Computer Vision I

Dense Stereo Correspondences

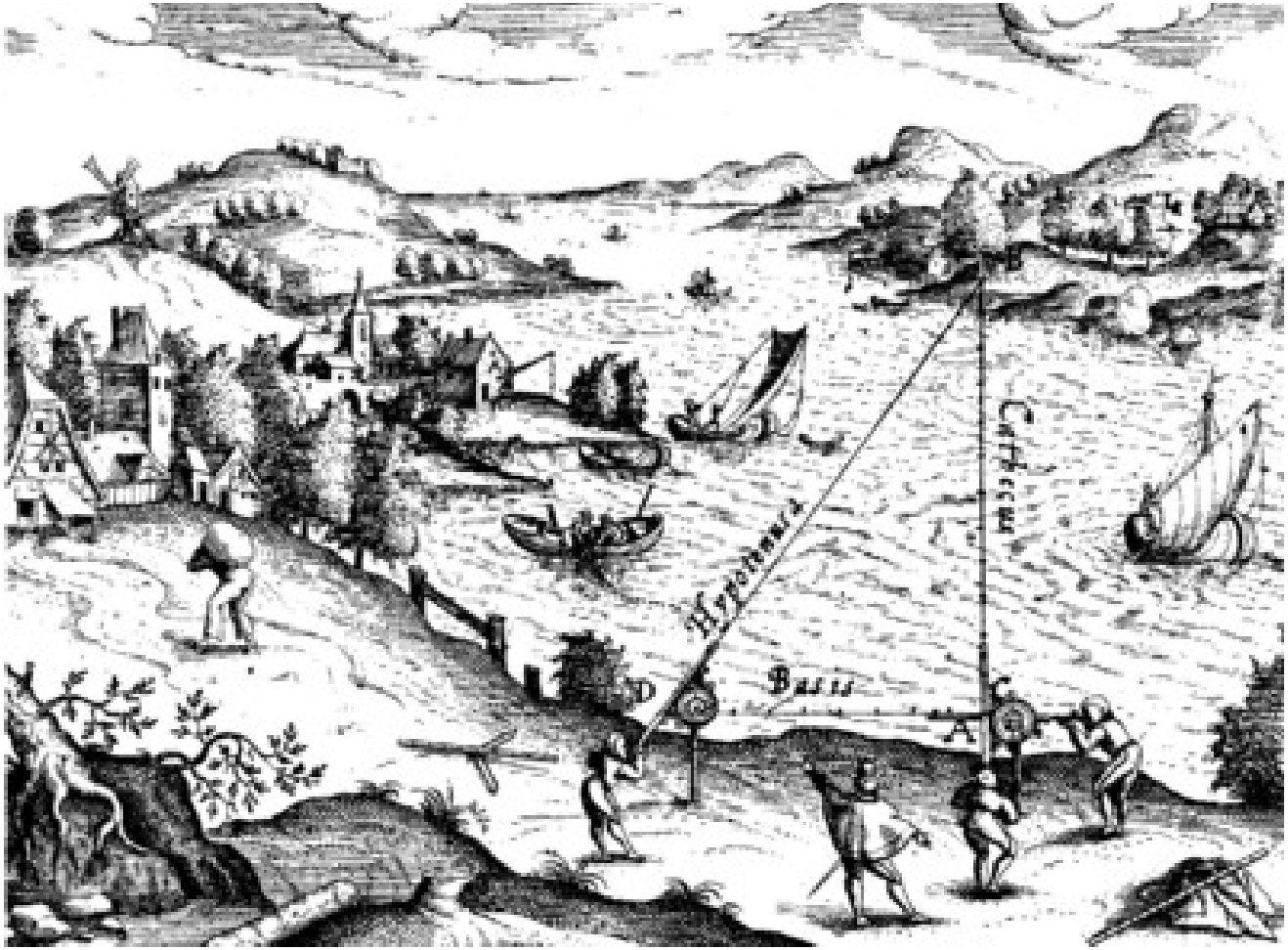
Myself

- “Correspondence Estimation in the Presence of Reality”
- Joint Position at TU Dresden and TU Darmstadt
- Room 2029
- Anita.Sellent@TU-Dresden.de

