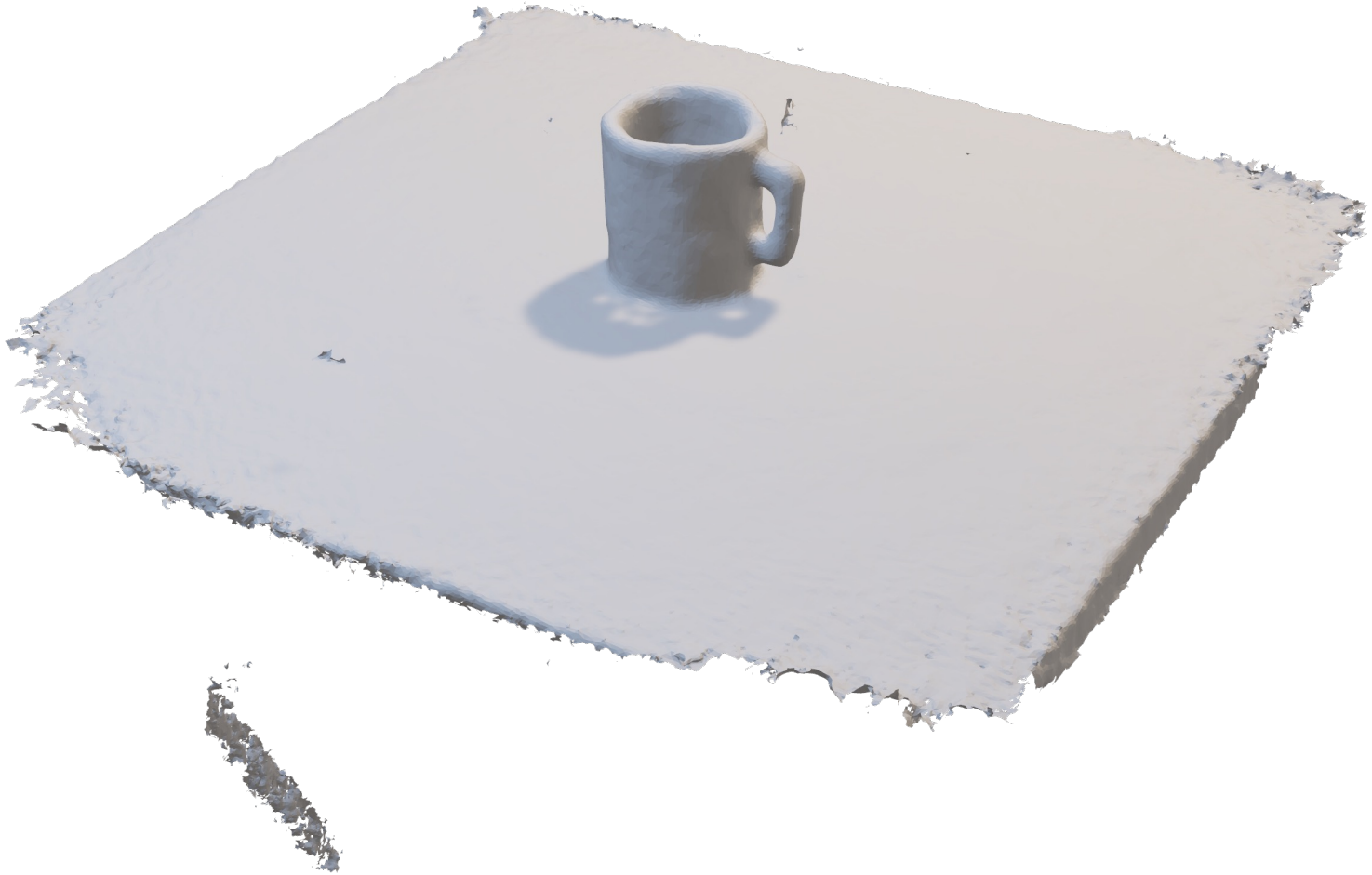
MOT & Reconstruction W16

- IPad ”GT” models for my dataset
- Results BundleSDF on my dataset
  - Pose Videos
  - 3D reconstructions
- Results BundleSDF on LineMod
  - Pose
    - ADD-S score
- Next Goals

MOT & Reconstruction W16



MOT & Reconstruction W16

Mug

Metal mug

(Covered with paper)

Glass mug

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Teddy mug

Spray-paint can

(Covered with paper)

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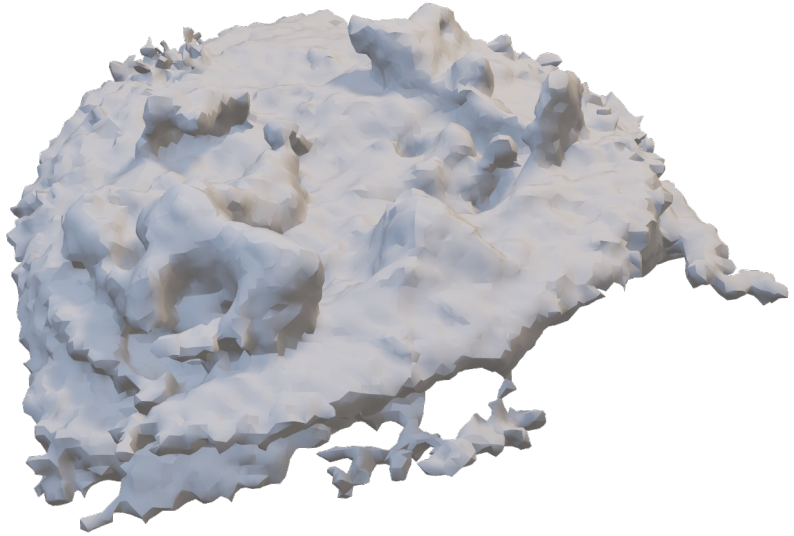

