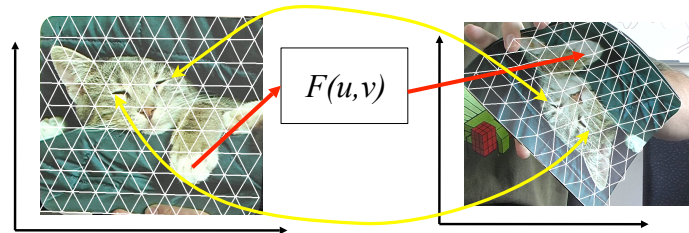


Surface Deformation



- Input:
 - Correspondences between a **reference** and **input image**.
 - No a priori pose information.
- Output:
 - A mapping **F** from model to input image.

Challenges

Non-rigid deformation without a priori pose:

- High dimensionality (200+ DOF)
- Large search space
- Wide baseline matching

Real-time requirements:

- Fast optimization scheme
- Fast matching

Deformable Model

Wide Baseline Matching

Regularization Term

$$\begin{aligned}\varepsilon(S) &= \varepsilon_C(S) + \lambda_D \varepsilon_D(S) \\ S &= (X, Y)\end{aligned}$$



Reference Image

Input Image

ε_D Regularization Term

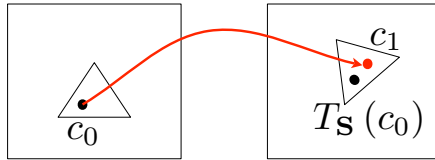
Quadratic function vertex coordinates:

$$\varepsilon_D(S) = \frac{1}{2} (X^T K X + Y^T K Y)$$

- penalizes non uniform scaling;
- penalizes excessive bending;
- allows perspective distortion;
- allows smooth surface deformation.

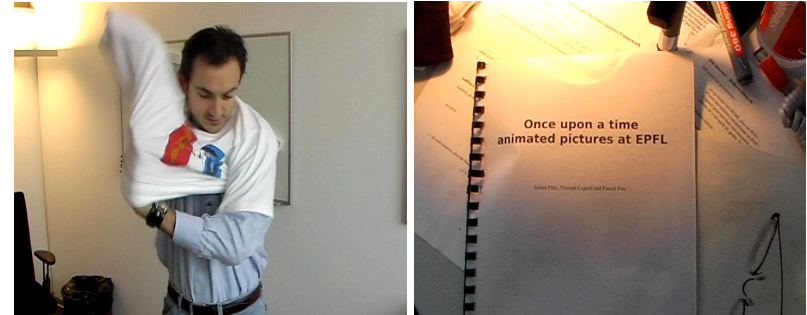


ε_C Correspondence Term



$$\varepsilon_C = - \sum_{c \in C} \|c_1 - T_S(c_0)\|^2$$

Real-Time Augmentation



Key Ingredients

- Classification-based approach to matching.
- Robust minimization scheme.
- Intensity ratios for illumination correction.