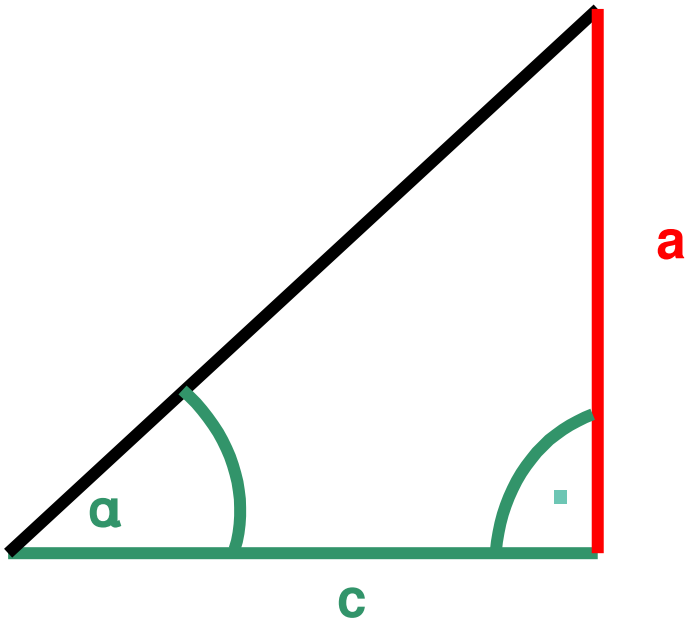
Measurement Devices for Distance

- Graphometer
- Louis Chapotot, Paris 1680

Triangulation: How to obtain distances?