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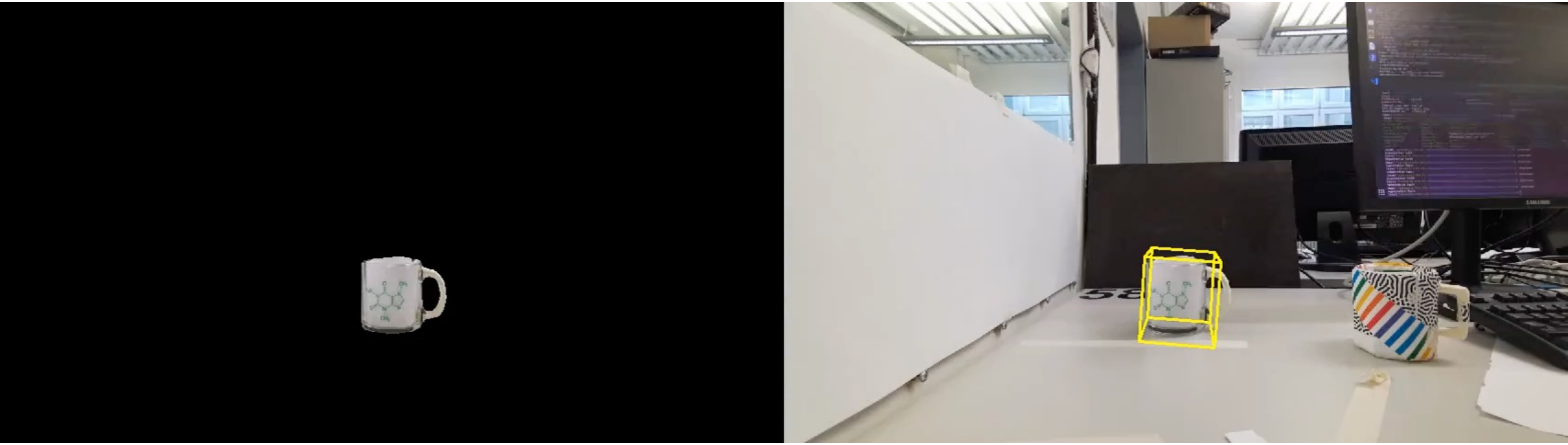

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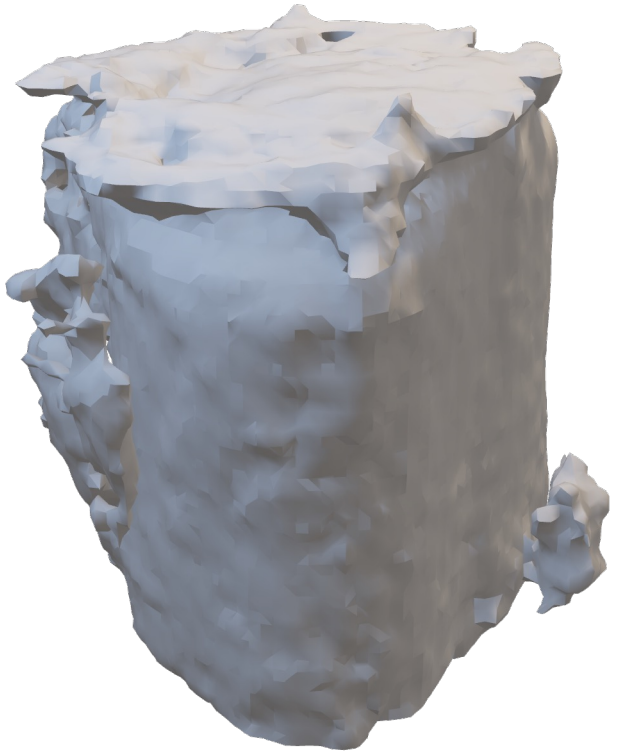

