Laser pointer drawing

Let's speak together 2010

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Equipment

- camera
- projector
- computer
- laser pointer

Image processing

- using framework CocoaSequenceGrabber
- goes pixel by pixel

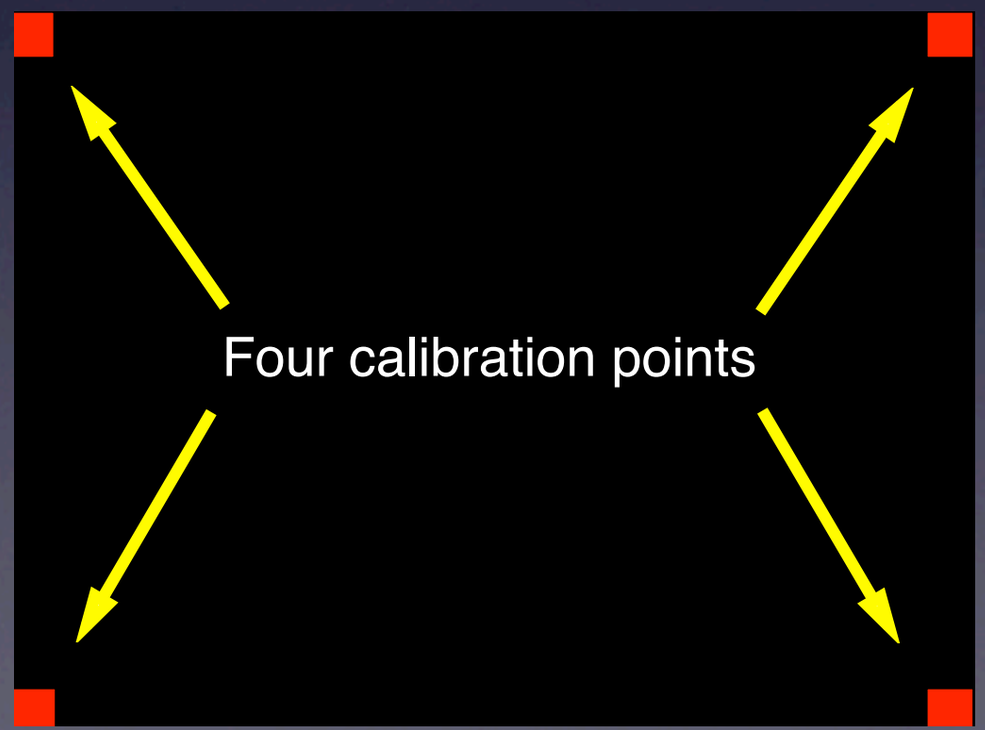
- throws away pixels of bad color
- 2 methods
  - finding lightness 5x5 pixels square

  - finding ligtness pixel which inner and outer points are in specified range

Calibration

- determining where in image are corners of screen
- sequential showing little square in corners
- same finding algorithm

  like in image processing



Transformation

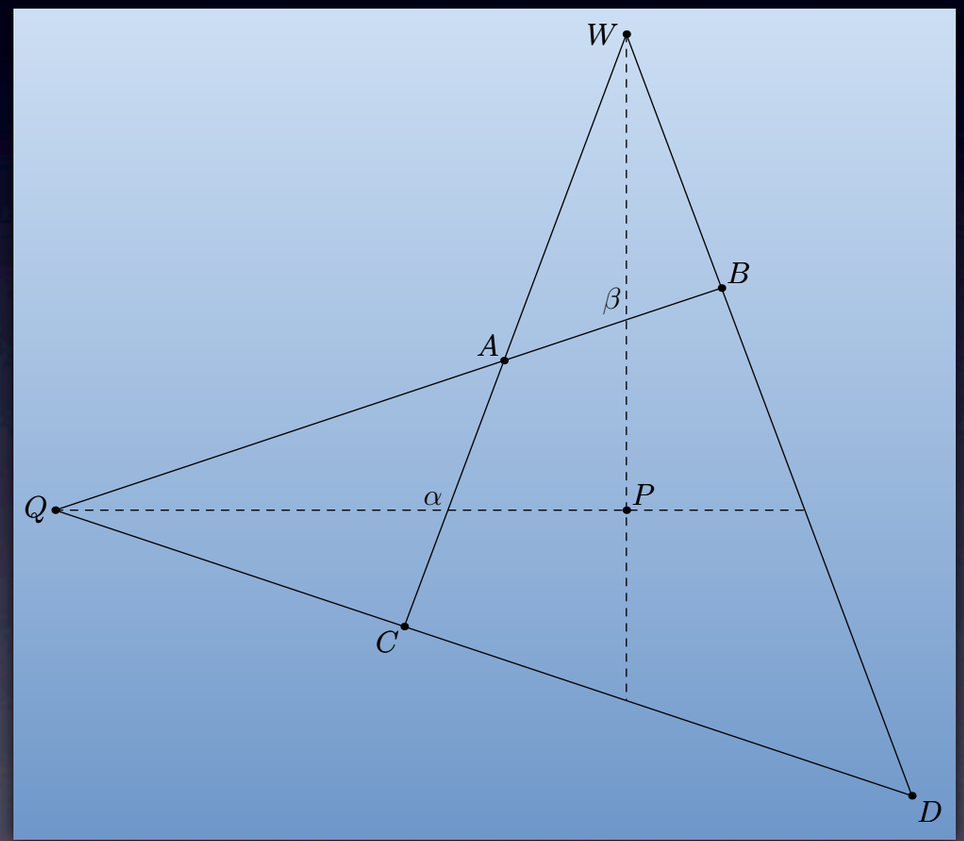
- the original image is distorted
- we need to make rectangle from quadrilateral
- various methods with various results

