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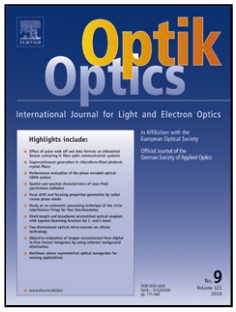


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# Development of a total variation noise reduction algorithm for chest digital tomosynthesis

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## ABSTRACT

Chest digital tomosynthesis (CDT) is developed to solve the problem of overlapping and absence of depth information as seen in general X-rays applied in chest radiography and high-exposure dose problem of computed tomography. However, in CDT, noise can reduce the quality of the image and increase the rate of false diagnosis. Thus, noise removal is an important issue in the clinical application of CDT, and a total variation (TV)-based noise reduction algorithm is an excellent algorithm because of its high noise reduction efficiency. In this study, we demonstrate the superiority of the TV noise reduction algorithm by quantitative comparisons of analyses with conventional algorithms. The quantitative evaluation of the image quality, coefficient of variation (COV), contrast-to-noise ratio (CNR), and intensity profile are evaluated. The COV and CNR results in the TV noise reduction algorithm are 1.88 times lower and 1.54 times higher than those of the original image, respectively; the smoothest graph is also obtained in the intensity profile. In conclusion, it is expected that the quality of the CDT image processed using the TV noise reduction algorithm is better than that processed using conventional noise reduction methods and the use of our algorithm will increase in the clinical field in the future.

**Keywords:** Chest digital tomosynthesis (CDT); Total variation (TV) noise reduction algorithm; Image processing; Quantitative evaluation of image quality.

## 1. Introduction

X-ray imaging devices are vital for diagnosing diseases in the clinical field. Among them, general X-rays and computed tomography (CT) are widely used, and in recent years, various research and

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