

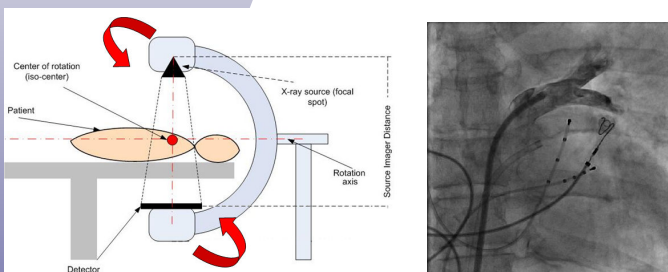
Feature-based depth estimation for multi-view X-ray

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1. Introduction

- X-ray guidance in interventional procedures
- 2D position of clinically interesting structures (e.g. catheters)



Goal:

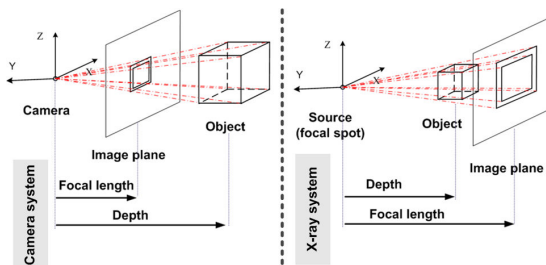
Obtain 3D location of interest points (IP) by small, “wiggling” motion of the C-arm

Challenges:

- Low CNR makes detection difficult
- Non-coplanar scenes
- Motion (heart, respiration, handling of catheter)

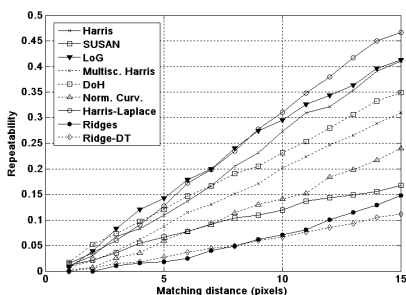
2. Multi-view X-ray

- Different projective relations due to configuration
- Strongly perspective & non-coplanar scenes



3. Feature point detection

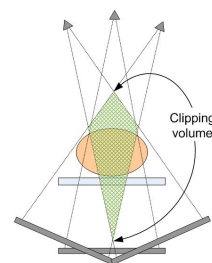
Which detector(s)? Detector evaluation [1]



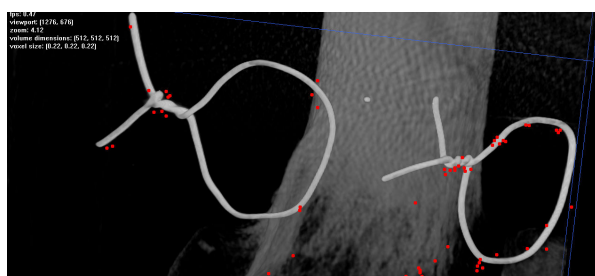
Harris-Laplace and LoG scored overall highest in 4 datasets

4. Matching & tracking

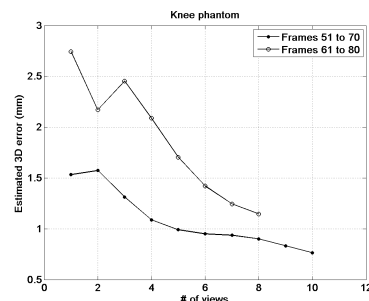
- Calibrated sequences
- Epipolar + clipping volume constraints guide the matching
- Correlation-based matching using feature representations



5. Backprojection - Results



3D error estimated from a volume segmentation of the object



6. Future work

Moving object – moving camera

If the object can be modeled as a linear combination of K shape bases, then the problem becomes a projection from $P^{3K} \rightarrow P^3$.

Only recently a full framework, in closed form, was proposed for the perspective case [2].

Next challenge

- Model catheter motion/deformation
- Resolve projective ambiguity for X-ray geometry

References:

- [1] C. Papalazarou, P. M. J. Rongen and P. H. N. de With, “Evaluation of Interest Point Detectors for non-coplanar, transparent scenes”, submitted to: ACIVS 2009
- [2] R. Hartley and R. Vidal, “Perspective Nonrigid Shape and Motion Recovery”, ECCV 2008