VIEWPOINT SIMULATION FOR POSE COMPUTATION

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Abstract

We want to improve the localization of cameras from a point model obtained through a SfM algorithm. To do so we add to the model photometric descriptors extracted from simulated images.

Motivation

- pose computation has numerous applications, in geo-localisation or augmented reality [2]

- SIFT descriptors are not robust to transformations induced by viewpoint changes

no correct matches between these two views

Problematic

- enhancing the model by adding descriptors extracted from simulated patches

- computing a pose using this enhanced model

Model enhancement

red points are reconstructed from the **red cameras** using a SfM algorithm

goal:

computing the pose of the image corresponding to the **blue camera**

algorithm:

- define a set of virtual viewpoints (**green cameras**) to be added to the model

- for each point of the model and for each virtual camera position generate a patch according to the surface normal at this point, using affine or homographic transformation [1, 3]

- extract a SIFT descriptor from this patch and associate it to the 3D point

Results

(a)

(b)

(c)
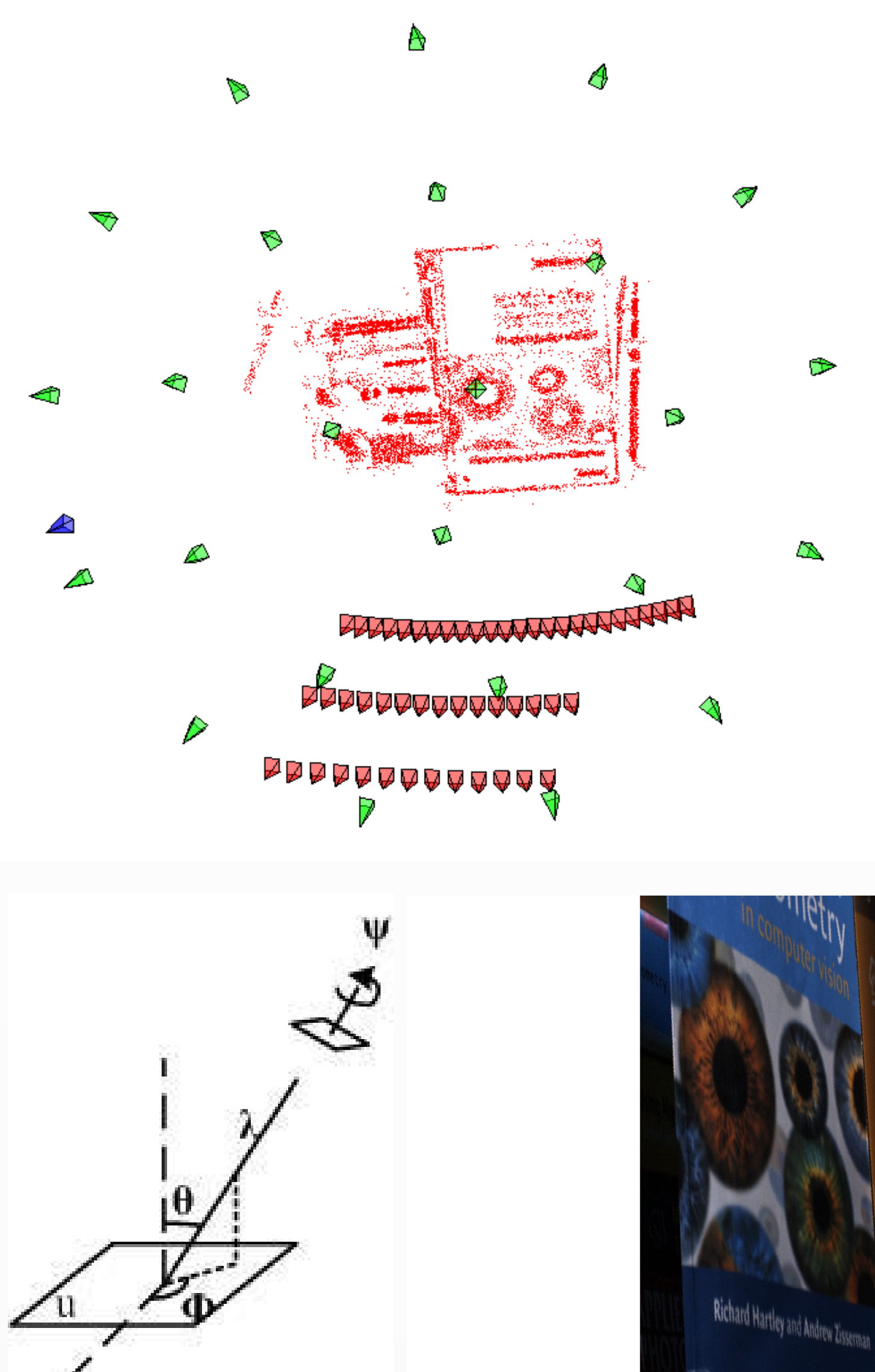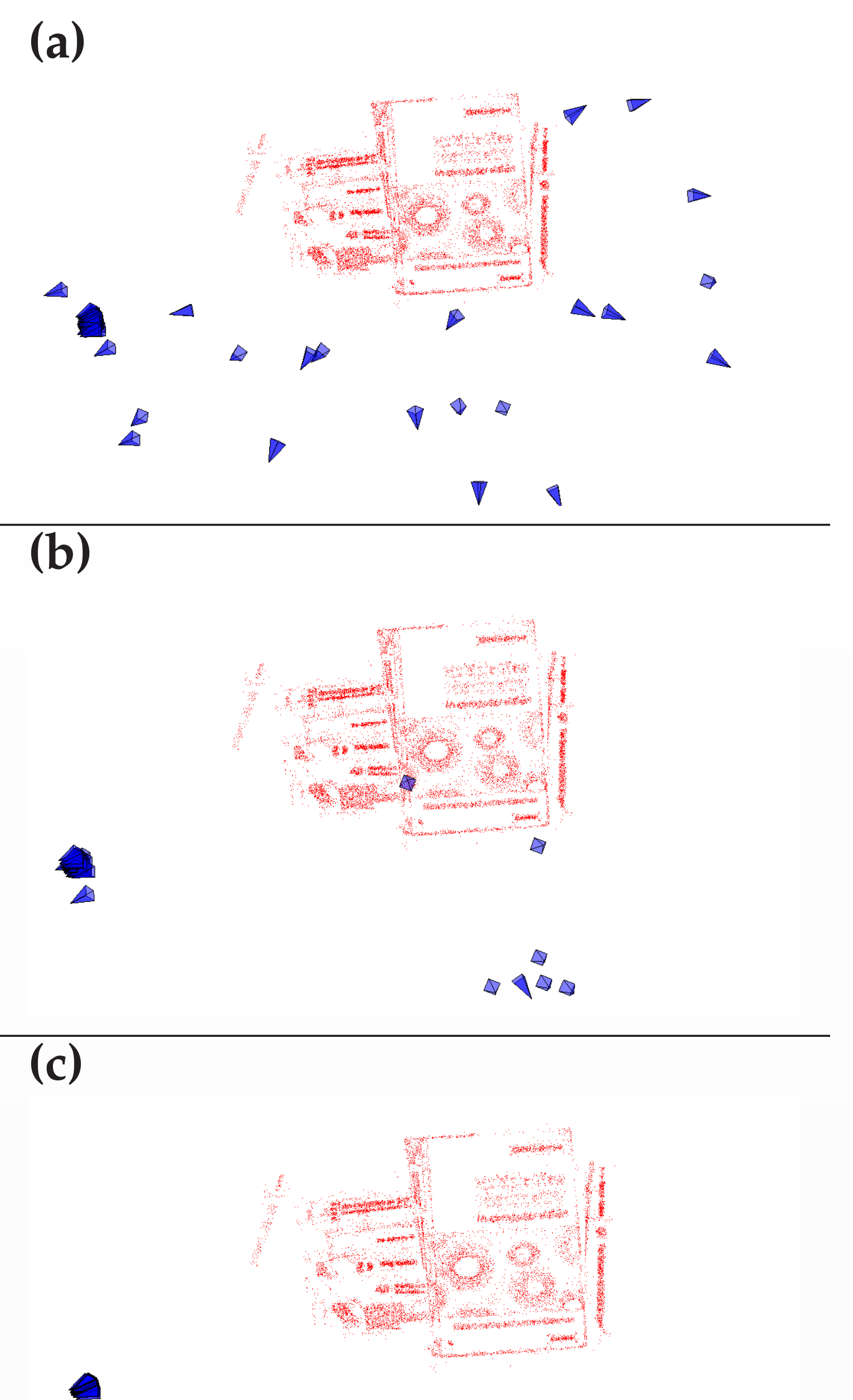
(a) *result of 100 pose computation for the same view using the initial model*

(b) *same experience using a model enhanced with affine simulations*

(c) *same as (b) with homographic simulations*

- our method improves the quality of computed poses

- it improves the inlier ratio in the 2D/3D matching from 23% in (a) to 30% in (b) and 37% in (c)

References

[1] R. I. Hartley and A. Zisserman. *Multiple View Geometry in Computer Vision*.

[2] David G. Lowe. Object recognition from local scale-invariant features. ICCV 99.

[3] Guoshen Yu and Jean-Michel Morel. ASIFT: An Algorithm for Fully Affine Invariant Comparison. *Image Processing On Line 2011*.

Matching

- a RANSAC approach is used to compute the 4 2D/3D matches needed for pose computation

- the matching is challenging because of the amount of descriptors; we used brute force but further work on a better matching framework is needed