Development of CT Metal Artifact Reduction Algorithm for use in Radiotherapy Treatment Planning System

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INTRODUCTION

Computed Tomography (CT) images serve many benefit in radiology as well as radiotherapy treatment. Unfortunately the metal type inhomogeneities such as metal amalgam results a metal streak artifact in the images and thus raise errors in treatment planning system (TPS) [1,2]. In radiotherapy errors of radiation delivery can cause various side effects to patient. For this reason a metal artifact reduction (MAR) algorithm was developed in MATLAB platform to give a satisfaction in image quality and thus to TPS.

PROBLEM STATEMENT

Streak artifact can corrupt the valuable CT images used in Radiotherapy. Current commercial MAR is sold separate package from basic CT software and expensive. With the present of metal streak artifact in images leads to misdiagnosis, ineffective radiation delivery to tumor cells, induce cancer cell growth etc. Here, an algorithm was developed to control the steak and therefore can be used in TPS.

NOVELTY

➢ Development of CT Metal Artifact Reduction Algorithm which able to correct small size artifact and thus can be directly use in Radiotherapy Treatment Planning System.

USEFULNESS OF INVENTION

- Due to the wide use of CT images especially in medical imaging and radiotherapy, this algorithm is critical to reduce metal artifacts and maintain its use in radiotherapy TPS.
- The algorithm is also useful as a reference materials in medical image processing studies.

COMMERCIAL POTENTIALITIES

As for commercialization purpose, MAR algorithm can be use in radiology department as well as radiotherapy department to improve CT image quality and correct the density of a medium in TPS.

RESEARCH OBJECTIVES

The main objective of this paper is to develop an algorithm that can improve quality of image affected with metal streak artifact. The algorithm is hoped to help medical doctor in his diagnosis and medical physicist in treatment planning process.

INVENTION

CT IMAGES AFFECTED WITH STREAK ARTIFACT

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METAL ARTIFACT REDUCTION TECHNIQUE [3,4]

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METADATA INFORMATION

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CORRECTED IMAGES IN DICOM FORMAT

Figure 1: Flowchart of Establishment of the algorithm

ADVANTAGES

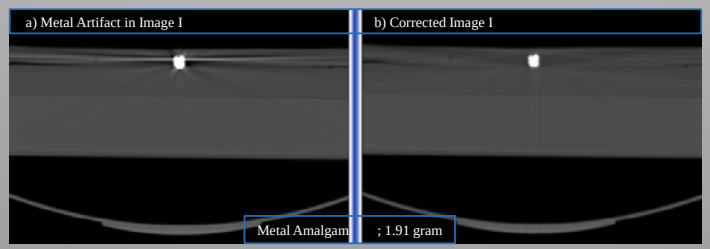
Avoid potential of misinterpretation in diagnosis (Medical Imaging)

Reduce dose calculation error in TPS (Radiotherapy)

Decrease unwanted dose to patient due to repeated CT scanning

Fast processing time

RESULTS



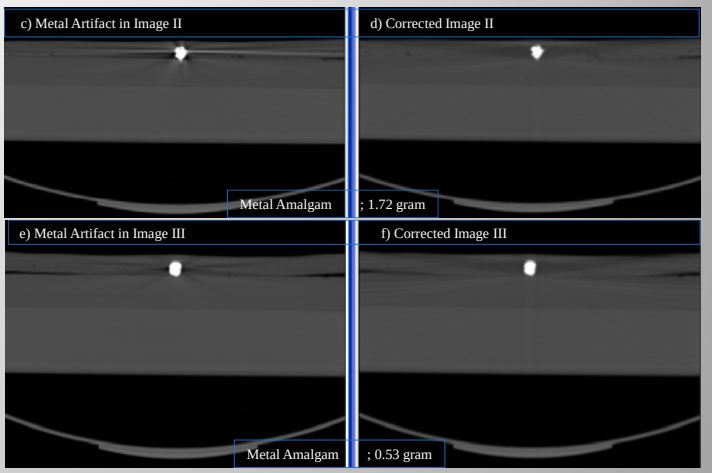


Figure 2: Input and output images of the algorithm; input images: a,c,e, output images: b,d,f

CONCLUSIONS

➢With an assistance of MATLAB software , the metal artifact correction algorithm was successful developed and tested on small dental fillings samples.

➢The corrected images are now ready to be utilize in Radiotherapy Treatment Planning Systems.

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