Accurate Camera Registration in Urban Environments Using High-Level Feature Matching

BMVC 2017 Submission # 115
Supplementary Material

1 Introduction

In the following, we provide additional results and information for our approach, which could not be included to the paper. In particular, we provide an evaluation on the number of pose evaluations required to estimate the best pose for each image in Section 2. In addition, we illustrate the whole process by showing intermediate steps and results for each image in Section 3.

2 Numbers of Posterior Evaluations

The numbers for all 40 test images are summarized in Fig. 1. This number is often very small, but can become large for the most complex scenes.

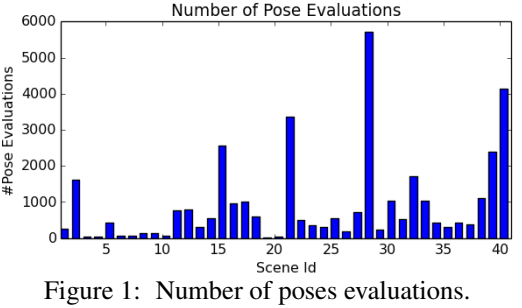


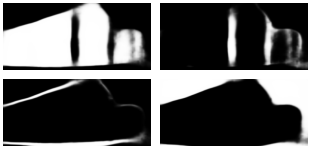
Figure 1: Number of poses evaluations.

3 Intermediate Results

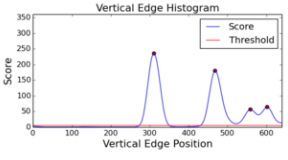
(a) Input image.

(b) Rectified input image.

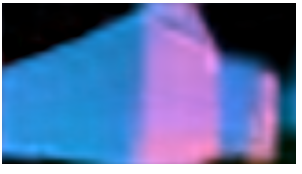
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).



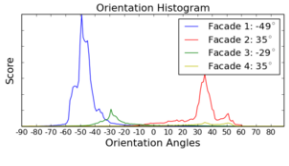
(d) Probability maps (façade, vertical edge, horizontal edge, background).



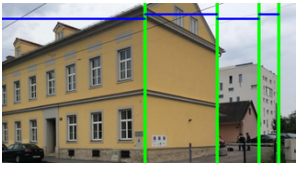
(e) Vertical edge histogram.



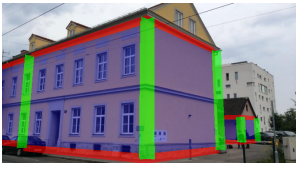
(f) Façade normal estimation.



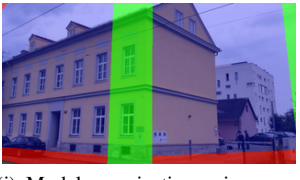
(g) Orientation histograms for detected façades.



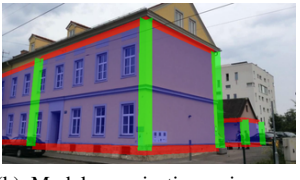
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



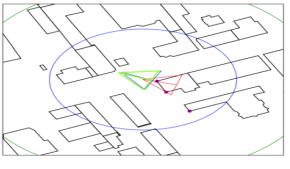
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



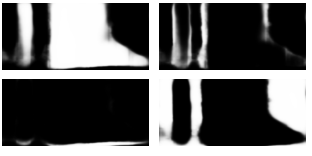
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #1 - Best solution was found using 3 corner correspondences.

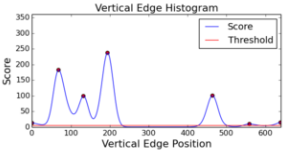
(a) Input image.

(b) Rectified input image.

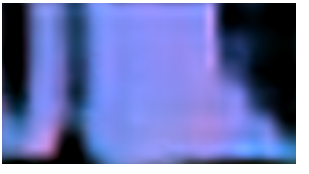
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).



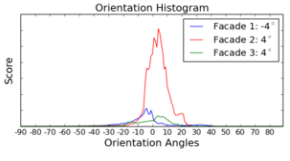
(d) Probability maps (façade, vertical edge, horizontal edge, background).



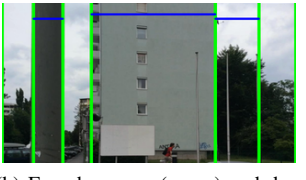
(e) Vertical edge histogram.



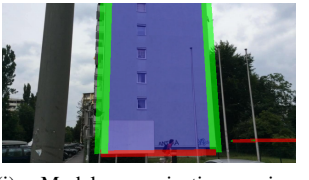
(f) Façade normal estimation.



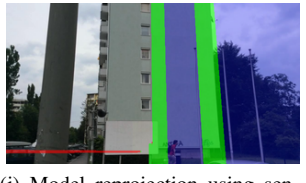
(g) Orientation histograms for detected façades.



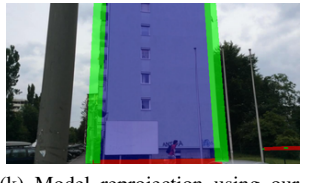
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



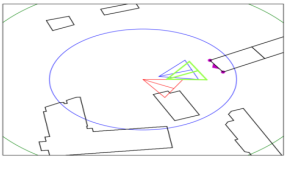
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



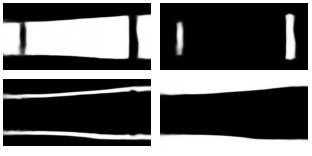
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #2 - Best solution was found using 2 corner correspondences and one façade normal.

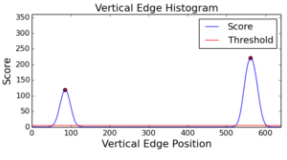
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

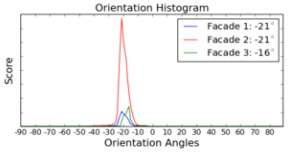


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.



(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.

(l) Map (blue:ground truth, red:sensors, green:our method).

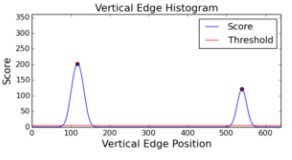
Scene #3 - Best solution was found using 2 corner correspondences and one façade normal.

(a) Input image.

(b) Rectified input image.

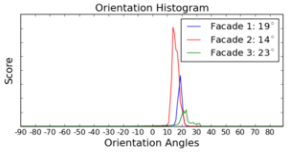
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

(d) Probability maps (façade, vertical edge, horizontal edge, background).



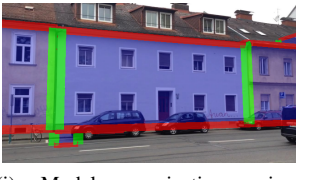
(e) Vertical edge histogram.

(f) Façade normal estimation.

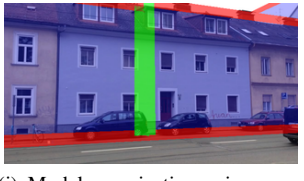


(g) Orientation histograms for detected façades.

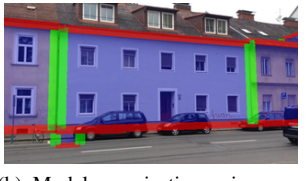
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



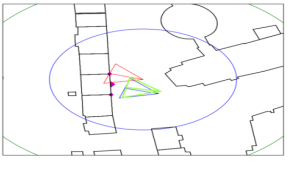
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



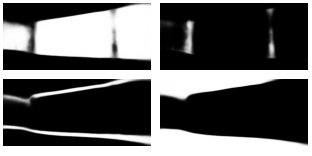
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #4 - Best solution was found using 2 corner correspondences and one façade normal.