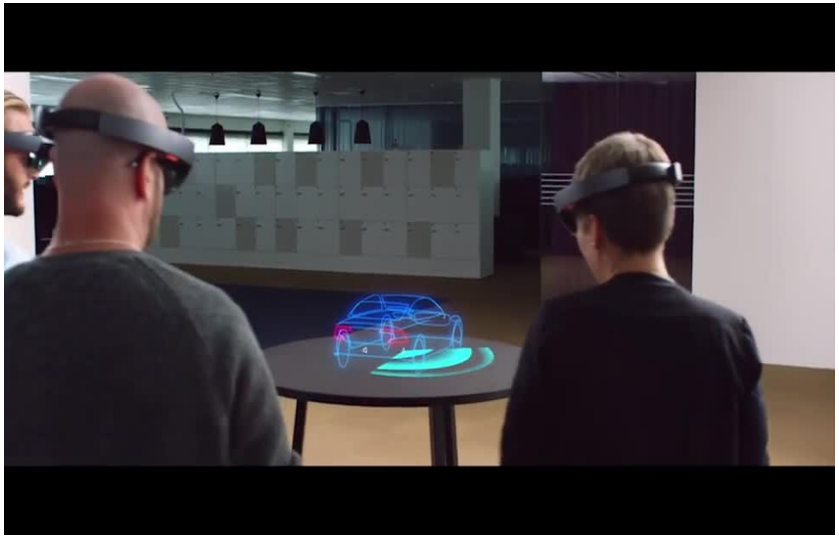
Triangulation



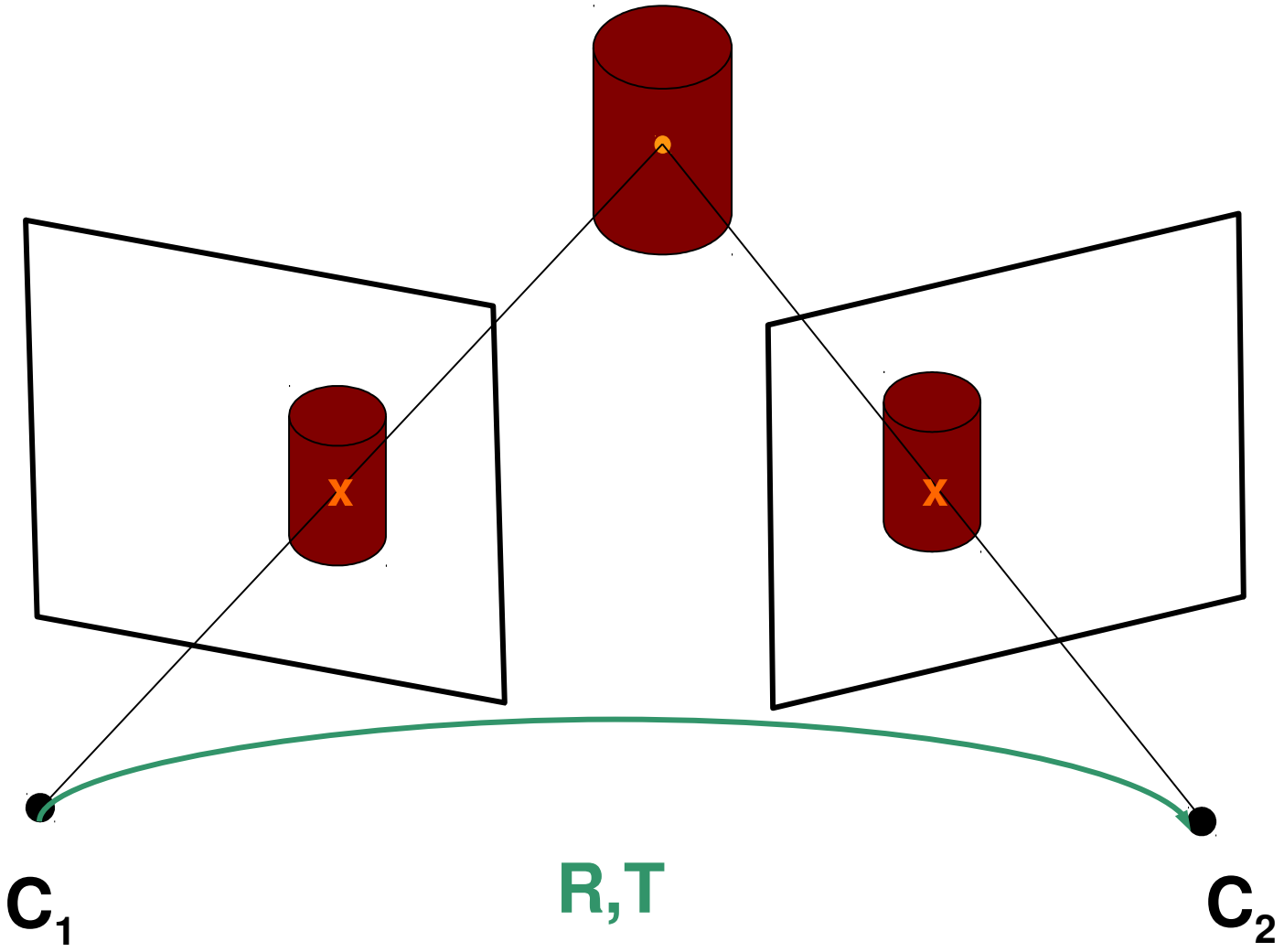
$$\tan(\alpha) = \frac{a}{c}$$

