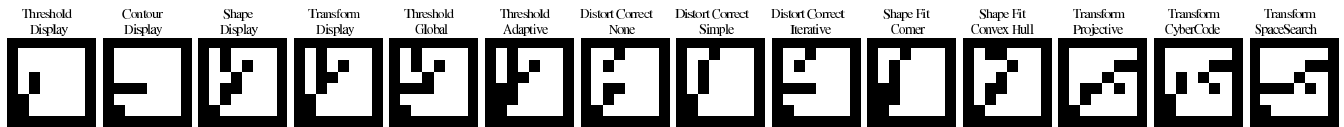


Demo: Investigating algorithms in the machine vision pipeline

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Cantag is a marker-based machine vision system designed to allow the user to select, and compare, different tag designs and tracking algorithms. It allows investigation into fundamental properties and limitations of particular 2-dimensional marker tag designs. This demonstration shows a number of possible techniques for recognising square tags. The image processing pipeline may be reconfigured dynamically by displaying the relevant marker tag to the camera.



The following table shows a number of possible configurations of the Cantag pipeline. Each row highlights a particular aspect of the processing pipeline (labelled in the centre column). For example, the row containing cells 3,4,5,6 details the thresholding stage. Cells connected vertically show different stages of the chosen processing pipeline. For example, cells 9,11,13 show the output of a pipeline incorporating (computationally expensive) lens distortion correction. These cells may be compared to cells 7,10,11 which show the output of the pipeline without distortion correction.

The Projective algorithm (direct linear equations) will exactly fit image noise by distorting the object co-ordinates of the overlay	1	2	The SpaceSearch algorithm maintains an orthogonal 3D co-ordinate frame
Varying lighting intensity across the image causes false-negatives	3	4	6
Tags on the edge of the image are most affected by lens distortion	7	8	9
Shape fitting quality could be increased by activating the linear regression algorithm to refine the corner estimates	10	11	11
Accumulated error from previous stages causes inaccuracy in the sample points for the data payload	12	13	13

Papers

- [1] Andrew Rice, Christopher Cain, and John Fawcett. Dependable Coding for Fiducial Tags. In *Ubiquitous Computing Systems, LNCS 3598*, pages 259–274, Springer-Verlag, November 2004.
- [2] Andrew C. Rice, Alastair R. Beresford, and Robert K. Harle. Cantag: an open source software toolkit for designing and deploying marker-based vision systems. In *Proceedings of the Fourth IEEE International Conference on Pervasive Computing and Communications (PERCOM'06)*, March 2006.