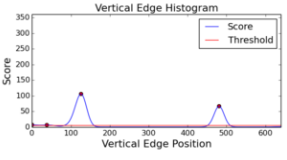
(a) Input image.

(b) Rectified input image.

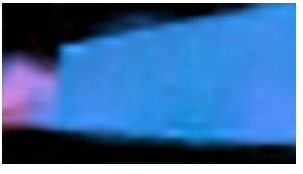
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).



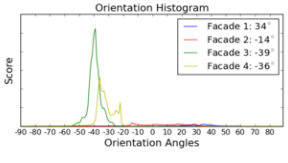
(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.



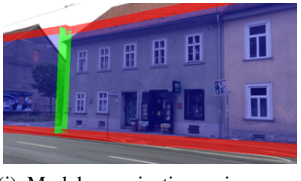
(f) Façade normal estimation.



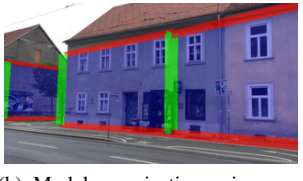
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

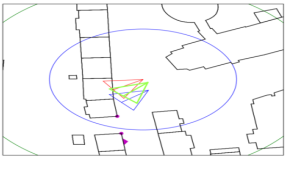
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



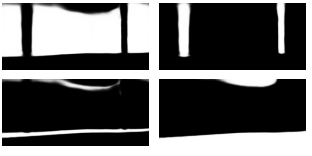
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #5 - Best solution was found using 2 corner correspondences and one façade normal.

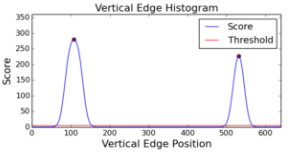
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

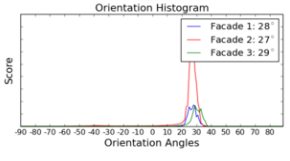


(d) Probability maps (façade, vertical edge, horizontal edge, background).



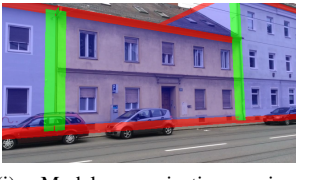
(e) Vertical edge histogram.

(f) Façade normal estimation.

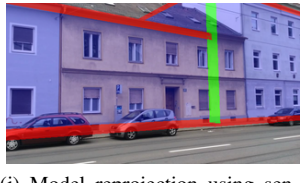


(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

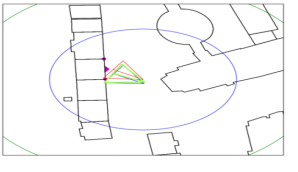


(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



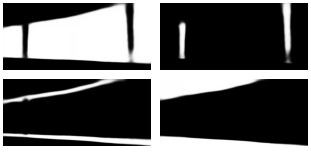
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #6 - Best solution was found using 2 corner correspondences and one façade normal.

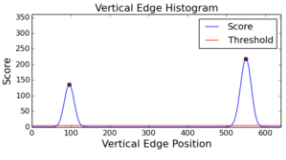
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

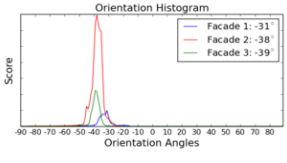


(d) Probability maps (façade, vertical edge, horizontal edge, background).



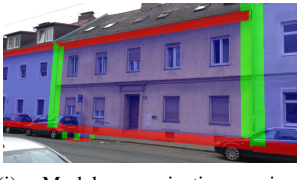
(e) Vertical edge histogram.

(f) Façade normal estimation.



(g) Orientation histograms for detected façades.

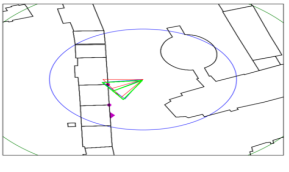
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



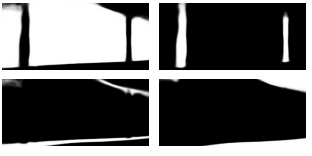
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #7 - Best solution was found using 2 corner correspondences and one façade normal.

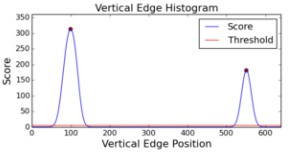
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

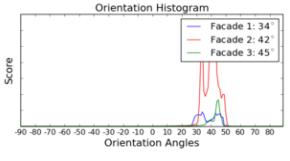


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

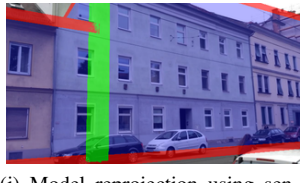
(f) Façade normal estimation.



(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.

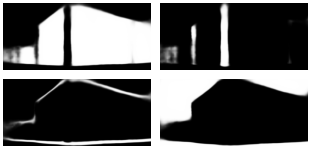
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #8 - Best solution was found using 2 corner correspondences and one façade normal.

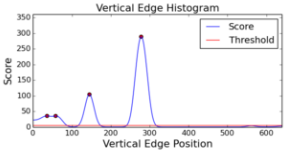
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

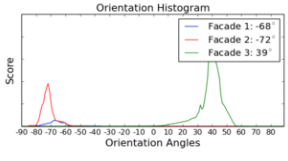


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.



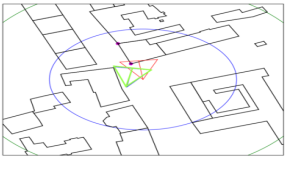
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.

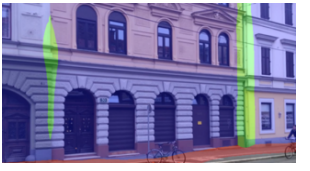


(l) Map (blue:ground truth, red:sensors, green:our method).

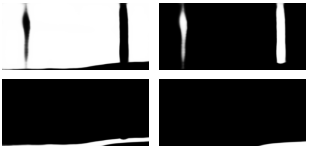
Scene #9 - Best solution was found using 3 corner correspondences.

(a) Input image.

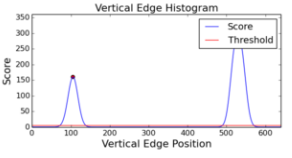
(b) Rectified input image.



(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

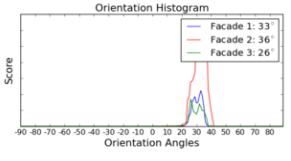


(d) Probability maps (façade, vertical edge, horizontal edge, background).



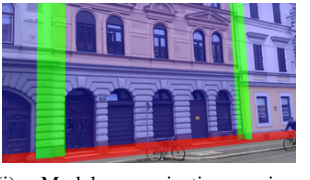
(e) Vertical edge histogram.

(f) Façade normal estimation.

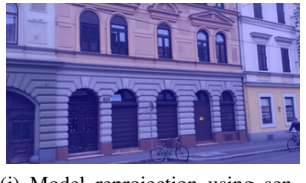


(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

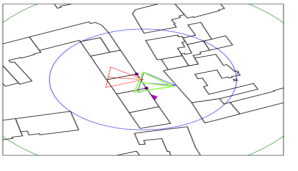


(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.

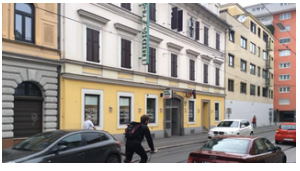
(k) Model reprojection using our method's estimate.



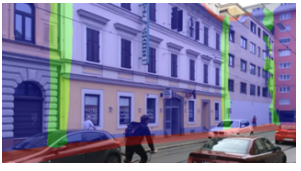
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #10 - Best solution was found using 2 corner correspondences and one façade normal.