Sparse vs. Dense Depth Estimation I

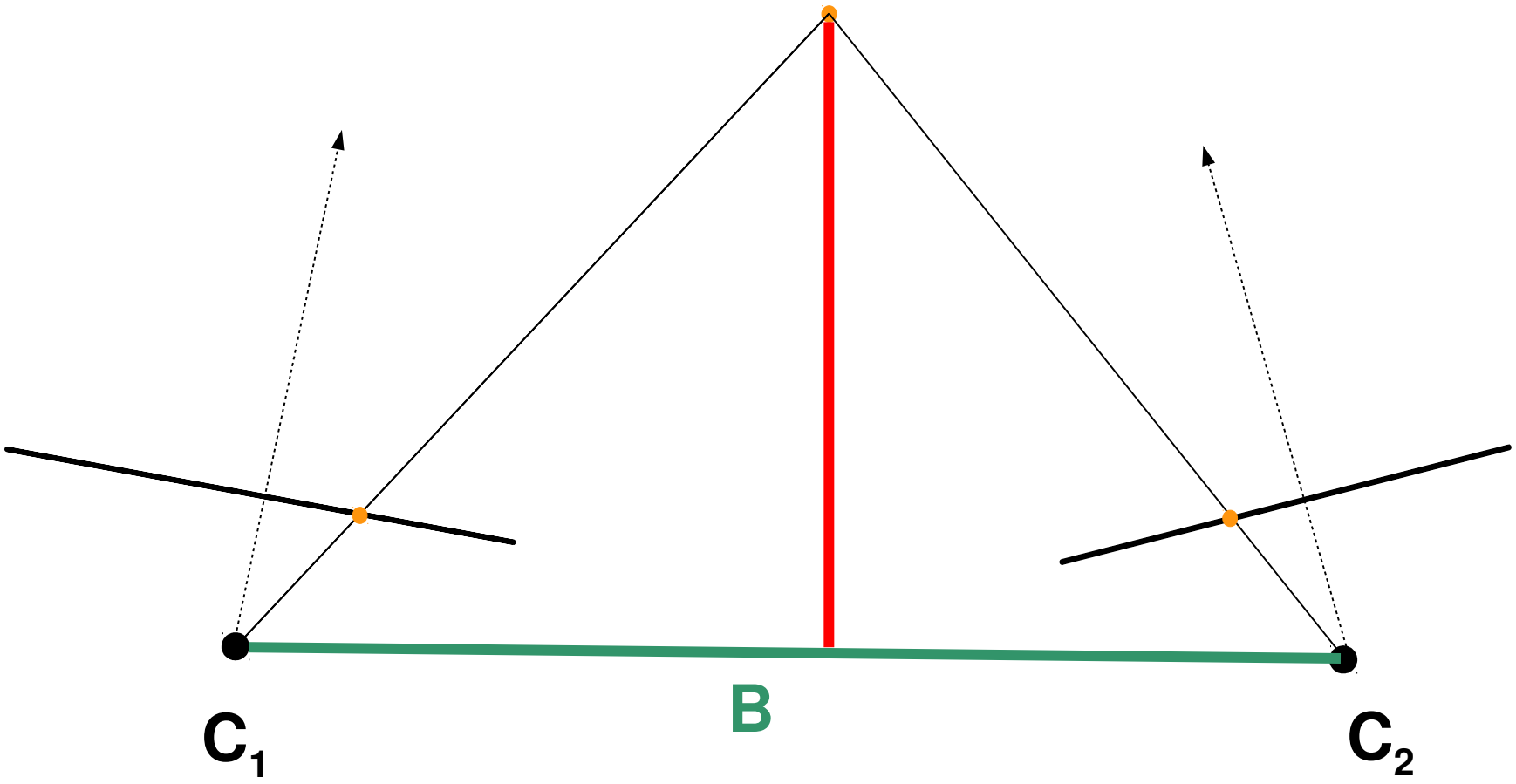
Applications



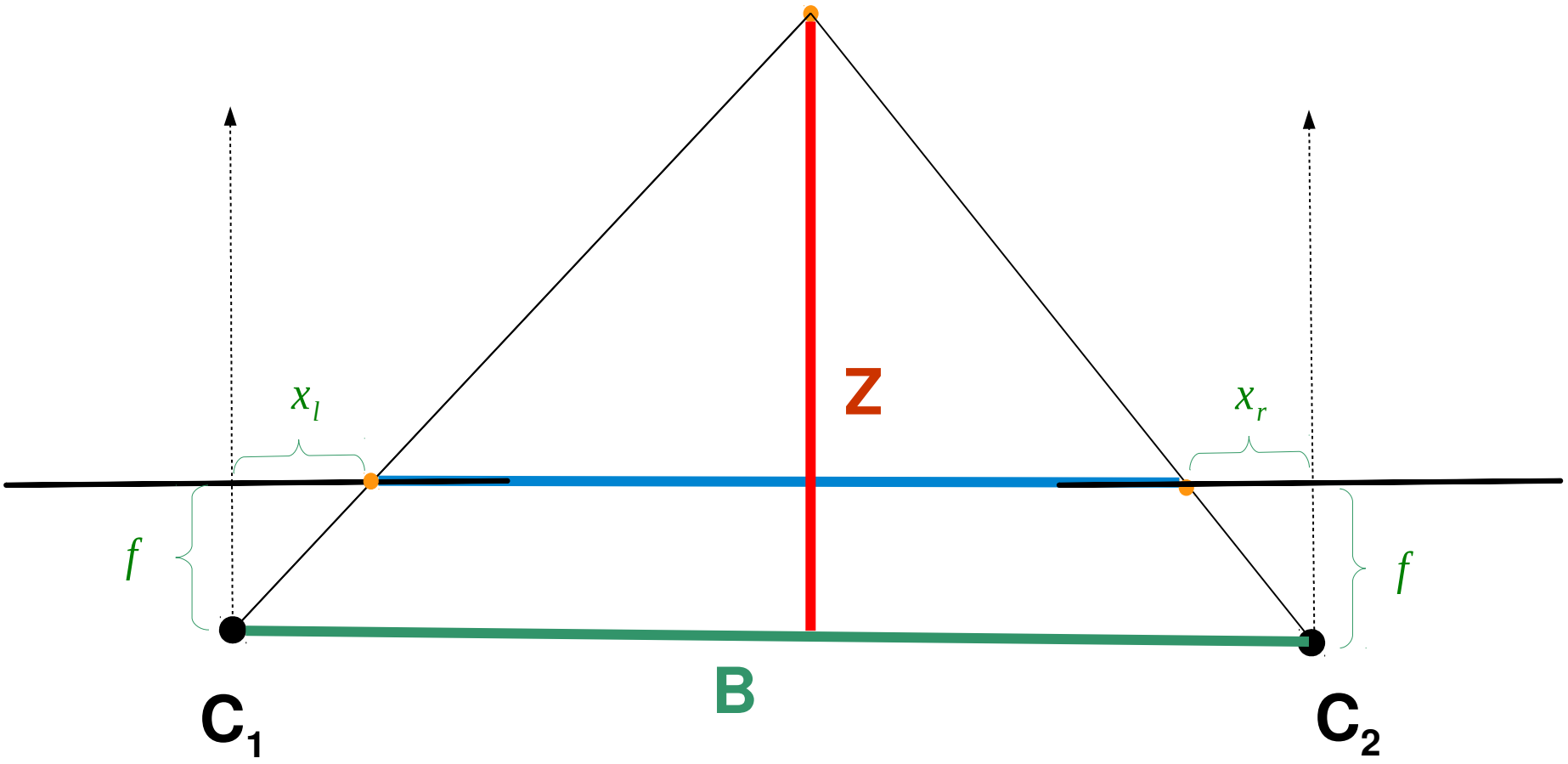
