

INTRODUCTION

Studies with awake animals are needed in order to avoid the effects of anesthesia on PET response in the brain and to perform simultaneous physiological and psychological studies.

The detection of external motion based on the optical tracking of markers placed on the surface of the skin of the patient, have been proposed.

In order to avoid the requirement of additional hardware, we propose to use several external relatively-low activity sources to register the reconstructed images from the motion-free fragments of the acquisition.

METHODS

1 Motion-free frames identification

Position of the centroid of all acquired LORs is obtained every 50 ms.

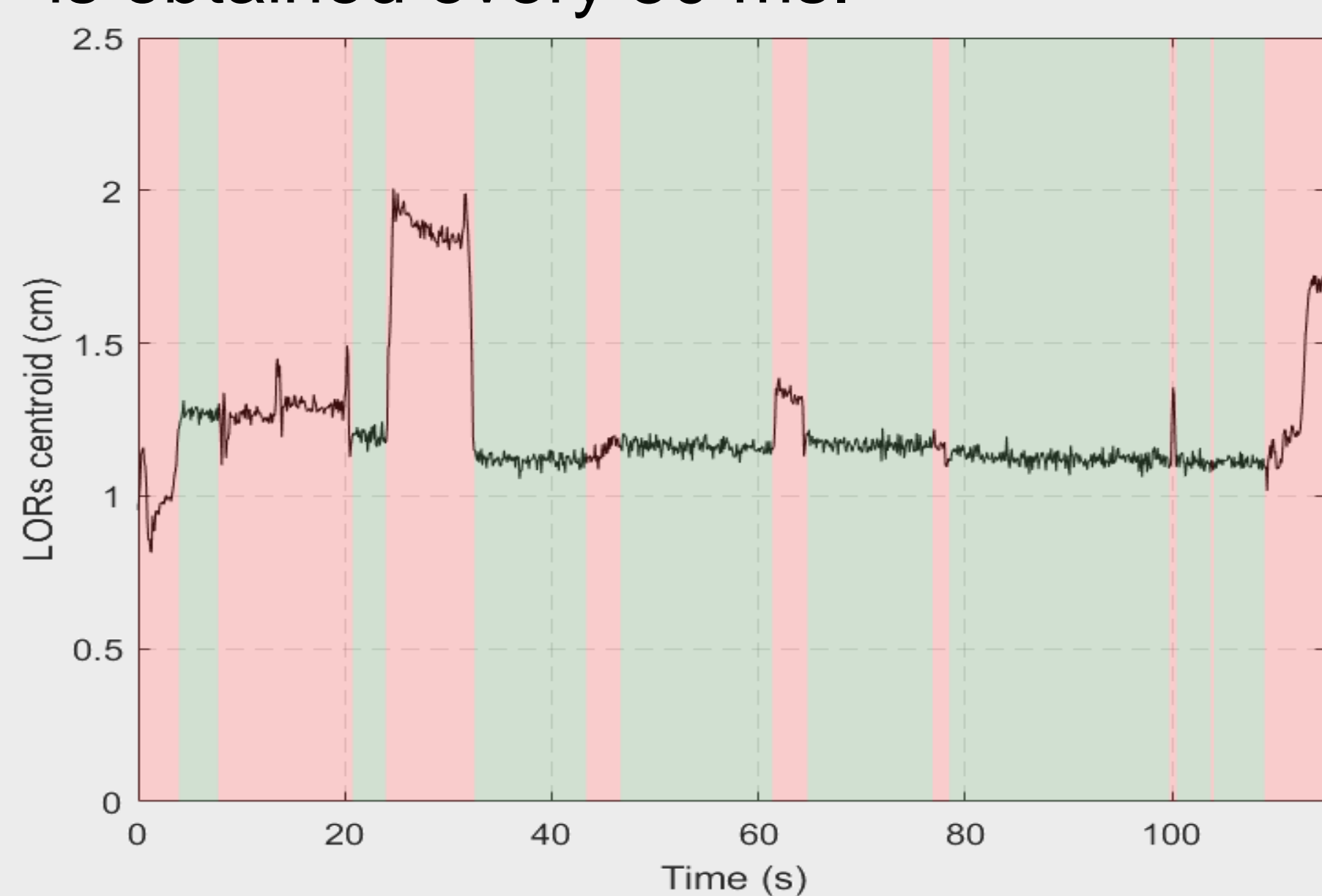
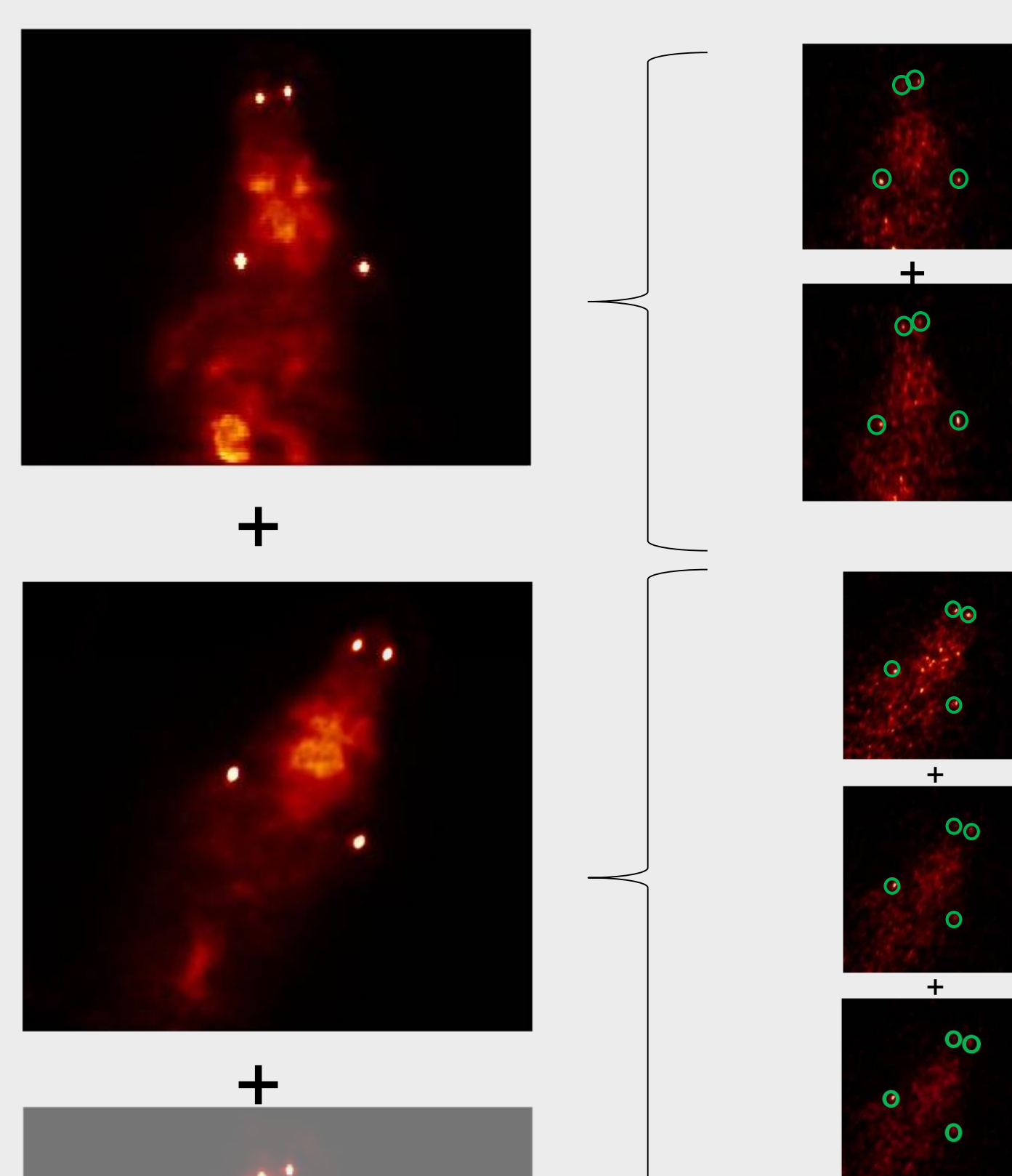


Fig 1. Position of the centroid of the detected LORs. Each green area is a motion-free frame that will be used for the reconstruction. Red areas are the time lapses where the movement is significant and are rejected.

2 Motion characterization

To improve the precision of the motion characterization, motion-free frames are split into short frames (25 ms in the figure below).

Motion-free frames Short frames



The four ¹⁸F markers attached on the rat head were located in these images and they were used to register the images with a reference one.

