



Eliminating CT Image Artifacts Using Artifact 'Dictionaries'

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new method for the identification and removal of artifacts, including recurring artifacts, in CT imaging.

The method involves decomposing an artifact-contaminated image into two sub-images: one that is entirely or primarily artifacts, and a second that is an artifact-mitigated image or target outcome.

Overview

In modern computed tomography (CT) imaging, a number of non-ideal physical conditions may cause artifacts in the reconstructed images. Mitigation or elimination of image artifacts has been a time- and resource-consuming issue for medical imaging devices.

Certain conventional approaches have been aimed at improving data acquisition hardware so that that acquired data is more consistent with underlying imaging models, or to incorporate a model of a non-ideal acquisition process into a calibration and/or reconstruction process. Such approaches are strongly dependent on the data acquisition methods and the underlying physical and engineering principles.

The Invention

A UW-Madison researcher and industry collaborator have developed a new method that would be incorporated in software and used prior to a radiologist reviewing the CT images. The method involves two key steps. In the first step, the image is divided into many small patches, which may or may not overlap. The size and/or location of the patches may be anatomy- and/or location-dependent.

In the next step, each small patch is decomposed into two sub-patches with one sub-patch corresponding to one or more artifacts and the other devoid of artifacts, or having reduced artifacts. After each small patch is separated into artifacts and non-artifacts, the artifact patches and non-artifact patches may be recombined to generate an artifact image and an artifact-free image (or reduced artifact image).

To achieve this, two dictionaries are constructed: an artifact dictionary and a non-artifact dictionary. Using such constructed dual dictionaries *a priori*, each small image patch may be decomposed into an artifact patch and a non-artifact patch. It may be noted that multiple passes or iterations may be made on a given patch or patches to remove more than one type of artifact.

Applications

- Eliminating banding artifacts caused by the off-focal radiation in volumetric CT exams
- Removal of truncation artifacts, which frequently occur in CT exams
- Removal of residual noise artifacts in X-ray phase contrast images, which can limit the extraction of X-ray differential phase contrast signals
- May also be applicable to any other imaging modality provided an artifact dictionary can be constructed

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Key Benefits

- Provides improved imaging
- Proven to reduce or eliminate artifacts
- Reduces hardware costs (e.g., costs associated with calibrating a system to address off-focal radiation or other potential sources of artifacts)
- Widely applicable – the method does not depend on the origin of the image.

Stage of Development

The researchers have tested 20 images with industry-specific artifacts.

Additional Information

For More Information About the Inventors

- [Guang-Hong Chen](#)

Tech Fields

- [Medical Imaging : CT](#)

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846

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