Triangulation



Triangulation: Top View



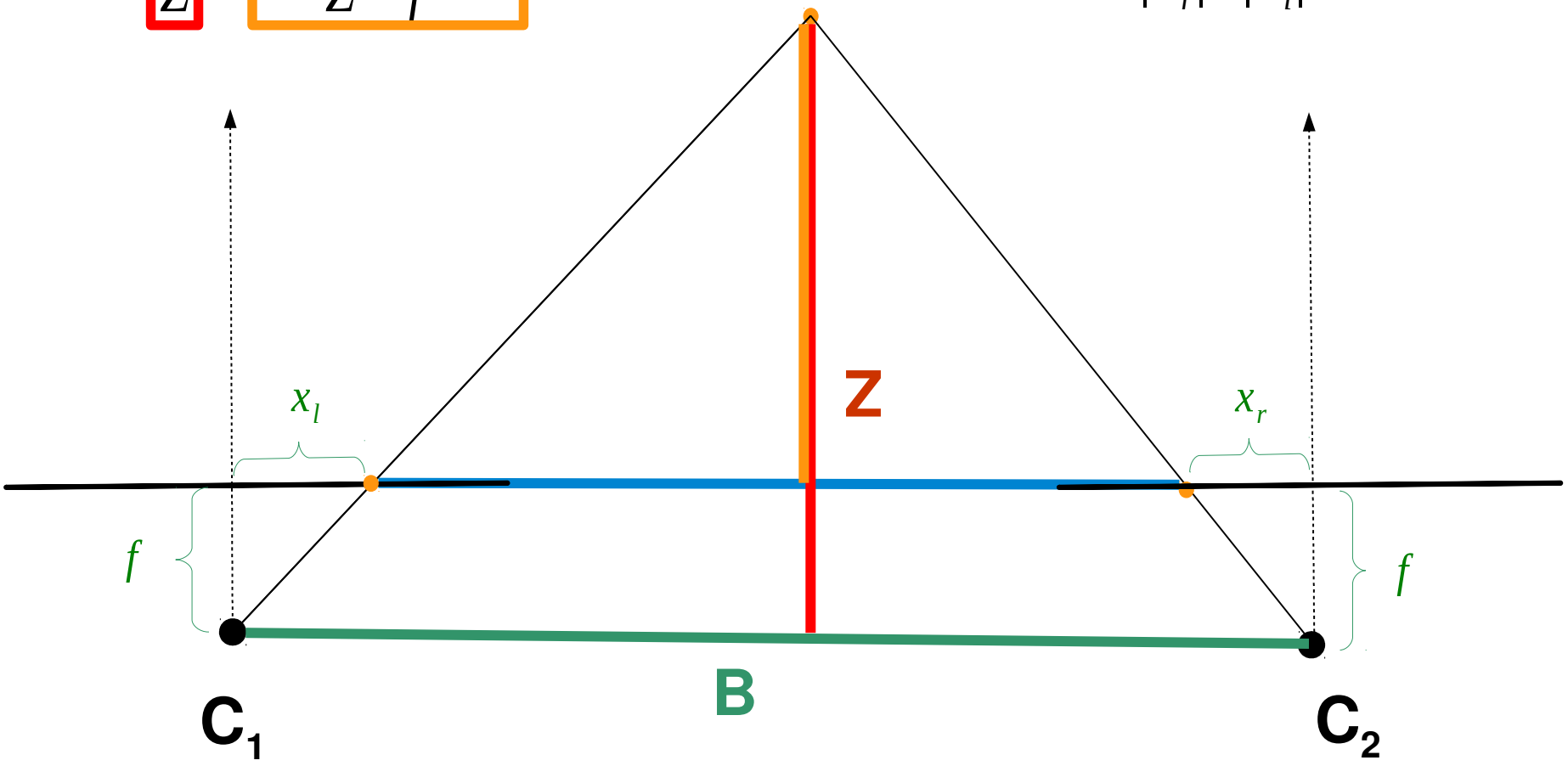
Triangulation: Top View



