



TECHNOLOGY

Individually Optimized Uniform Enhancement in Contrast Enhanced Computed Tomography (CT) Scans

OVERVIEW

CT has become the primary method for to evaluate for pulmonary embolism (PE). However for CT to be diagnostic, uniform contrast enhancement of the pulmonary arterial tree is desired. Obtaining uniform contrast enhancement is difficult because there are numerous factors involved. There are methods for calculating the correct injection rate for contrast medium needed to reach optimal contrast enhancement. However, each of these methods has a significant limitation. The patented method describes a greatly improved way to determine the correct contrast injection rate thereby leading to optimal contrast enhancement.

The patented technology describes a method for optimizing a contrast injection for CT imaging. Current techniques for determining a contrast injection function either treat all patients equally (exponentially decelerated injection function (EDI)) or are complex and can result in unrealistic flow rates (discrete Fourier transform (DFT)). The authors have developed a direct optimization method for obtaining an injection function that eliminates the difficulty of the current methods and assures nearly optimal contrast enhancements. The optimized method comprises two steps: (1) Computation of an image enhancement factor (IEF) based on a test bolus scan; (2) Optimization of the contrast injection function using the IEF to achieve uniform target enhancement.

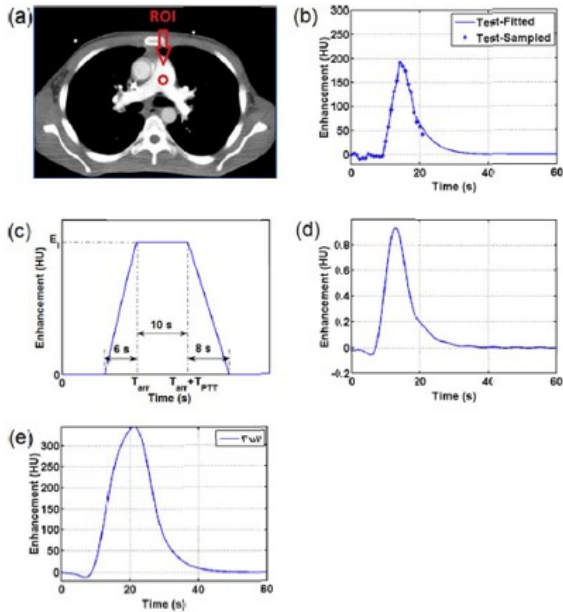


FIGURE 1. (a) A test injection CT image with ROI on pulmonary artery. (b): Measured (star) and fitted (line) test injection (20 mL at 5 mL/s) enhancement curves. (c): Targeted enhancement curve for DFT approach. (d): Patient IEF extracted from (b). (e): Simulated full bolus (65 mL at 5 mL/s) enhancement curve based on IEF in (d).

APPLICATIONS

The global market for CT scanners was valued at ~\$4.4B in 2012 and expected to reach \$5.7B by 2020. The rising prominence of image-guided interventions and the need for early and accurate diagnosis drives the growth rate.

There is considerable interest in improving noninvasive methods of detecting the subclinical signs and symptoms of PE associated with cardiovascular disease. Currently, the diagnosis of PE depends on clinical results in combination with laboratory tests and imaging studies, including CT. Current estimates are that ~300,000 Americans are affected by venous thromboembolism each year and possess the potential to become PE.

ADVANTAGES

Improved contrast enhancement

Patient optimized method for determining contrast injection rates

STAGE OF DEVELOPMENT

A retrospective study conducted on a 27 patient dataset showed that the new optimization approach produced significantly better contrast enhancement (closer to the targeted uniform contrast enhancement) than the DFT approach. Additional studies using this technology have been performed in subjects with pancreatic ductal adenocarcinoma and subjects undergoing total knee arthroplasty.

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LICENSING POTENTIAL

Available for licensing

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PATENT STATUS

US 9,456,798

LICENSE STATUS

Available for licensing

CATEGORIES

- Software + Algorithm

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ATTACHMENTS

-  [Download MX-2013-110 Marketing Sheet 5-17-17 FINAL.pdf](#)

EXTERNAL RESOURCES

- [Individually optimized uniform contrast enhancement in CT angiography for the diagnosis of pulmonary thromboembolic disease](#)

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