Ratio transformation

- ratios of lengths stays kept
- generalised in 2 dimensions we get transformation
- not so accurate

Two point transformation

- good results
- opposite sides of the quadrilateral intersects
- drawing lines through these points and found points
- intersection with sides defines ratios



Projective transformation

- using transformation 3x3 matrix
- mathematically correct
- very accurate

$$\begin{bmatrix} u' \\ v' \\ w' \end{bmatrix} = \begin{bmatrix} x \\ y \\ 1 \end{bmatrix} \cdot \begin{bmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_7 \\ a_7 & a_8 & 1 \end{bmatrix}$$

$$x' = \frac{u'}{w'} \qquad y' = \frac{v'}{w'}$$

Other transformations

- trapezoidal transformation
  - easy
  - not very accurate
- angle transformation
  - bad pricipe

Viewing

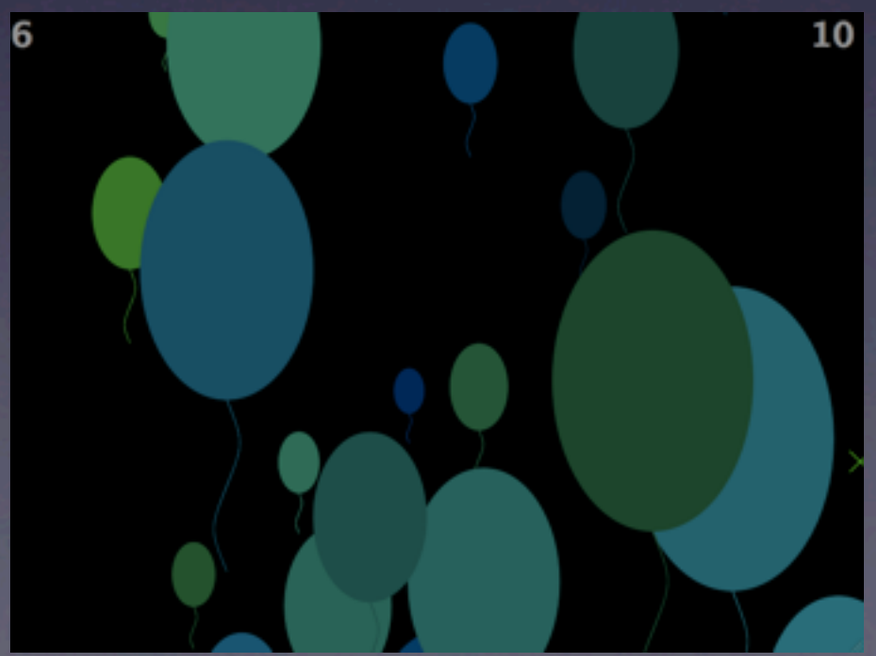
- using computed ratios
- need to use right color
  - good visibility
  - can’t be determined as laser pointer

Drawing

- choosing between three colors
- resetting drawed picture
- export picture as SVG

Shooting balloons

- simple game for laser pointer
- shooting flying up balloons
- various speed, size, number, ...
- counting shooted and flown away balloons



Thanks for your attention