Extended Partial Angle Based Motion Compensation for Dental CT

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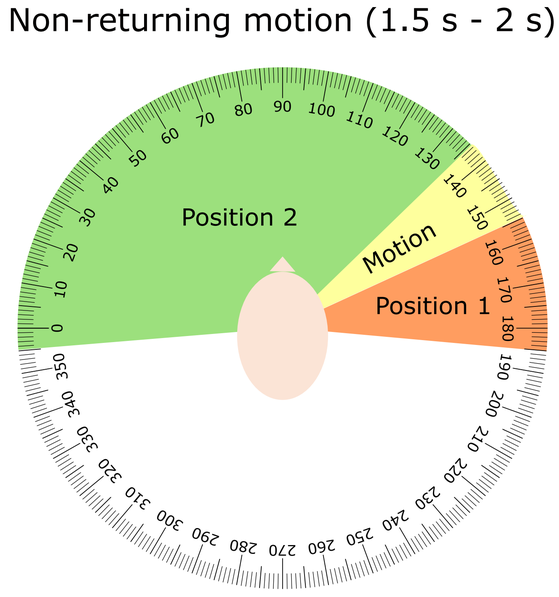
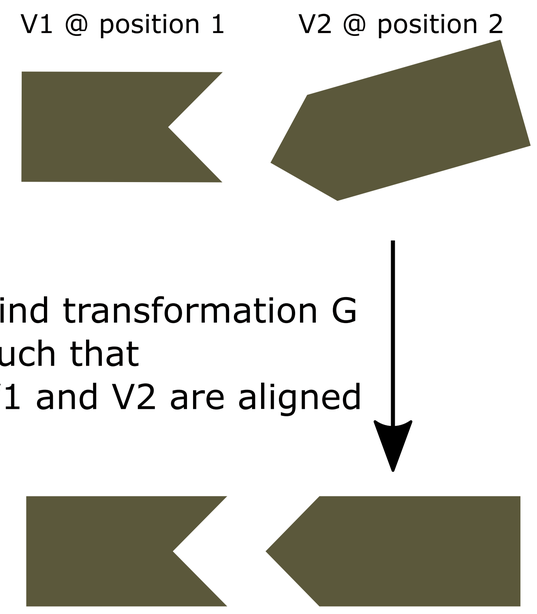
Introduction

Problem statement: small patient movements during a CBCT scan result in significant image artifacts leading to
- poor diagnosis
- additional radiation due to exam retakes

Common case on the filed: patient remains still except during a brief interval

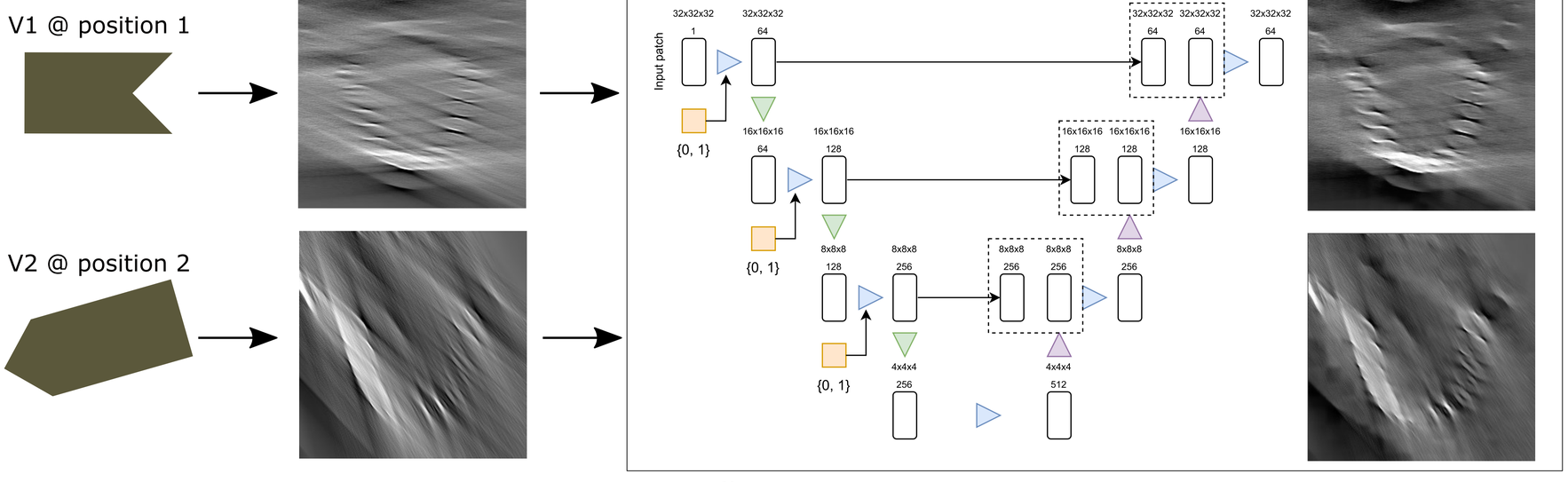
Our solution: AI motion compensation by the registration of two partial reconstructions





