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

\[ 65 \times 60 \times 1 \rightarrow \]
\[ 16C5 \rightarrow BN \rightarrow ReLU \rightarrow MP2 \rightarrow DO(0.5) \rightarrow \]
\[ 32C5 \rightarrow BN \rightarrow ReLU \rightarrow MP2 \rightarrow DO(0.5) \rightarrow \]
\[ 64C3 \rightarrow BN \rightarrow ReLU \rightarrow MP2 \rightarrow DO(0.5) \rightarrow \]
\[ 128C3 \rightarrow BN \rightarrow ReLU \rightarrow MP2 \rightarrow DO(0.5) \rightarrow \]
\[ FL \rightarrow 512N \rightarrow BN \rightarrow ReLU \rightarrow DO(0.5) \rightarrow \]
\[ 16N \rightarrow Softmax \]

Simulated source (training datum): 150 mm

Real source: 150 mm

Collimator with activity image