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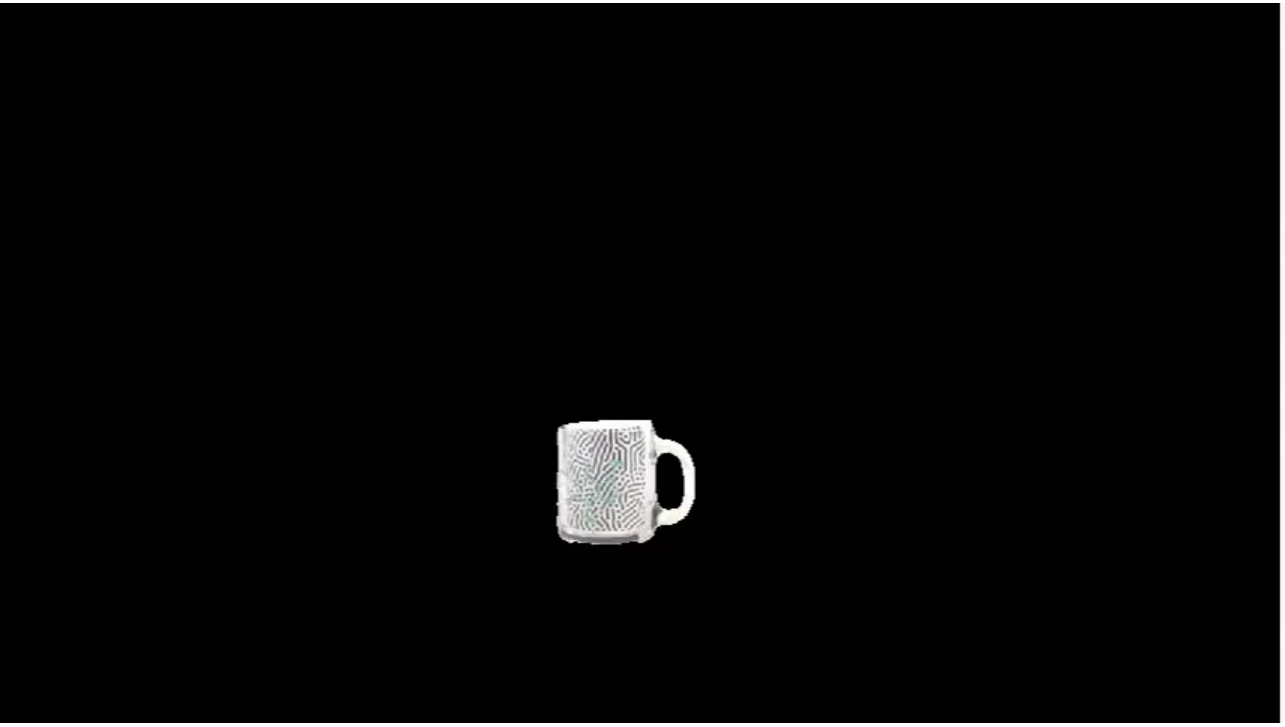

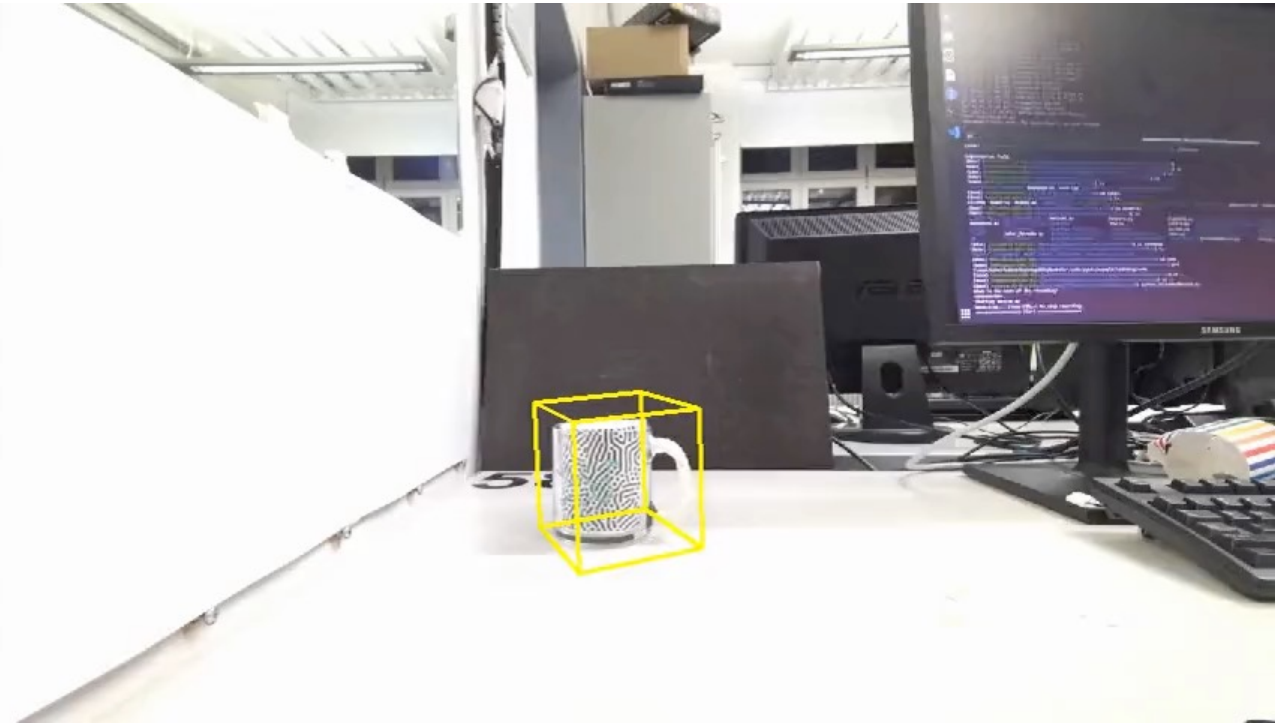

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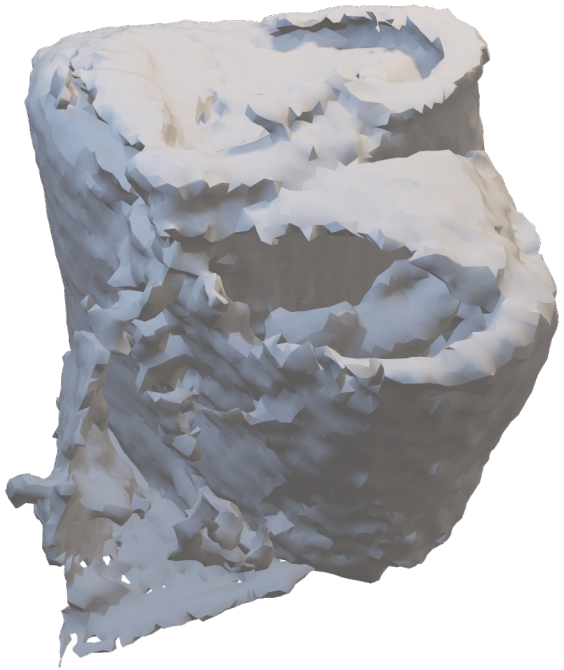