Triangulation: Top View

$$\frac{B}{Z} = \frac{B - |x_l| - |x_r|}{Z - f}$$

$$Z = \frac{fB}{|x_r| + |x_l|}$$

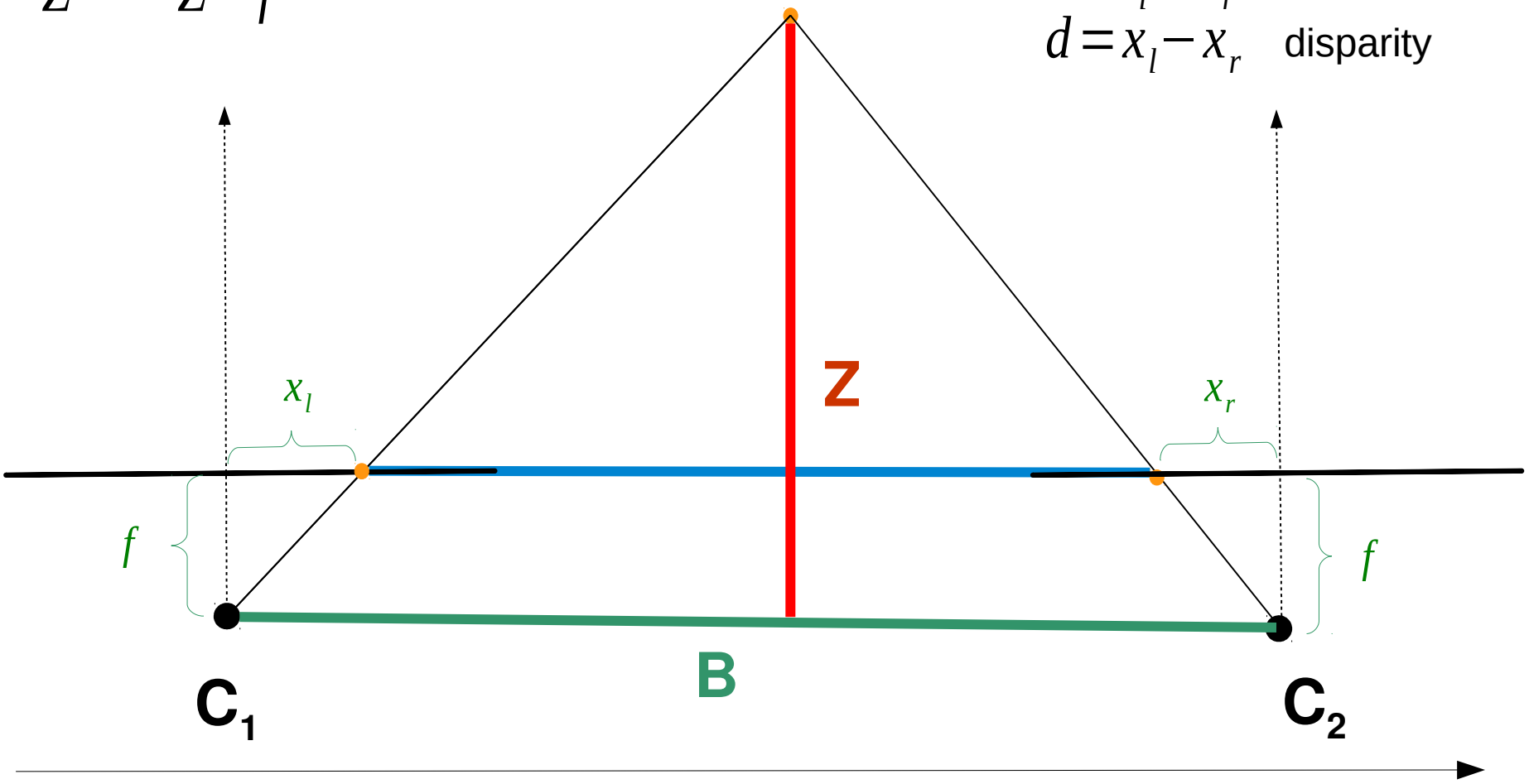


