

2D Synthetic Data Sets From Images for Deep Learning in Computed Tomography

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ABSTRACT:

The study investigated computer-generated synthetic data sets for use in reconstructing images in computed tomography. The data sets of computed tomography were in the format of forward projection. The present study focused on transforming a normal image data set to those of a forward projection data set. The method used to transform the normal image data set to a forward projection data set was Radon transformation. Forward projection data sets are also called sinogram data sets or the output of computed tomography data acquisition systems. The experiment was conducted using both grayscale and colour images. The time taken for the completion of the image reconstruction was measured and recorded in a table. The images from the synthetic data sets of computed tomography were plotted side by side with the original image. The synthetic data sets using forward projection data sets could be transformed back to their original image form through the application of inverse Radon transformation. This technique is known as backwards projection.

KEYWORDS: - *Tomography, synthetics dataset, phantom, projection, attenuation, simulation*

I. INTRODUCTION

This paper concerns computer-generated synthetic data sets for use to reconstruct images for computed tomography (CT). The exploitation of synthetic data sets in computed tomography has a long history spanning many years. Data generators have been used to produce synthetic data sets for analysis in machine learning and data visualization (Mendonça et al. 2020).

Synthetic data sets are computer-generated data sets which contain similar measurements and numerical properties, this data can then be applied to mimic the real world data sets of a study domain (K Sree Kumar 2020). Researchers used synthetic data sets for seismic analysis (Stekl et al. 2008), behavioral sciences (Quintana 2020), information visualization (Brito et al. 2018), deep learning (Toda et al. 2020), socio-spatial systems (Raimbault 2019) and financial studies (Gan & Valdez 2017).

II. BACKGROUND

The synthetic datasets for computed tomography are classified into two categories. These two categories are synthetic data sets which are generated from a simulation of mathematical calculation and synthetic data sets which are acquired through the action of scanning physical phantom objects. The computational properties of synthetic data sets using mathematical equations do not involve the use of a