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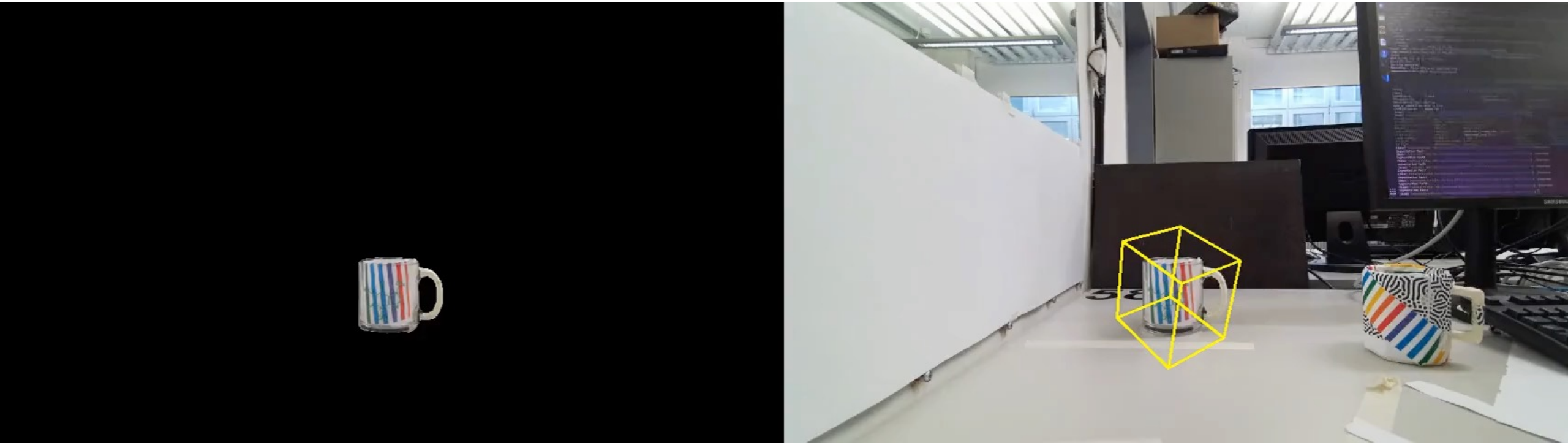

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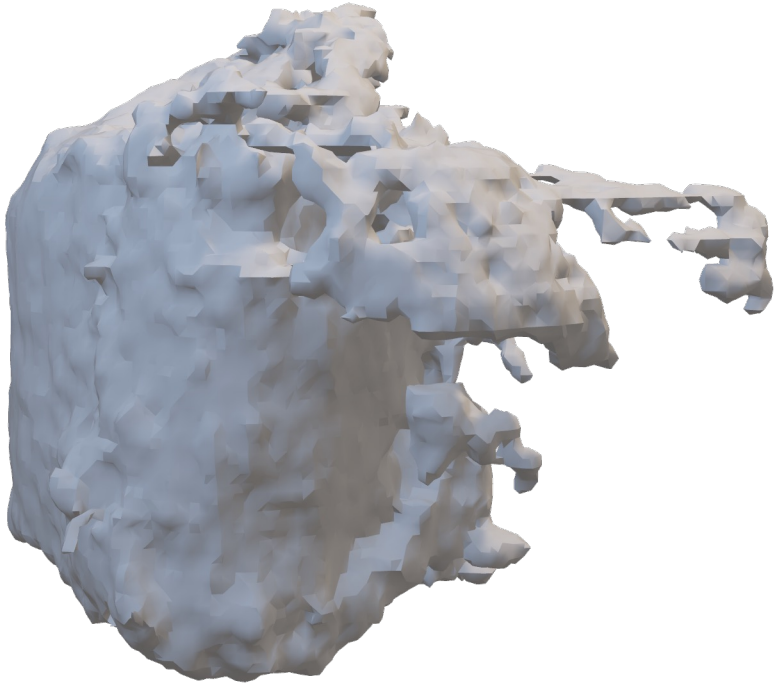