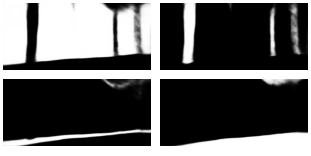
(a) Input image.



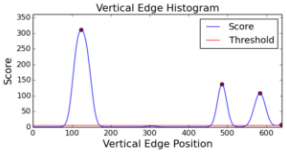
(b) Rectified input image.



(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

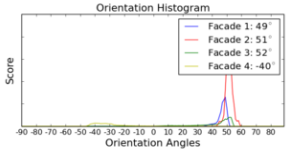


(d) Probability maps (façade, vertical edge, horizontal edge, background).

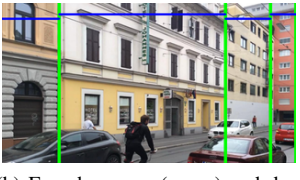


(e) Vertical edge histogram.

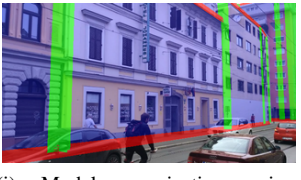
(f) Façade normal estimation.



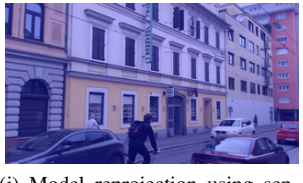
(g) Orientation histograms for detected façades.



(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

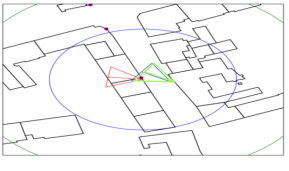


(i) Model reprojection using ground truth pose.



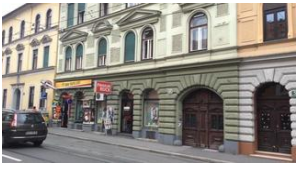
(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.

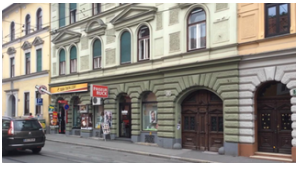


(l) Map (blue:ground truth, red:sensors, green:our method).

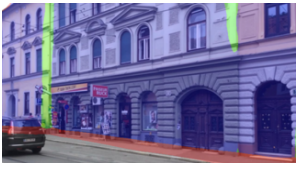
Scene #11 - Best solution was found using 3 corner correspondences.



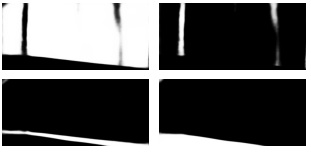
(a) Input image.



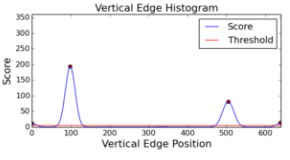
(b) Rectified input image.



(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

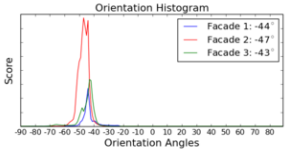


(d) Probability maps (façade, vertical edge, horizontal edge, background).

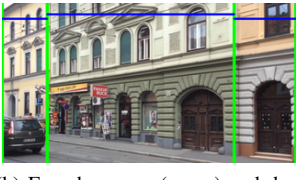


(e) Vertical edge histogram.

(f) Façade normal estimation.

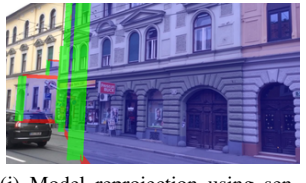


(g) Orientation histograms for detected façades.



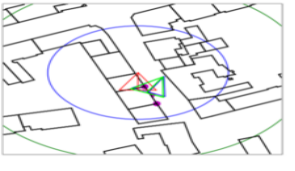
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



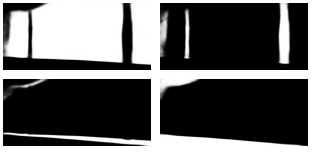
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #12 - Best solution was found using 2 corner correspondences and one façade normal.

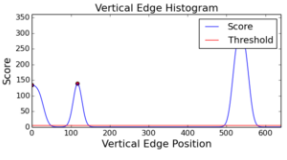
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

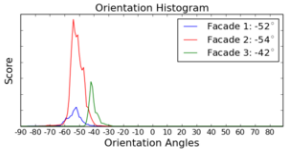


(d) Probability maps (façade, vertical edge, horizontal edge, background).

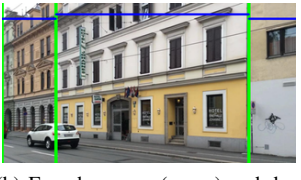


(e) Vertical edge histogram.

(f) Façade normal estimation.

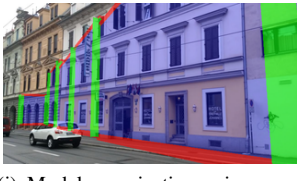


(g) Orientation histograms for detected façades.

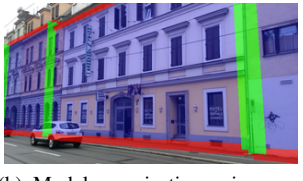


(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

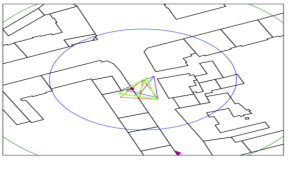
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



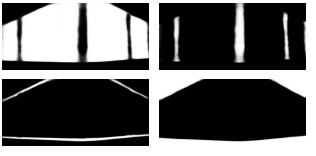
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #13 - Best solution was found using 2 corner correspondences and one façade normal.

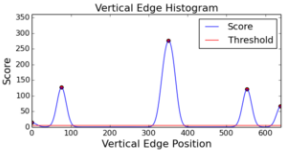
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

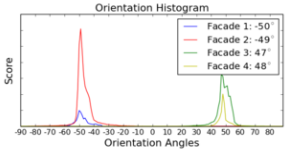


(d) Probability maps (façade, vertical edge, horizontal edge, background).



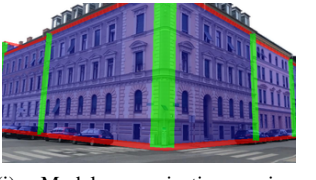
(e) Vertical edge histogram.

(f) Façade normal estimation.

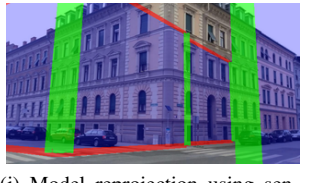


(g) Orientation histograms for detected façades.

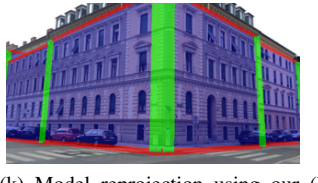
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



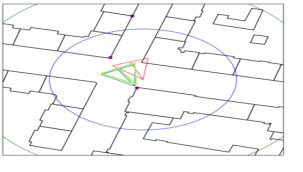
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



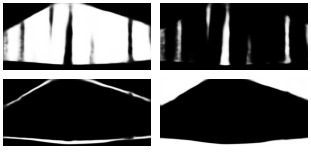
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #14 - Best solution was found using 3 corner correspondences.

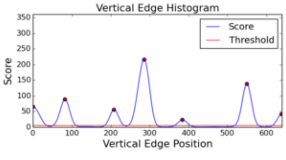
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

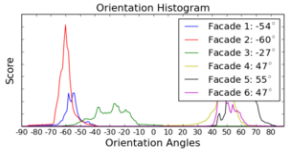


(d) Probability maps (façade, vertical edge, horizontal edge, background).



