We use **modeled** multi-pinhole collimator data to **reconstruct** the **depth** of a gamma source.

Depth Learning from Simulated Collimator Data

Peter von Niederhäusern *et al.*, Center for medical Image Analysis & Navigation, Department of Biomedical Engineering, University of Basel

1 Introduction

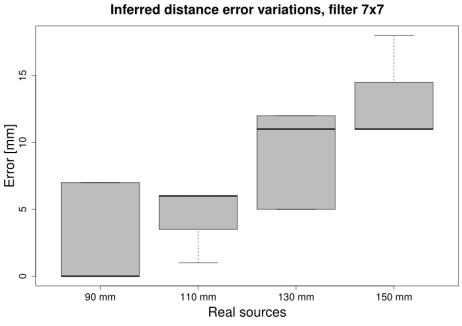
In surgical navigation, depth is a crucial measure. Especially for Sentinel Lymph Node Biopsy (SLNB).

GOAL: reconstruct depth of a gamma source, based on activity images produced by a multi-pinhole collimator.

2 Methods

- Deep Learning based approach using a ConvNet
- Create lots of training data by simulating photon-collimator interaction
- Compare with few experimental data (real sources)

3 Results



4 Discussion

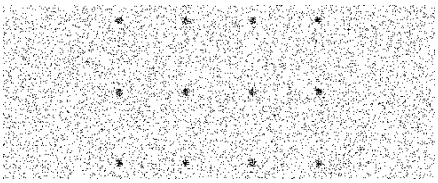
- Inverse problem solver
- Model accuracy
- Need to learn x,y-coordinates
- More than one gamma source

Additional figures

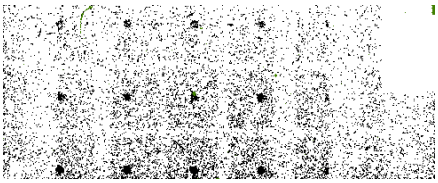
ConvNet structure

$$
\begin{gathered}
65 \times 60 \times 1 \rightarrow \\
16\text{C5} \rightarrow \text{BN} \rightarrow \text{ReLU} \rightarrow \text{MP2} \rightarrow \text{DO}(0.5) \rightarrow \\
32\text{C5} \rightarrow \text{BN} \rightarrow \text{ReLU} \rightarrow \text{MP2} \rightarrow \text{DO}(0.5) \rightarrow \\
64\text{C3} \rightarrow \text{BN} \rightarrow \text{ReLU} \rightarrow \text{MP2} \rightarrow \text{DO}(0.5) \rightarrow \\
128\text{C3} \rightarrow \text{BN} \rightarrow \text{ReLU} \rightarrow \text{MP2} \rightarrow \text{DO}(0.5) \rightarrow \\
\text{FL} \rightarrow 512\text{N} \rightarrow \text{BN} \rightarrow \text{ReLU} \rightarrow \text{DO}(0.5) \rightarrow \\
15\text{N} \rightarrow \text{Softmax}
\end{gathered}
$$

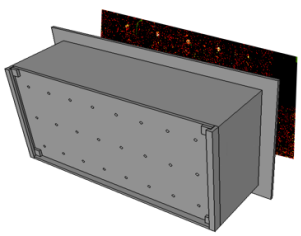
Simulated source (training datum): 150 mm



Real source: 150 mm



Collimator with activity image



University of Basel

Department of Biomedical Engineering