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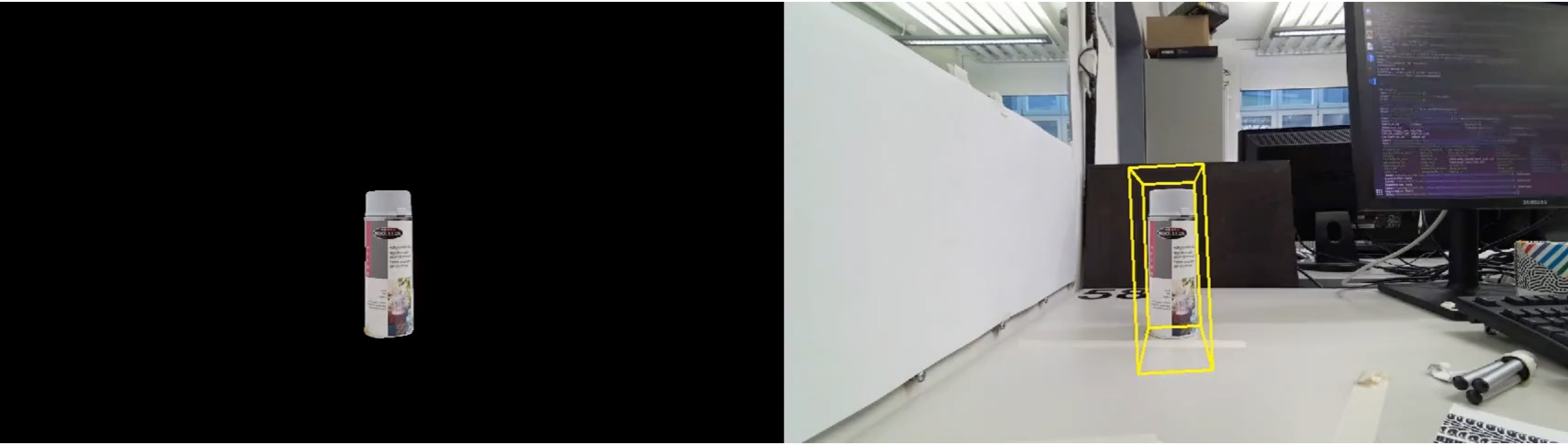

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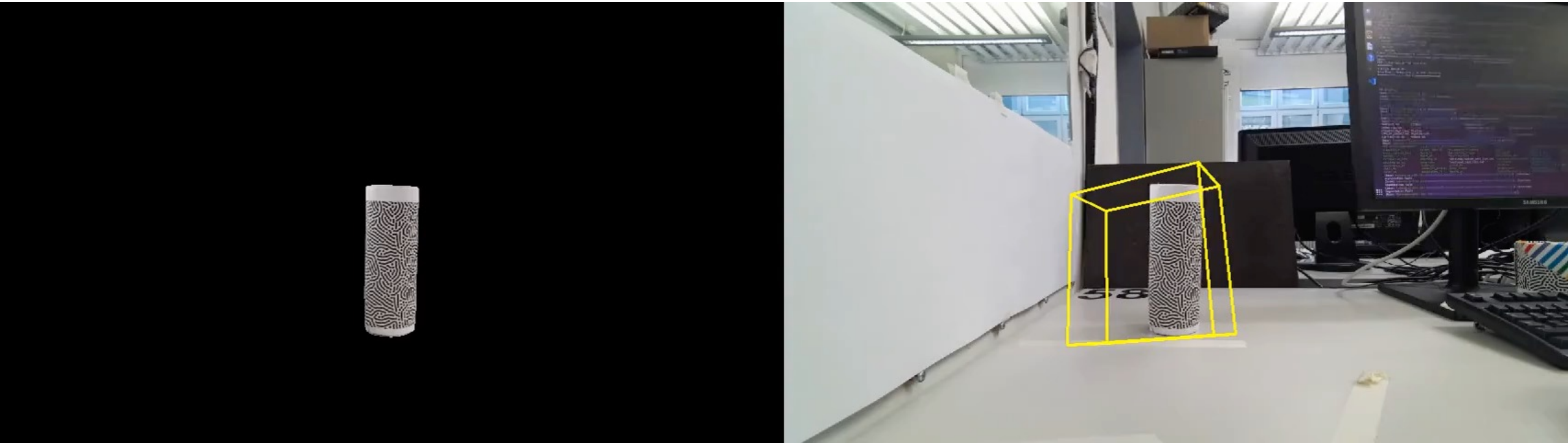

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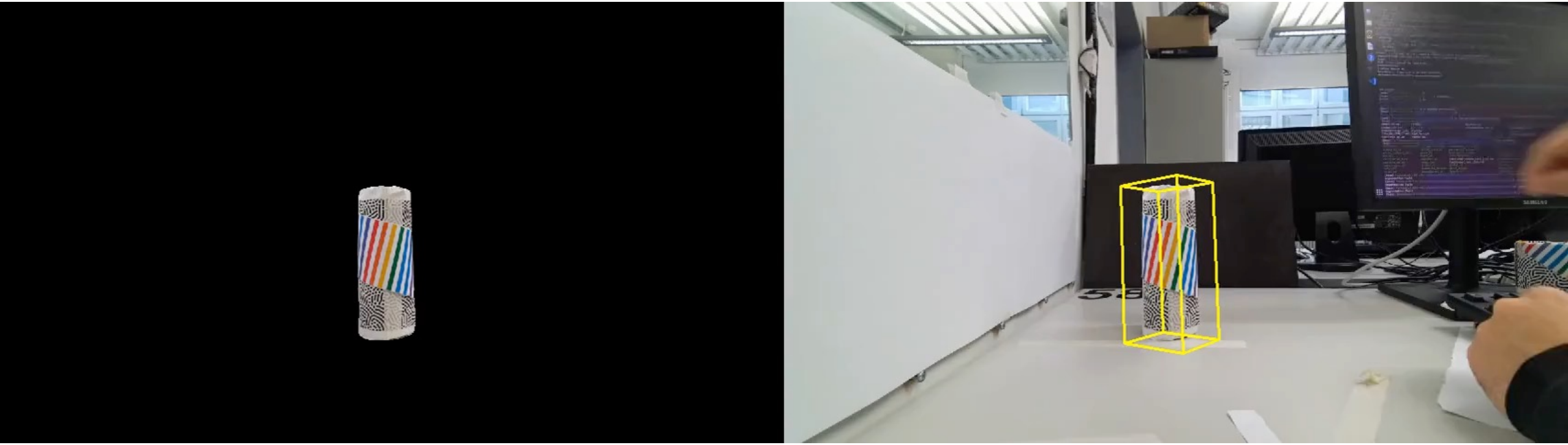

