**Detection, estimation and correction of motion artifacts in lower limbs EOS images by a deep learning approach**

1. **Abstract**

**Purpose**

Many medical imaging systems are faced with the appearance of artifacts due to patient motion. In this method, a framework is proposed to notify the user whenever EOS biplanar images (acquired with a fan-bean scanning along the body) contain motion artifacts on the lower limbs, specify the region containing the artifacts, provide an estimation of the motion artifacts, and finally, remove the motion artifacts from the images.

**Methods**

A Resnet50 network is used to classify the lower limb’s EOS images into two classes: motion/no motion. To specify the region containing motion, a modified Res-UNet network is used to classify the image’s lines as motion/no motion. Then, to estimate the motion, an approach using image segmentation and a modified Res-UNet network is proposed. A method to recursively cut an EOS image into small square patches is proposed as a preprocessing for motion estimation to facilitate the processing of large EOS images. The motion correction is then integrated into the original real-size images. To train and validate these methods, an approach for simulating motion artifacts in EOS images of the lower limb is proposed.

**Results**

Excellent results are obtained when classifying the images into motion/no motion: 96% accuracy on simulated data, and 95% on real data. To detect the region containing the motion in the image, a 97% accuracy is obtained on simulated data. The results on real data are evaluated subjectively since the real motion is unknown. For the motion estimation, a mean error of 0.25 mm is obtained on simulated data.

# **Methods**

The global structure of the proposed framework is presented in Figure 1. The inputs are the radiographic EOS images (front, side or 45-degree view) and the corresponding lower limb segmentation masks.

Une image contenant texte, capture d’écran, diagramme, conception

Description générée automatiquement

Figure 1: Overview of the proposed framework for detecting and correcting motion artifacts in EOS images of the lower limbs

1. **Results**

Une image contenant film radiographique, Imagerie médicale, radiologie, radiographie

Description générée automatiquement Une image contenant film radiographique, Imagerie médicale, radiologie, radiographie

Description générée automatiquement

Figure 7: (a) Two examples of original image containing motion; (b) corrected images obtained with the proposed framework