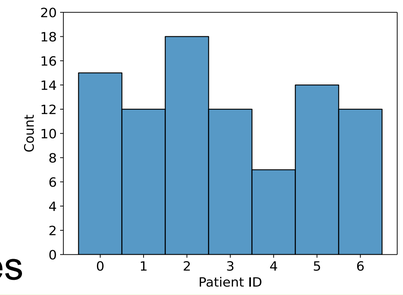
Method

Detection *Partial-angle reconstruction* *Edge extension with a conditioned U-Net* *Forward-projection and 2D-3D registration*



Dataset construction

- Seethrough Max CBCT device
- Simulated rotation and translation
- Training data: seven patients, partial volumes to 'edge-extended' volumes

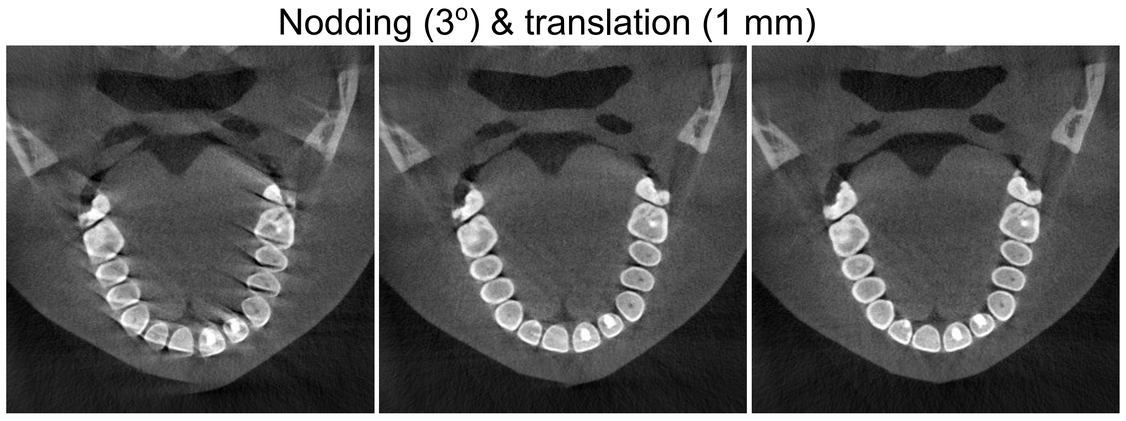


Training

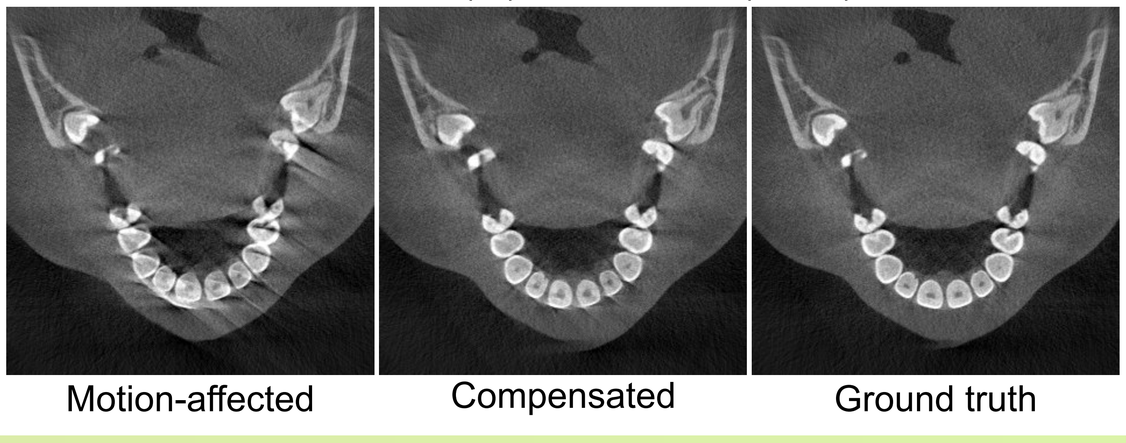
- Patches 32x32x32 with stride 16 from 316x316x344 volumes
- Adam optimizer (lr=0.0001)
- Early stopping criterium