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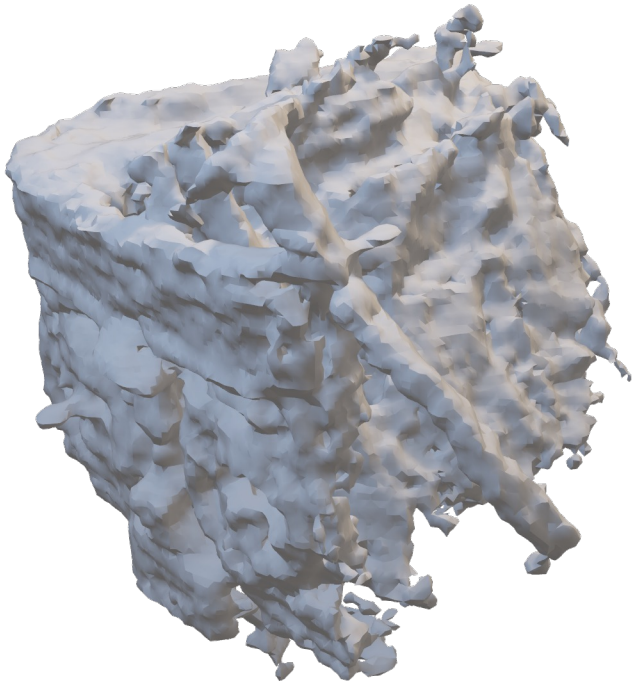
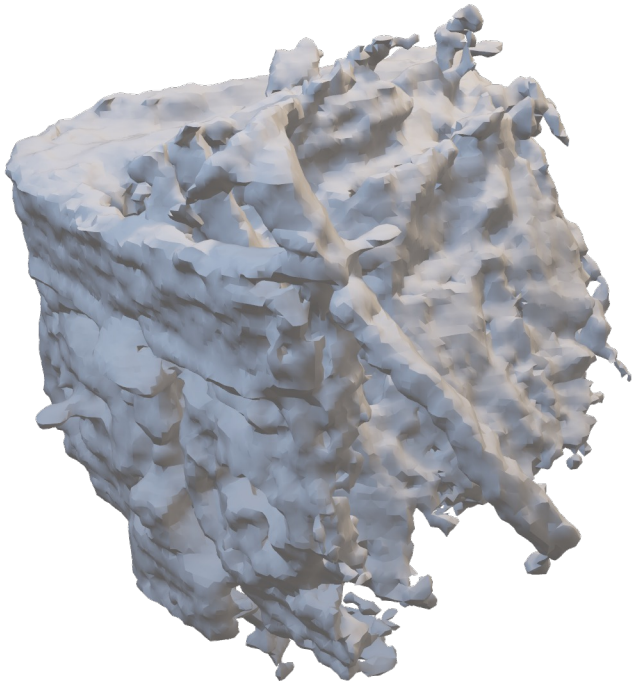
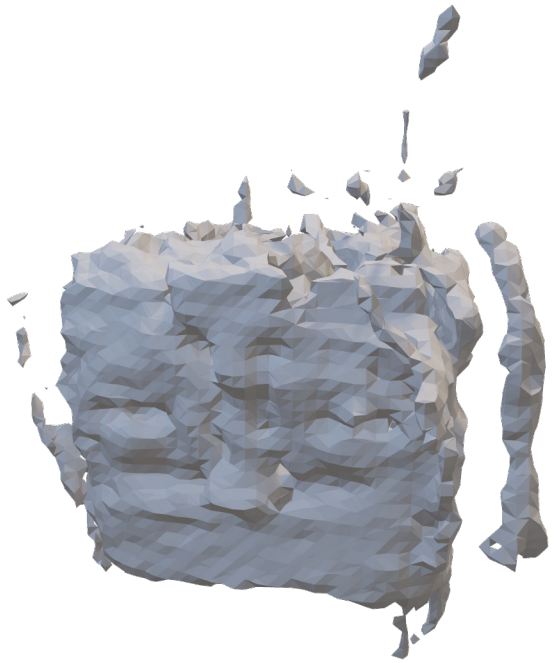


final

MOT & Reconstruction W16

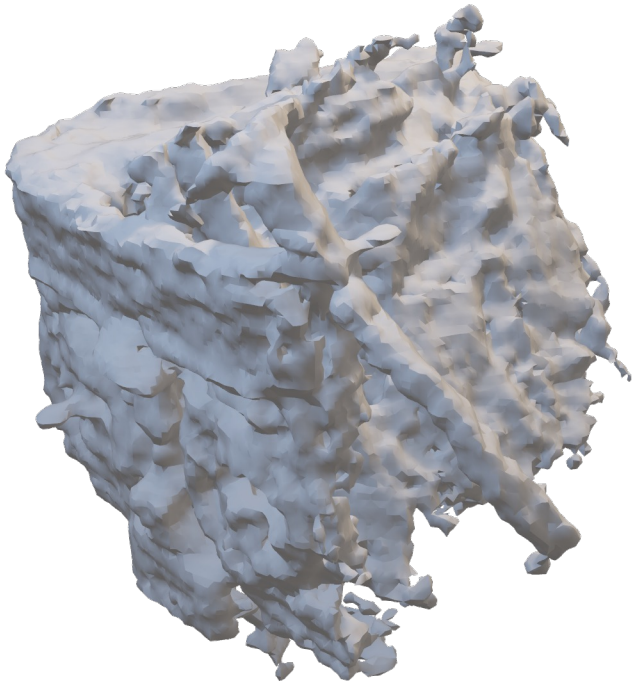


final



At 260 frames (halfway)