Triangulation: Top View

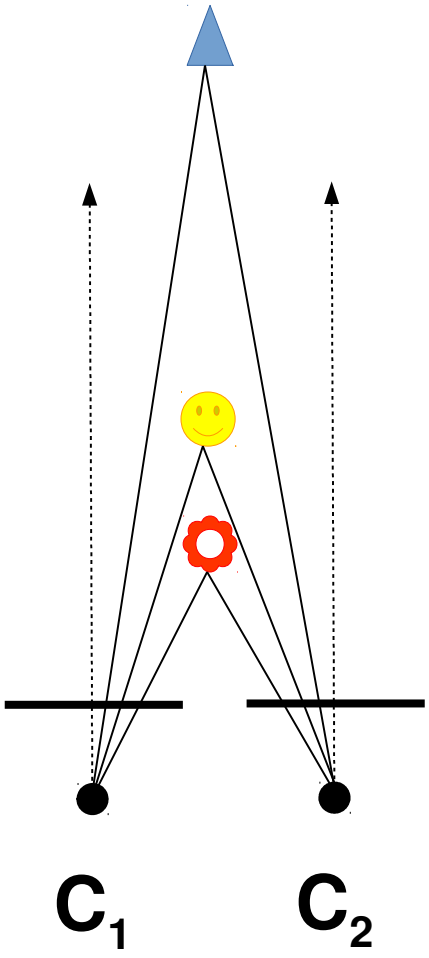
$$\frac{B}{Z} = \frac{B - x_l + x_r}{Z - f}$$