Results

Nodding (3°) & translation (1 mm)

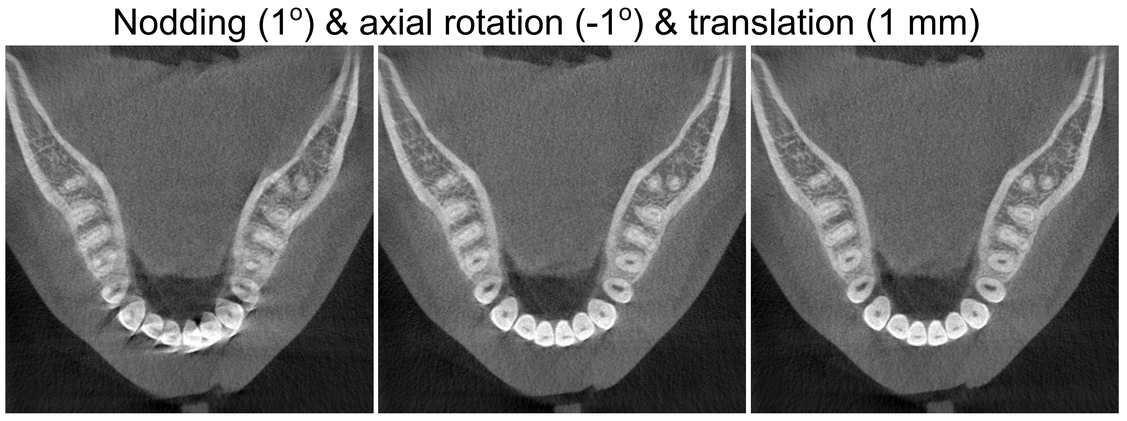


Axial rotation (2°) & translation (2 mm)

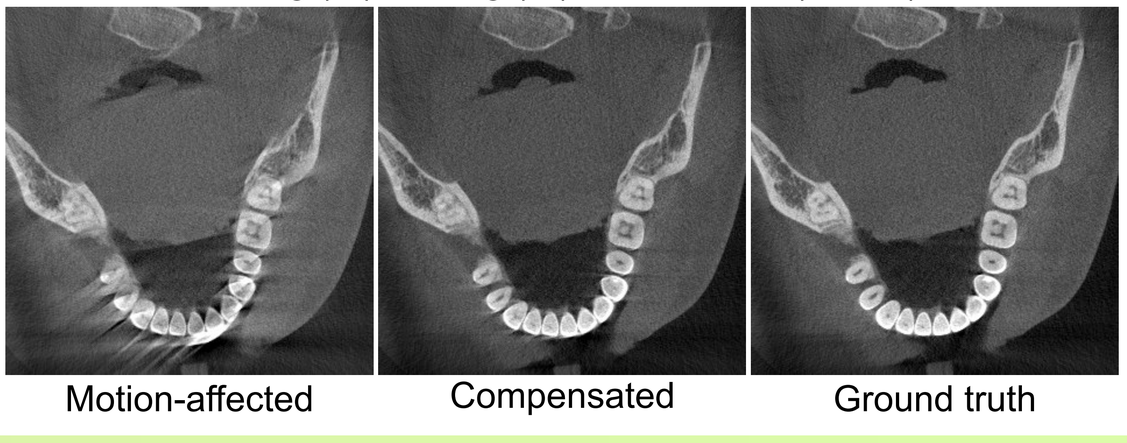


Motion-affected Compensated Ground truth

Nodding (1°) & axial rotation (-1°) & translation (1 mm)



Nodding (2°) & tilting (1°) & translation (-1 mm)



Motion-affected Compensated Ground truth

Conclusion

Robustness: registration of only forward-projected data

Speed: two partial volumes reconstructed and only a few forward-projected images needed

Previous detection: reliable detection of frames affected by motion is needed

Generalizibility: limited to specific motion patterns

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https://www.wh.com/en_global/dental-products/imaging