MOT & Reconstruction W16



final

At 260 frames (halfway)

At 66 frames (first reconstruction)

MOT & Reconstruction W16

- Bounding boxes have weird depth
  - Due to reflections and artifacts caused by the material?
  - When covered with paper results get better
- Pose estimation suddenly shifts away
  - Due to fast movements?
  - Code might link successive frames assuming them to be similar
- Rich texture and shape helps pose estimation
  - Colored texture most successful
  - Featured shapes most successful

MOT & Reconstruction W16

- For a good reconstruction is IMPERATIVE to achieve a good pose estimation
  - When no big visual pose estimation mistakes are made, reconstruction is actually very good

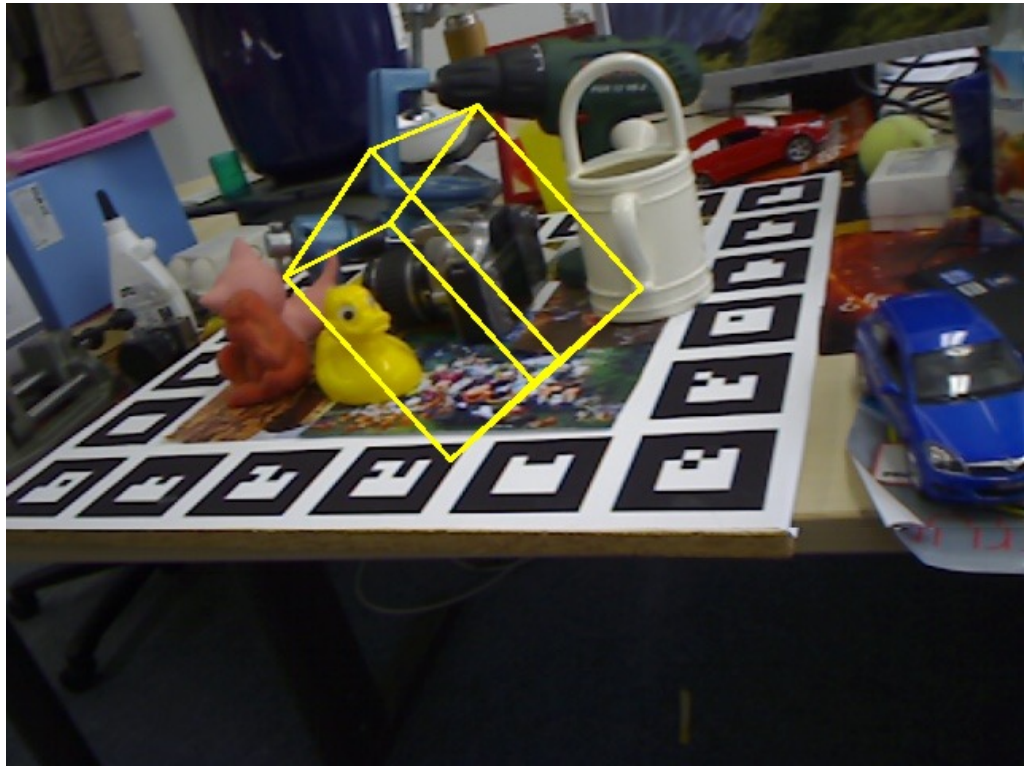
MOT & Reconstruction W16

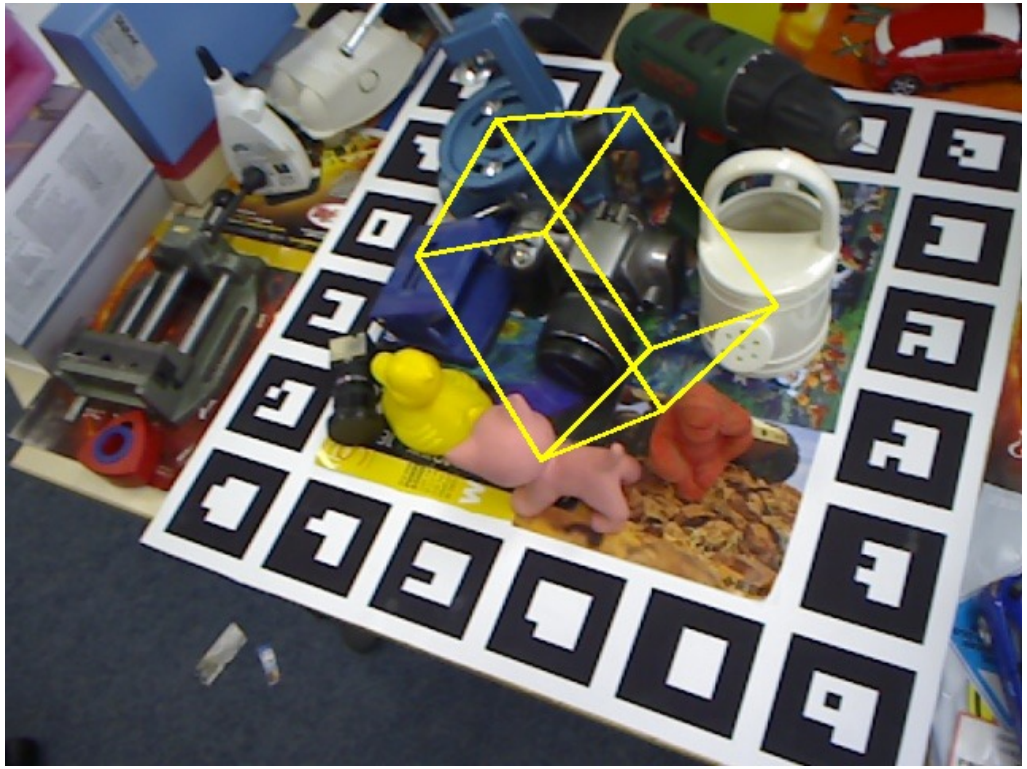
ADD-S score for pose esitmation

- Start to test on LineMod
  - Without previous training
  - LineMod Test (no occlusion)
    - 200 frames
    - Non-consecutive poses
    - Real images

```python
def compute_add_score(pts3d, diameter, gt_pose, pred_pose, R_rel, t_rel):
    """
    Compute the ADD score between two poses.

    Parameters:
    - pts3d: Numpy matrix of 3D points. nx3
    - diameter: Object diameter in centimeters.
    - gt_pose: Tuple containing ground truth pose (R_gt, t_gt).
    - pred_pose: Tuple containing predicted pose (R_pred, t_pred).

    Returns:
    - mean_distance
    """
    R_gt, t_gt = gt_pose        # 3x3, 3x1
    R_pred, t_pred = pred_pose

    ## Transform predicted pose to relative prediction pose
    R_pred = R.from_matrix(R_rel).as_matrix() @ R_pred
    t_pred = t_pred + t_rel

    # Transform 3D points to camera coordinate system
    pts3d_camera_gt = R_gt @ (pts3d.T) + t_gt

    # Transform 3D points to camera coordinate system
    pts3d_camera_pred = R_pred @ (pts3d.T) + t_pred

    # Compute distances between corresponding points
    distance = np.linalg.norm(pts3d_camera_gt - pts3d_camera_pred, axis=0)
    mean_distance = np.mean(distance)   # mean of the distances
    max_distance = np.max(distance)
    min_distance = np.min(distance)

    #print('  this is the GT        : {}'.format(R_gt))
    #print('  this is the prediction: {}'.format(R_pred))
    print('  distance between points: {}'.format(distance))
    print('  max distance between some points: {}'.format(max_distance))
    print('  min distance between some points: {}'.format(min_distance))

    return mean_distance
```

MOT & Reconstruction W16





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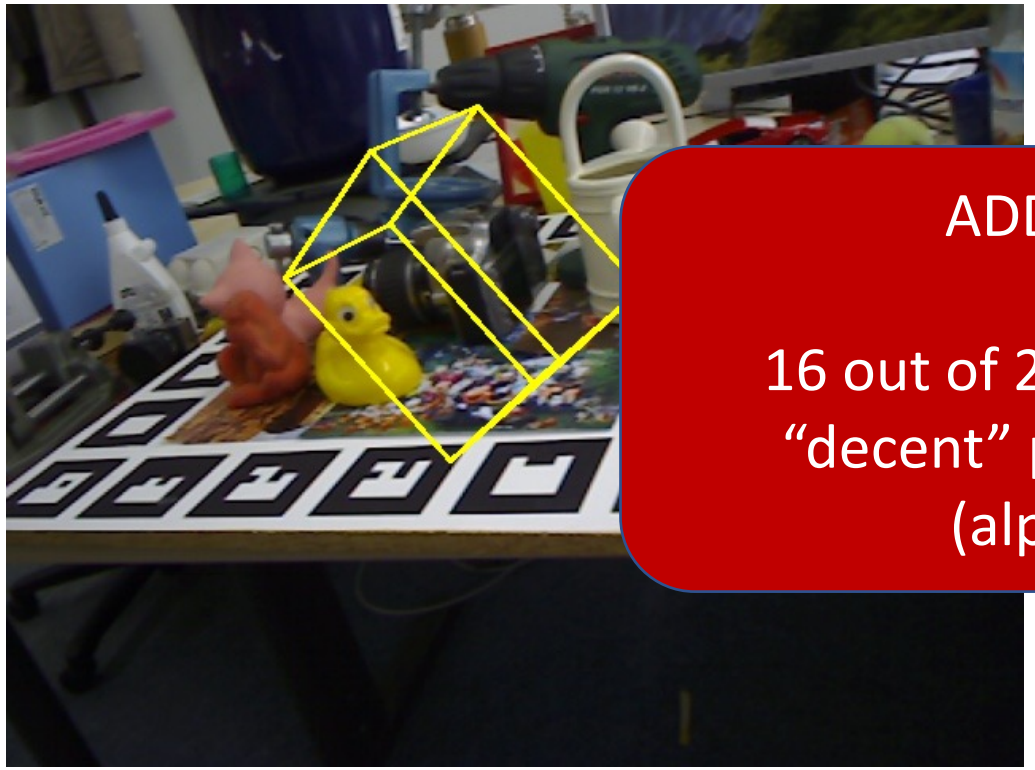

ADD-S score:
8%
16 out of 200 frames had a
“decent” pose estimation
(alpha=10%)

MOT & Reconstruction W16

- BundleSDF
  - Chamfer distance using GT
  - Conclusions
- New Papers

MOT & Reconstruction W16