In this work only rigid transformation were considered, which is a reasonable assumption for head imaging.

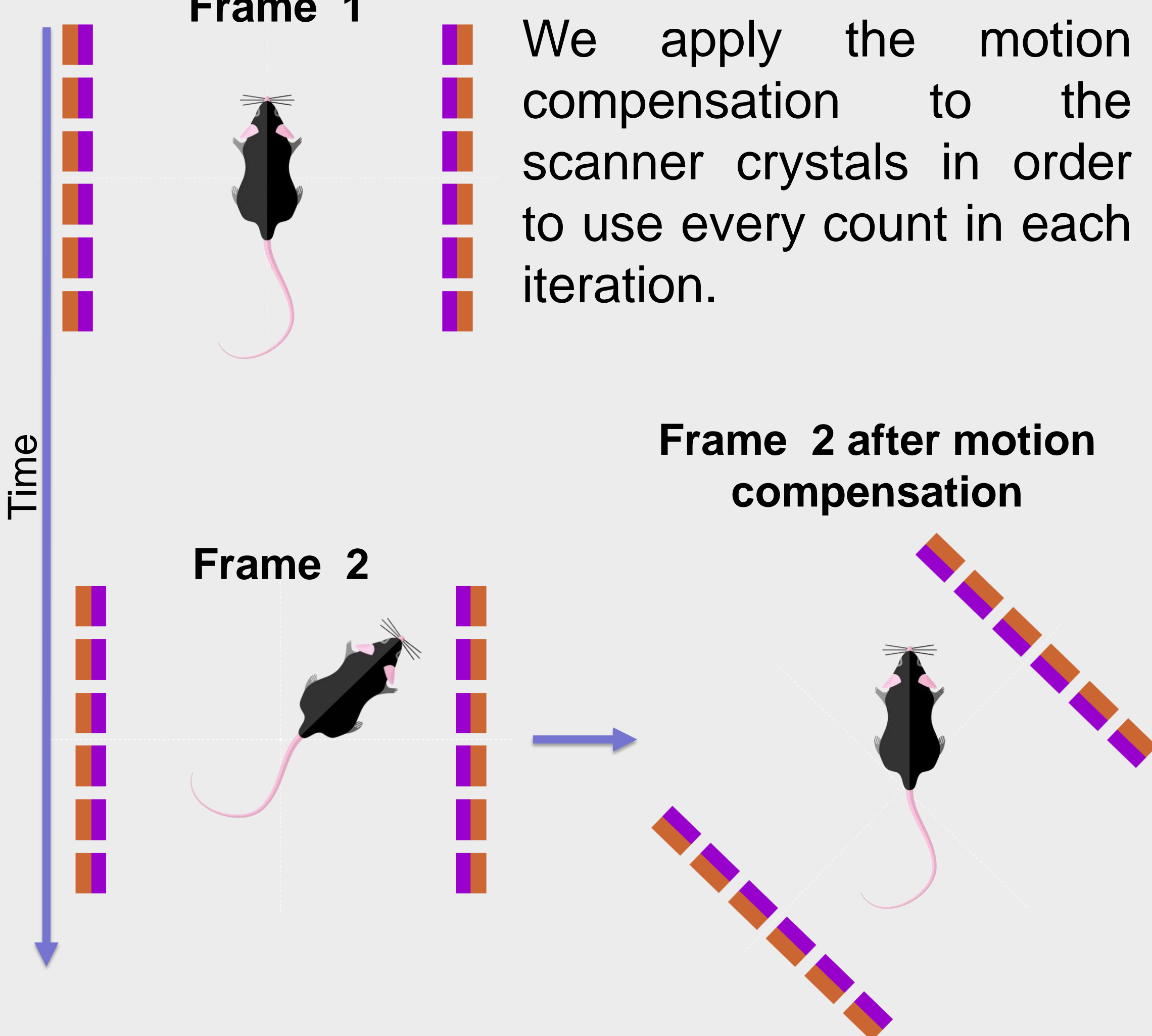
3 Motion compensation

Frame 1

We apply the motion compensation to the scanner crystals in order to use every count in each iteration.