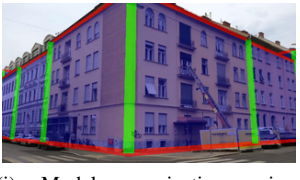
(e) Vertical edge histogram.

(f) Façade normal estimation.



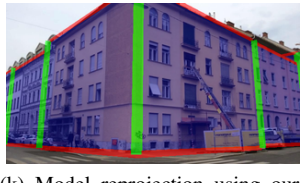
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

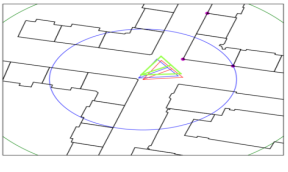


(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



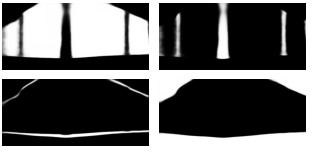
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #15 - Best solution was found using 3 corner correspondences.

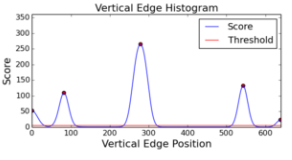
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

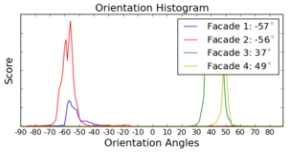


(d) Probability maps (façade, vertical edge, horizontal edge, background).



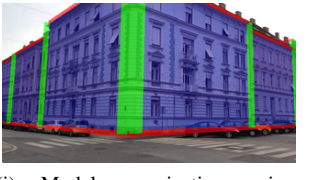
(e) Vertical edge histogram.

(f) Façade normal estimation.

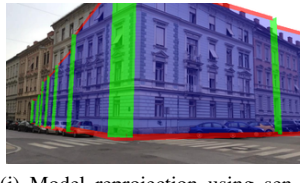


(g) Orientation histograms for detected façades.

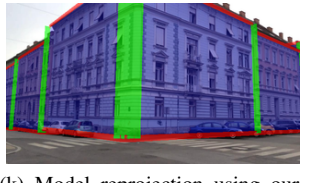
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



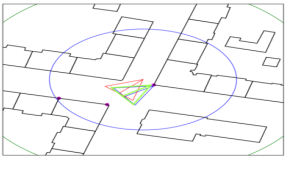
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



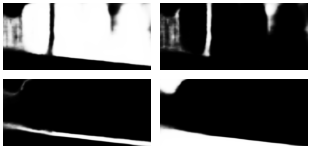
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #16 - Best solution was found using 3 corner correspondences.

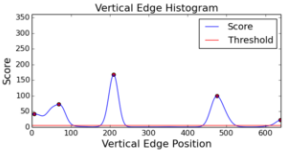
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

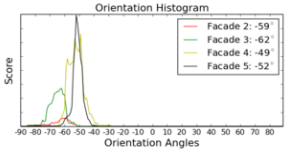


(d) Probability maps (façade, vertical edge, horizontal edge, background).

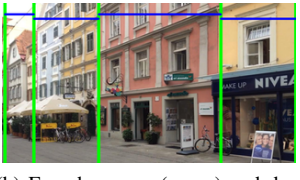


(e) Vertical edge histogram.

(f) Façade normal estimation.

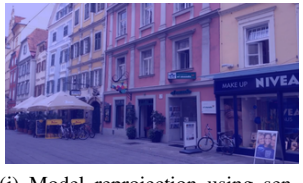


(g) Orientation histograms for detected façades.



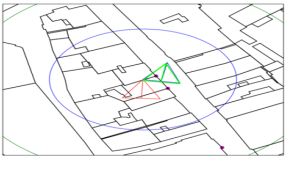
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



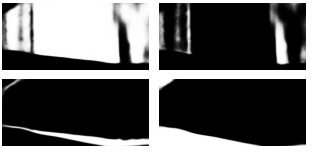
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #17 - Best solution was found using 2 corner correspondences and one façade normal.

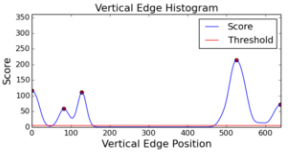
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

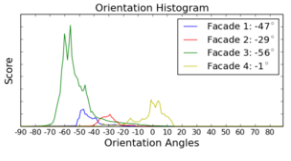


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.



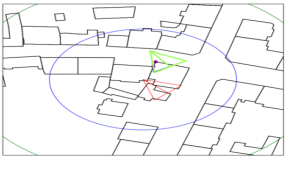
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



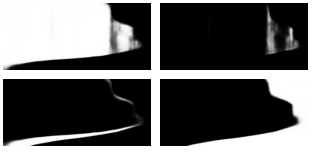
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #18 - Best solution was found using 3 corner correspondences.

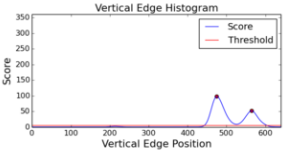
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

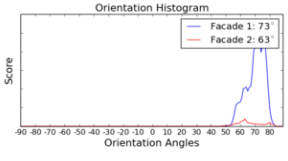


(d) Probability maps (façade, vertical edge, horizontal edge, background).



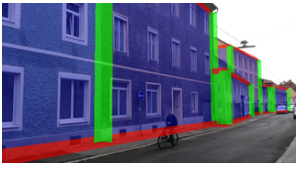
(e) Vertical edge histogram.

(f) Façade normal estimation.



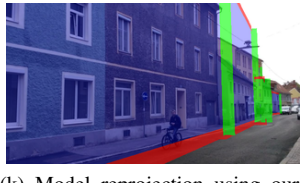
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

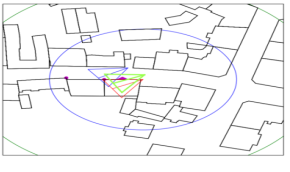


(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



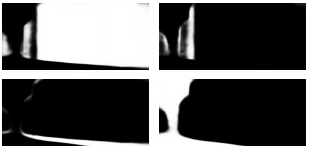
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #19 - Best solution was found using 2 corner correspondences and one façade normal.

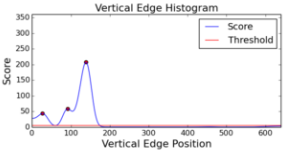
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

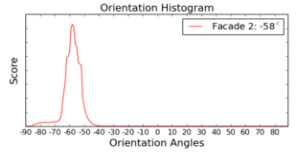


(d) Probability maps (façade, vertical edge, horizontal edge, background).

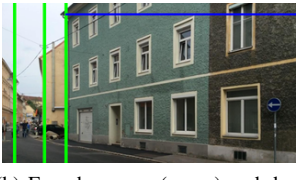


(e) Vertical edge histogram.

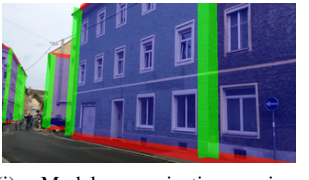
(f) Façade normal estimation.



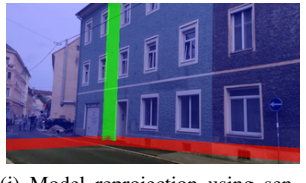
(g) Orientation histograms for detected façades.



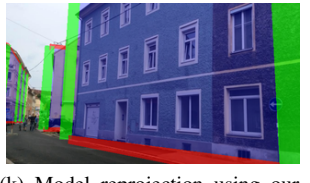
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.

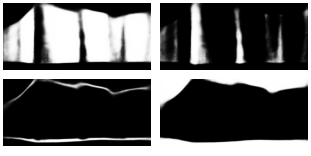
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #20 - Best solution was found using 3 corner correspondences.

