Estimation of Contrast Concentration from Angiograms in Presence Of Vessel Overlap

Tech ID: 27535 / UC Case 2014-950-0

SUMMARY

UCLA researchers have developed an image processing technique for quantitative measurement of brain hemodynamics using x-ray digital subtraction angiography (DSA) images. The technology generates color-coded parametric maps of cerebral blood perfusion that augment the image reader's ability to diagnose several pathophysiological events in acute ischemic stroke patients that are not otherwise easily visible on grayscale angiograms.

BACKGROUND

Quantification of cerebral blood perfusion is of significant importance for evaluating therapeutic strategies and guiding management therapies in patients suffering from acute ischemic stroke. Currently used methods for evaluating cerebral blood perfusion such as Thrombolysis in Cerebral Infarction (TICI) and NIH Stroke Scale (NIHSS) are highly subjective and vary from one radiologist to the other. Algorithms have been previously proposed to quantify cerebral perfusion. However, these algorithms have not been widely adopted because of difficulties in implementing them in real-time on DSA systems and their inability to address the problem of overlapping vessels.

INNOVATION

UCLA researchers have developed an image processing technique for quantitative measurement of brain hemodynamics using x-ray digital subtraction angiography (DSA) images. The technology generates color-coded parametric maps of cerebral blood perfusion that augment the image reader's ability to diagnose several pathophysiological events in acute ischemic stroke patients that are not otherwise easily visible on grayscale angiograms. The technology produces data on quantitative blood flow dynamics, resulting in more accurate data on multiple overlapping blood vessels within the imaging plane.

APPLICATIONS

- Quantifying cerebral perfusion during acute stroke
- Real-time image processing using DSA images critical for decision and evaluation of therapeutic strategies
- Individual blood vessel flow estimation
- Evaluation of collateral blood flow to the brain tissue
- Color-coded cerebral perfusion parametric maps that enhance the image reader's ability to discern a number of pathologies such as brain tissue at risk for further damage, risk of hemorrhage, risk of blood flow obstruction in microvasculature, traumatic injury and aneurysms.
- Evaluation of blood perfusion in the heart, lungs, abdominal organs, kidneys and other peripheral tissues to diagnose embolic obstruction or stenosis of major arteries.
- Quantitative perfusion imaging during angiogenesis (new blood vessel formation) in tissue
- Quantitative perfusion imaging of tumors

ADVANTAGES

- Real time blood flow analysis
- Short processing times for color-coded cerebral perfusion parametric maps
- Readily implemented in existing DSA systems
- High spatio-temporal resolution

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OTHER INFORMATION

KEYWORDS

Digital Subtraction Angiography, Digital X-Ray, Perfusion, Blood Flow, Blood Flow Analysis , Overlapping Vessels, Parametric Imaging, Mean Transit Time, Tmax, Angiography, Color Coding, Real Time, Cerebral Perfusion, Flow Analysis, Perfusion Parametric Maps

CATEGORIZED AS

- **Imaging**
  - Medical
  - Other
- **Medical**
  - Devices
  - Disease: Cardiovascular and Circulatory System
  - Disease: Central Nervous System
  - Imaging
- **Research Tools**
  - Other

RELATED CASES

2014-950-0

- Minimally invasive

STATE OF DEVELOPMENT

The invention was successfully demonstrated in April 2014 and has been used to perform analysis on several hundreds of multi-center images.

RELATED MATERIALS

- Lin, Michelle P., and David S. Liebeskind. "Imaging of Ischemic Stroke." CONTINUUM: Lifelong Learning in Neurology 22.5, Neuroimaging (2016): 1399-1423.
- Scalzo, Fabien, and David S. Liebeskind. "Perfusion Angiography in Acute Ischemic Stroke." Computational and Mathematical Methods in Medicine (2016).
- Schmitz, Marie L., et al. "Recanalization and Angiographic Reperfusion Are Both Associated with a Favorable Clinical Outcome in the IMS III Trial." Interventional Neurology 5.3-4 (2016): 118-122.

PATENT STATUS

Country	Type	Number	Dated	Case
Japan	Issued Patent	7090546	06/16/2022	2014-950
United States Of America	Issued Patent	10,966,679	04/06/2021	2014-950

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