Frame 2 after motion compensation

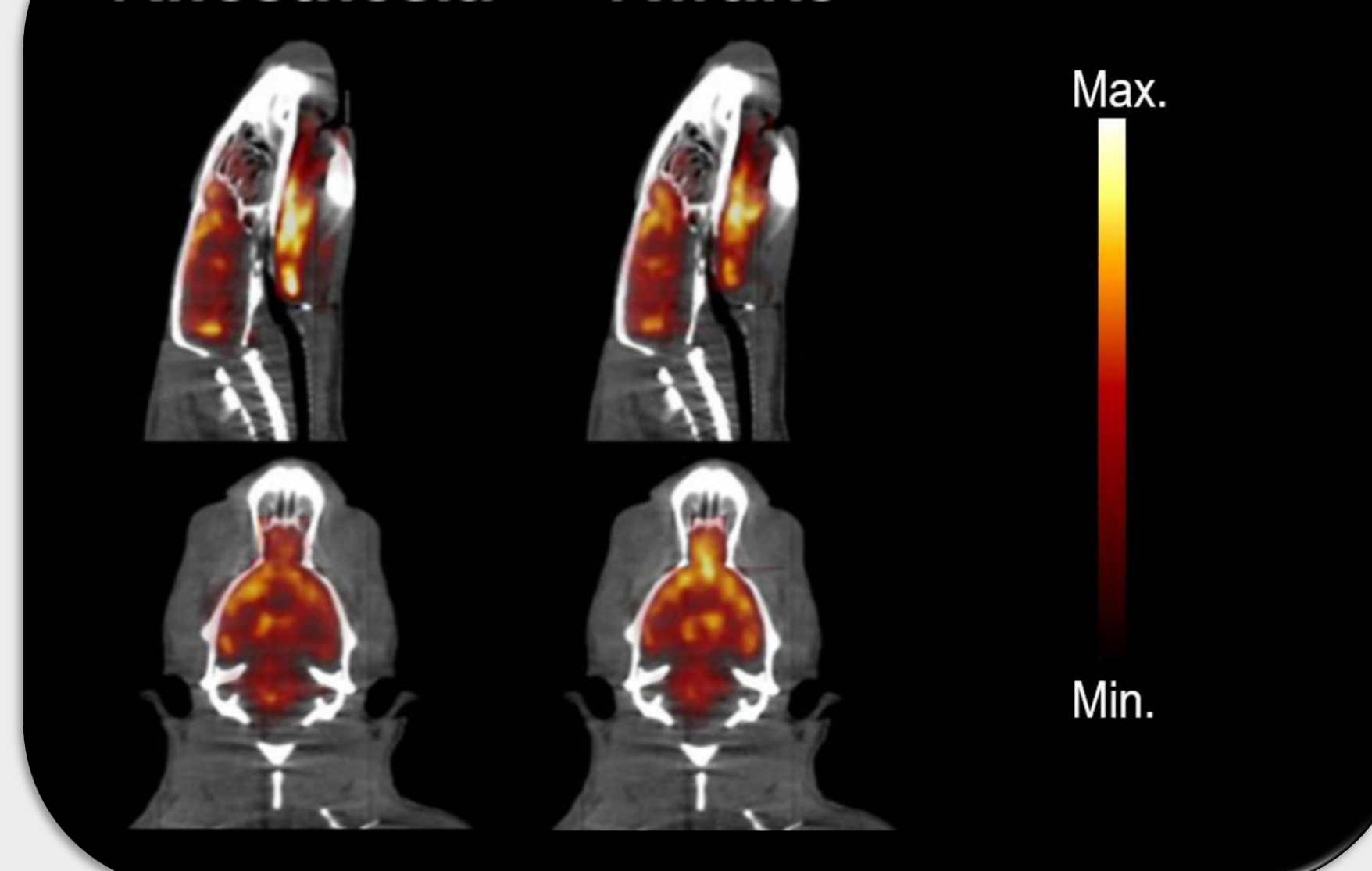
Frame 2



After LOR relocation the acquisition is reconstructed using 15 iterations of an EMLL-MAP algorithm implemented in-house using PGI CUDA Fortran Compiler.

RESULTS

Anesthesia Awake



Awake rat injected with 600 μ Ci and four ¹⁸F sources attached in its head.

70% of the acquired events are used in the reconstruction.

Resolution of the image in both cases is 1.00 ± 0.05 mm

CONCLUSIONS

Motion-free frames are correctly identified

Centroid method is really fast and robust

Resolution is comparable to motion-free acquisitions

References

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