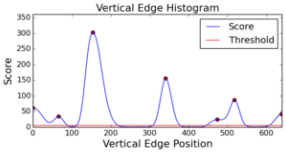
(a) Input image.

(b) Rectified input image.

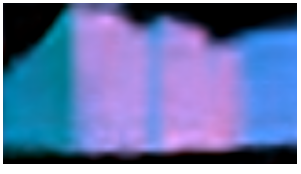
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).



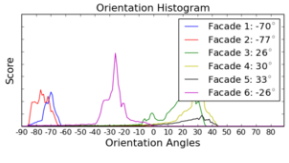
(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.



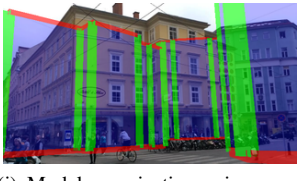
(f) Façade normal estimation.



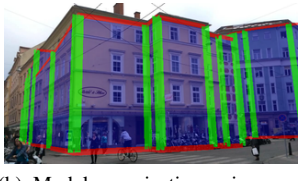
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

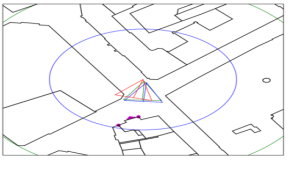
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



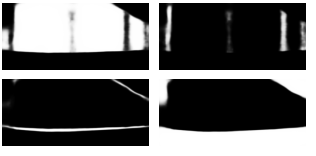
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #21 - Best solution was found using 3 corner correspondences.

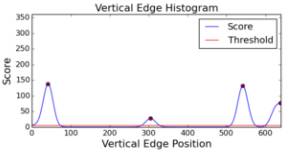
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

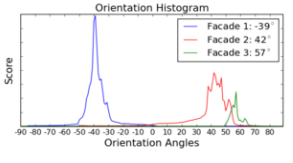


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.



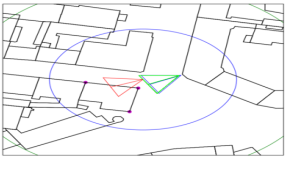
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



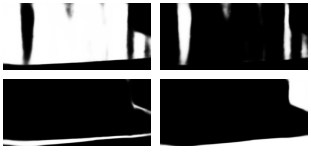
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #22 - Best solution was found using 3 corner correspondences.

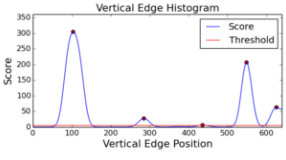
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

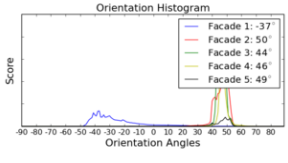


(d) Probability maps (façade, vertical edge, horizontal edge, background).

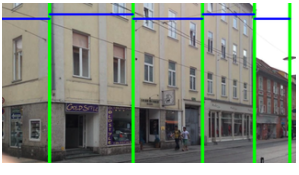


(e) Vertical edge histogram.

(f) Façade normal estimation.



(g) Orientation histograms for detected façades.



(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.

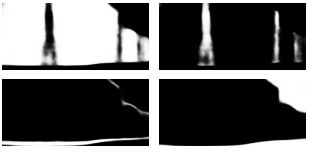
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #23 - Best solution was found using 3 corner correspondences.

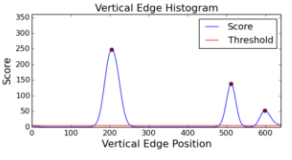
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

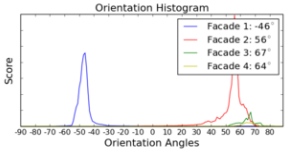


(d) Probability maps (façade, vertical edge, horizontal edge, background).



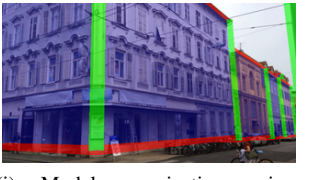
(e) Vertical edge histogram.

(f) Façade normal estimation.



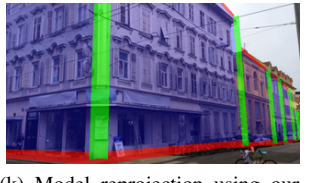
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

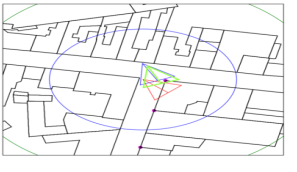


(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



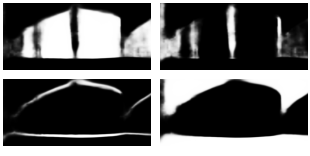
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #24 - Best solution was found using 2 corner correspondences and one façade normal.

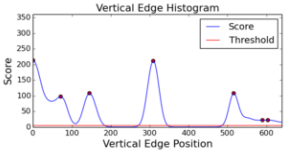
(a) Input image.

(b) Rectified input image.

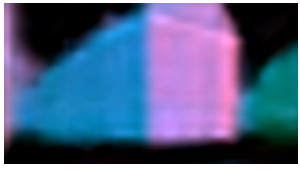
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).



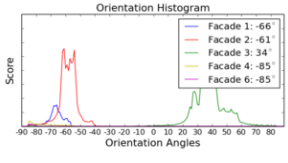
(d) Probability maps (façade, vertical edge, horizontal edge, background).



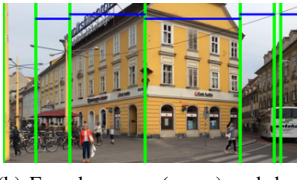
(e) Vertical edge histogram.



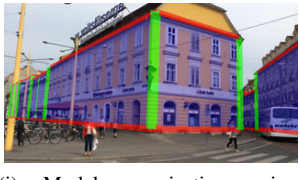
(f) Façade normal estimation.



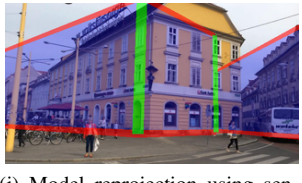
(g) Orientation histograms for detected façades.



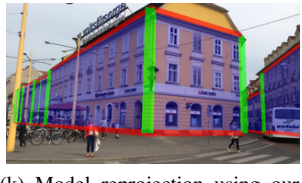
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



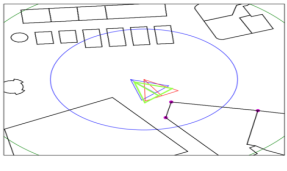
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



(l) Map (blue:ground truth, red:sensors, green:our method).

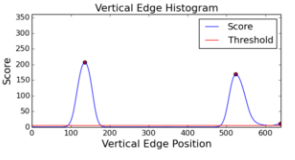
Scene #25 - Best solution was found using 3 corner correspondences.

(a) Input image.

(b) Rectified input image.

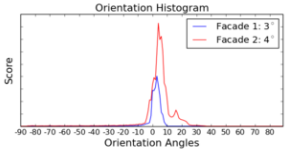
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.

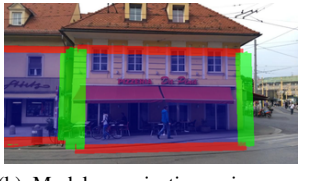


(g) Orientation histograms for detected façades.

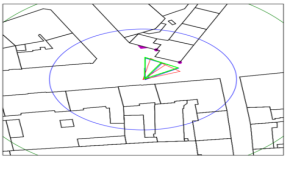
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



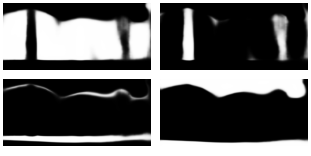
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #26 - Best solution was found using 2 corner correspondences and one façade normal.