$$Z = \frac{fB}{x_l - x_r} = \frac{f\,B}{d}$$

$$d = x_l - x_r \quad \text{disparity}$$

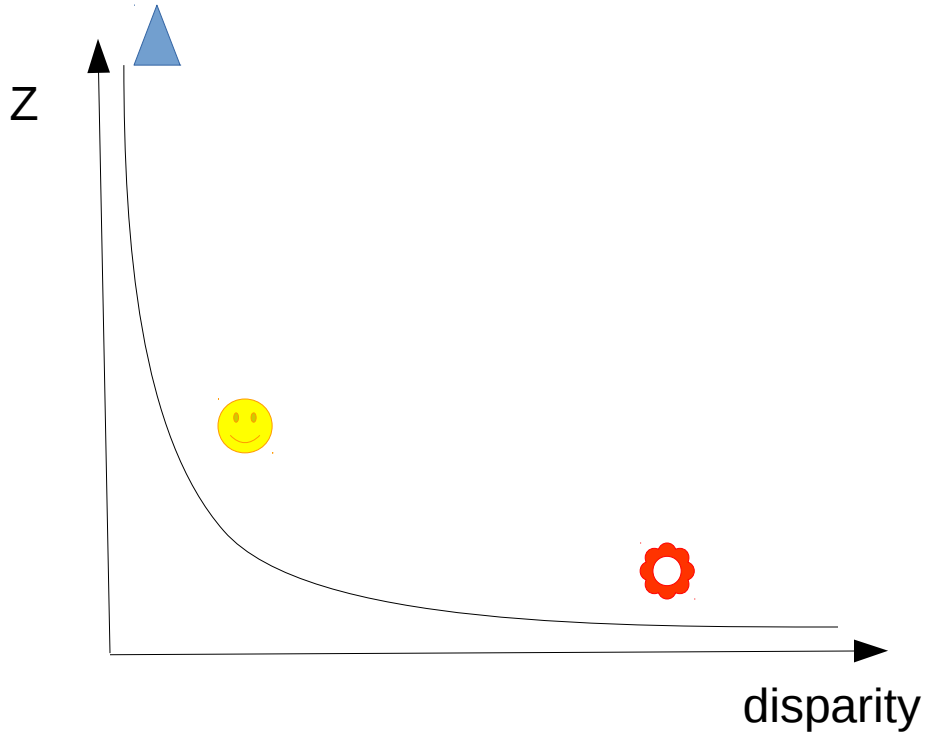


Disparity

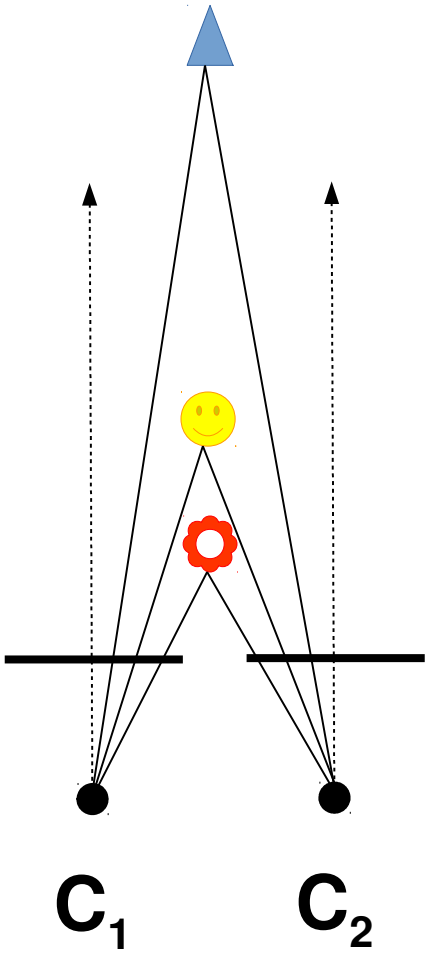


$$Z = \frac{fB}{x_l - x_r} = \frac{f\,B}{d}$$

$$d = x_l - x_r \quad \text{disparity}$$

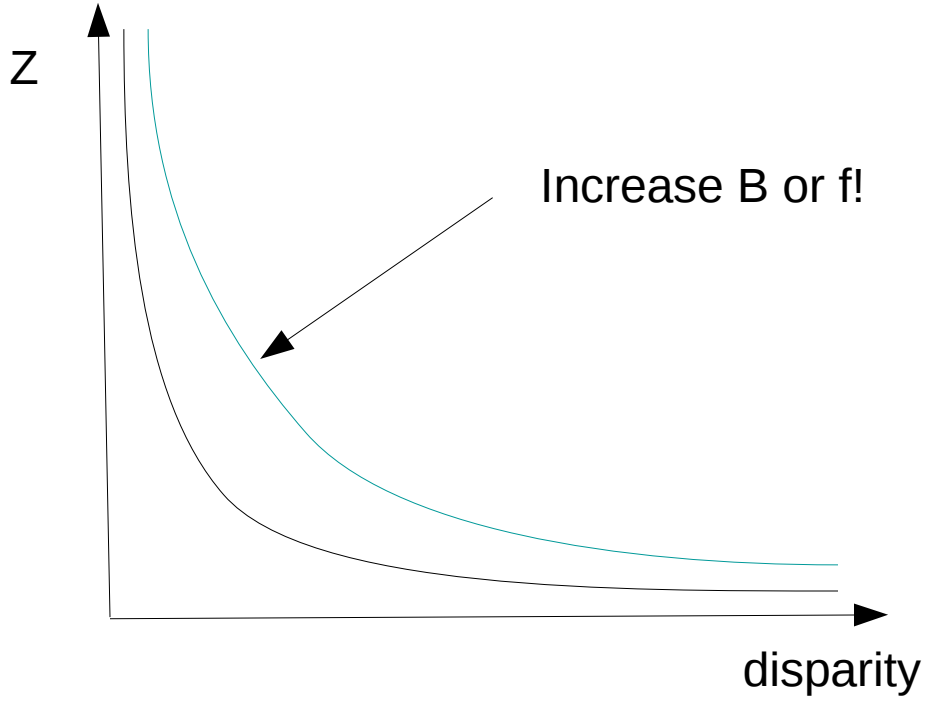


Disparity



$$Z = \frac{fB}{x_r - x_l} = \frac{f\,B}{d}$$

$$d = x_l - x_r \quad \text{disparity}$$



Stereo

- Two Cameras
  - Overlapping field of view
  - Known transformation between cameras
  - From disparity compute depth

[Bradski, Kaehler: Learning OpenCV, O'Reilly 2008]