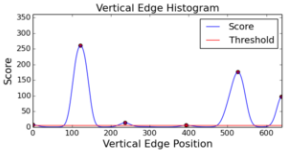
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

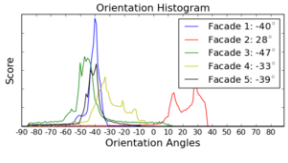


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

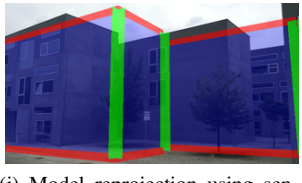
(f) Façade normal estimation.



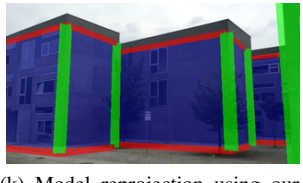
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

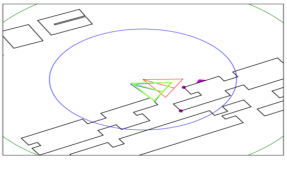
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



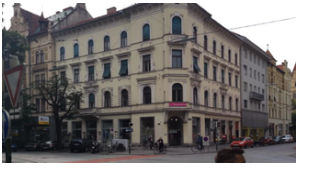
(k) Model reprojection using our method's estimate.



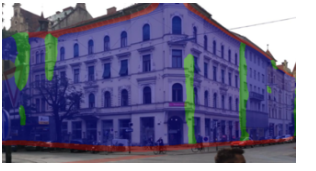
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #27 - Best solution was found using 2 corner correspondences and one façade normal.

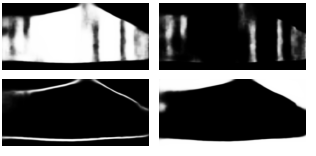
(a) Input image.



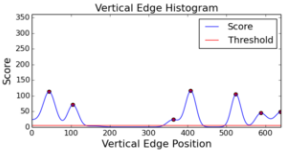
(b) Rectified input image.



(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

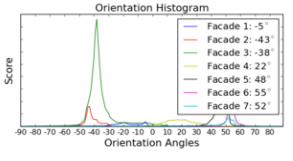


(d) Probability maps (façade, vertical edge, horizontal edge, background).

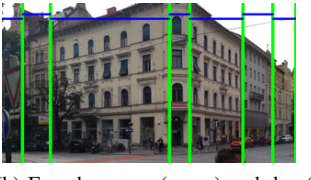


(e) Vertical edge histogram.

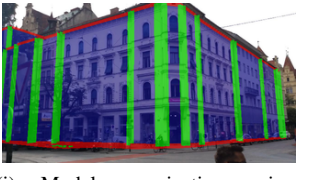
(f) Façade normal estimation.



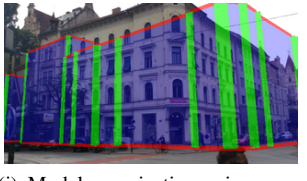
(g) Orientation histograms for detected façades.



(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

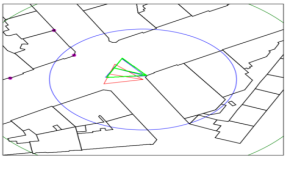


(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



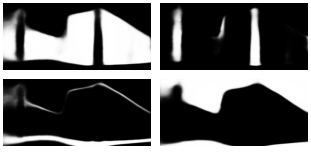
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #28 - Best solution was found using 3 corner correspondences.

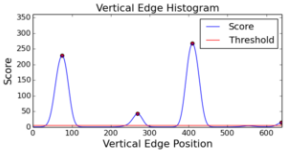
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

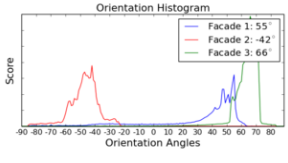


(d) Probability maps (façade, vertical edge, horizontal edge, background).



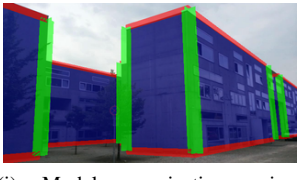
(e) Vertical edge histogram.

(f) Façade normal estimation.

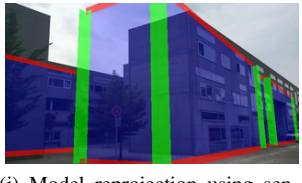


(g) Orientation histograms for detected façades.

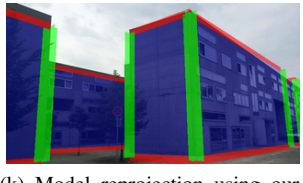
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



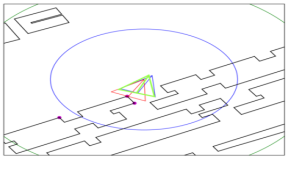
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



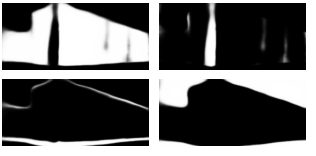
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #29 - Best solution was found using 3 corner correspondences.

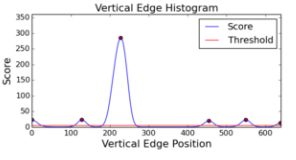
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

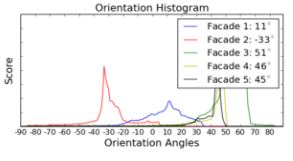


(d) Probability maps (façade, vertical edge, horizontal edge, background).

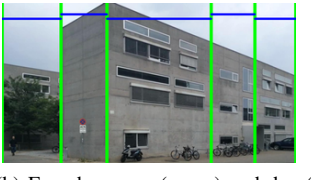


(e) Vertical edge histogram.

(f) Façade normal estimation.

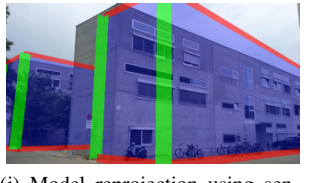


(g) Orientation histograms for detected façades.

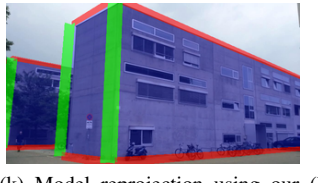


(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

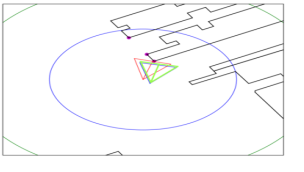
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



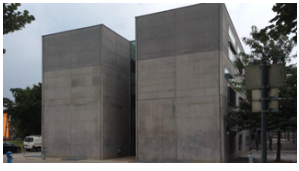
(k) Model reprojection using our method's estimate.



(l) Map (blue:ground truth, red:sensors, green:our method).

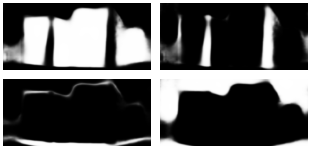
Scene #30 - Best solution was found using 3 corner correspondences.

(a) Input image.

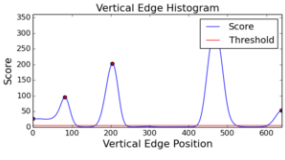


(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

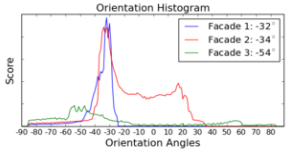


(d) Probability maps (façade, vertical edge, horizontal edge, background).

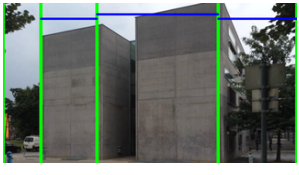


(e) Vertical edge histogram.

(f) Façade normal estimation.

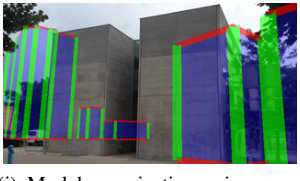


(g) Orientation histograms for detected façades.

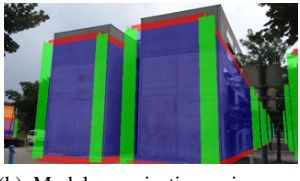


(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

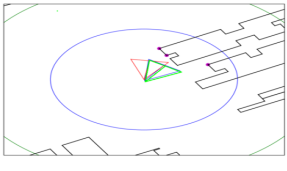
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.

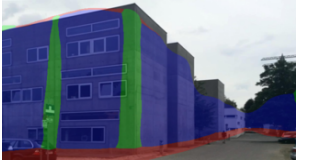


(l) Map (blue:ground truth, red:sensors, green:our method).

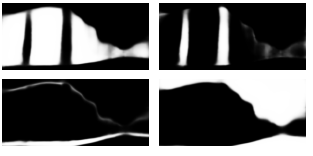
Scene #31 - Best solution was found using 3 corner correspondences.

(a) Input image.

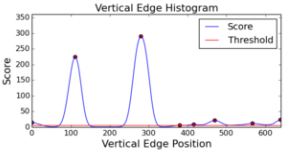
(b) Rectified input image.



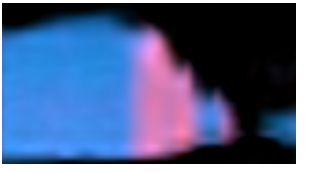
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).



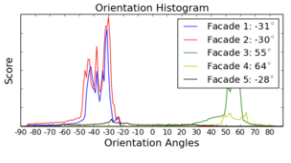
(d) Probability maps (façade, vertical edge, horizontal edge, background).



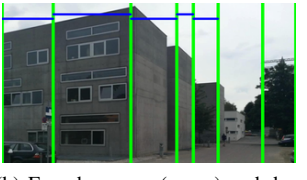
(e) Vertical edge histogram.



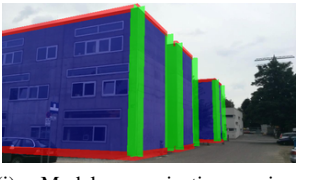
(f) Façade normal estimation.



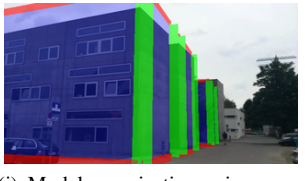
(g) Orientation histograms for detected façades.



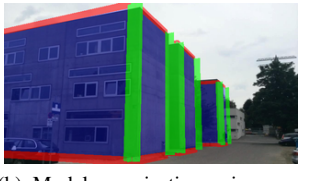
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



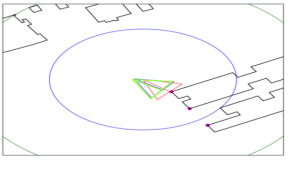
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.

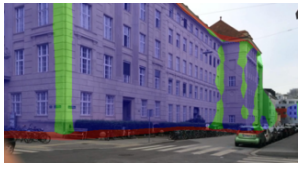


(l) Map (blue:ground truth, red:sensors, green:our method).

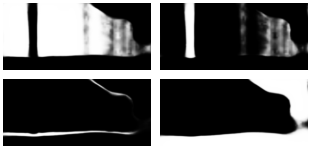
Scene #32 - Best solution was found using 3 corner correspondences.

(a) Input image.

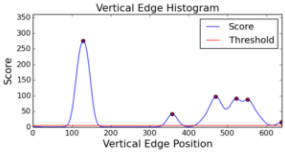
(b) Rectified input image.



(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

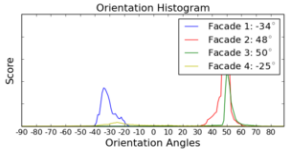


(d) Probability maps (façade, vertical edge, horizontal edge, background).

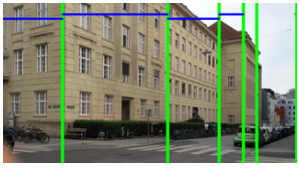


(e) Vertical edge histogram.

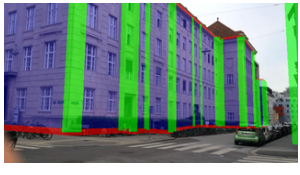
(f) Façade normal estimation.



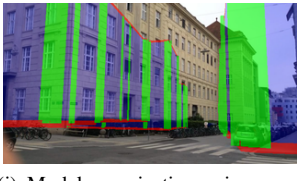
(g) Orientation histograms for detected façades.



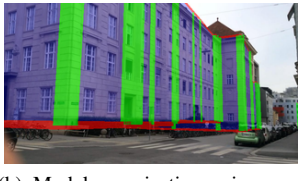
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



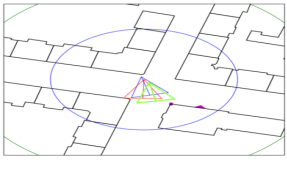
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



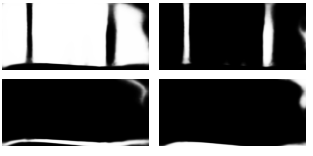
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #33 - Best solution was found using 2 corner correspondences and one façade normal.

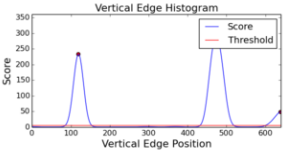
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

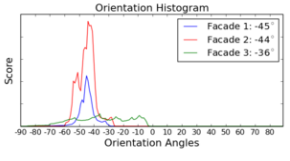


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.



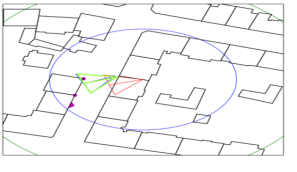
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



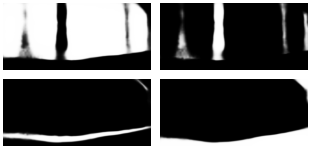
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #34 - Best solution was found using 2 corner correspondences and one façade normal.

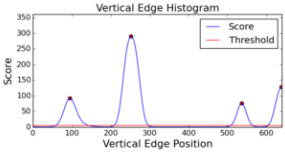
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

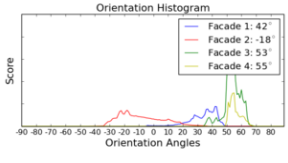


(d) Probability maps (façade, vertical edge, horizontal edge, background).



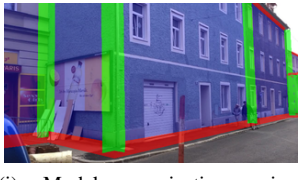
(e) Vertical edge histogram.

(f) Façade normal estimation.



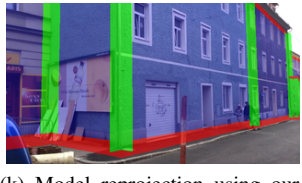
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.

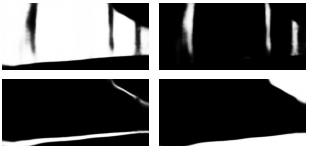
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #35 - Best solution was found using 2 corner correspondences and one façade normal.

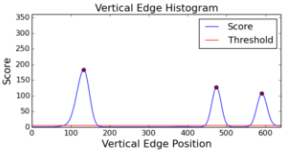
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

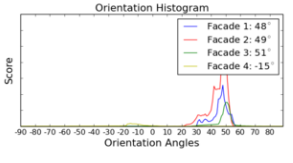


(d) Probability maps (façade, vertical edge, horizontal edge, background).



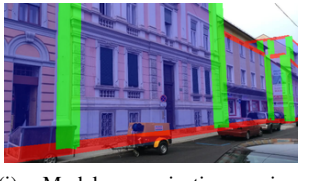
(e) Vertical edge histogram.

(f) Façade normal estimation.

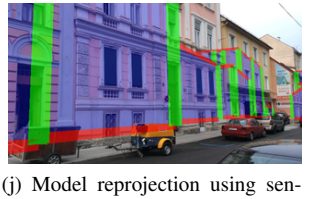


(g) Orientation histograms for detected façades.

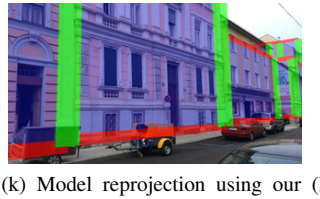
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.



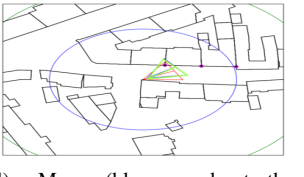
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



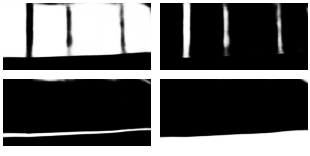
(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #36 - Best solution was found using 2 corner correspondences and one façade normal.

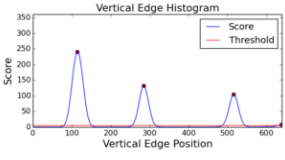
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

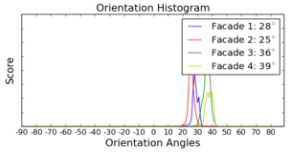


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

(f) Façade normal estimation.

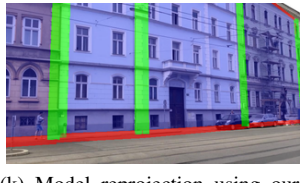


(g) Orientation histograms for detected façades.

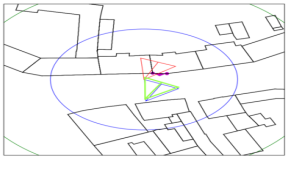
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.

(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



(l) Map (blue:ground truth, red:sensors, green:our method).

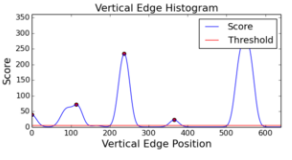
Scene #37 - Best solution was found using 2 corner correspondences and one façade normal.

(a) Input image.

(b) Rectified input image.

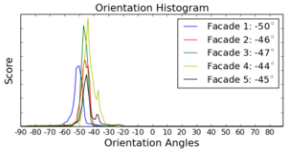
(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

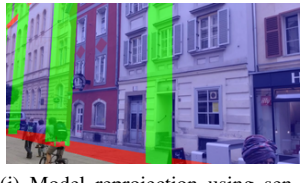
(f) Façade normal estimation.



(g) Orientation histograms for detected façades.

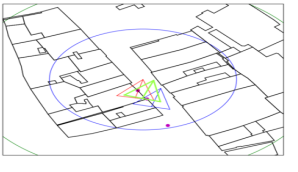
(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

(i) Model reprojection using ground truth pose.



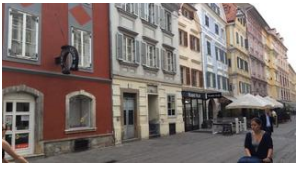
(j) Model reprojection using sensors estimation.

(k) Model reprojection using our method's estimate.



(l) Map (blue:ground truth, red:sensors, green:our method).

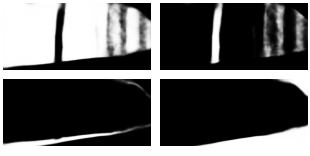
Scene #38 - Best solution was found using 2 corner correspondences and one façade normal.



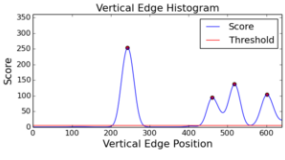
(a) Input image.

(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

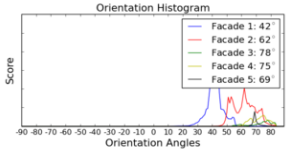


(d) Probability maps (façade, vertical edge, horizontal edge, background).



(e) Vertical edge histogram.

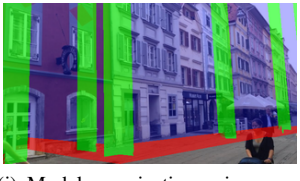
(f) Façade normal estimation.



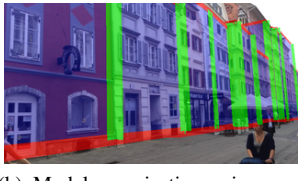
(g) Orientation histograms for detected façades.

(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

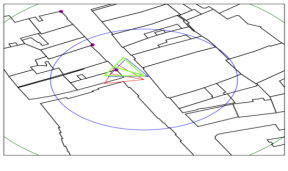
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



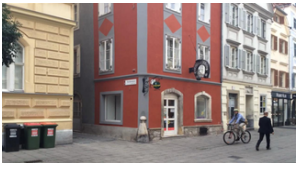
(k) Model reprojection using our method's estimate.



(l) Map (blue:ground truth, red:sensors, green:our method).

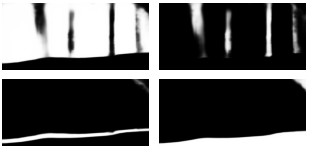
Scene #39 - Best solution was found using 3 corner correspondences.

(a) Input image.

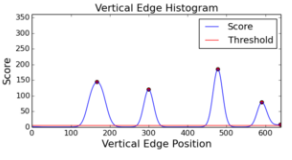


(b) Rectified input image.

(c) Segmentation Result (blue: façade, green: vertical edge, red: horizontal edge).

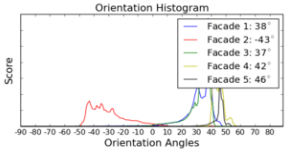


(d) Probability maps (façade, vertical edge, horizontal edge, background).

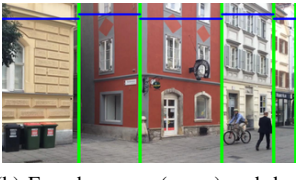


(e) Vertical edge histogram.

(f) Façade normal estimation.

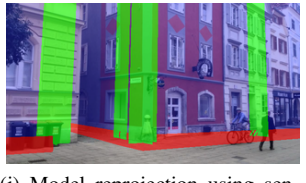


(g) Orientation histograms for detected façades.

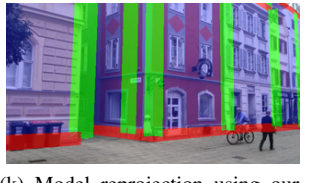


(h) Found corners (green) and defined façades (blue) shown over the rectified input image.

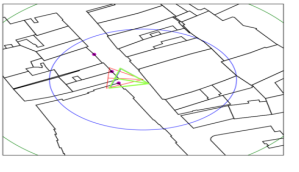
(i) Model reprojection using ground truth pose.



(j) Model reprojection using sensors estimation.



(k) Model reprojection using our method's estimate.



(l) Map (blue:ground truth, red:sensors, green:our method).

Scene #40 - Best solution was found using 3 corner correspondences.