Quantification of Symmetry in Imaging

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Technology description

Problem or Unmet Need:
Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and Positron Emission Tomography (PET) as well as other radiological techniques are widely used for medical diagnostics. In many cases it is desirable to quantify and assess content of acquired images in order to detect pathological changes occurring in one side of the scanned region by comparing it to other symmetrical part (which is presumably healthy).This technique, based on analysis of symmetry of the images, found its application, among other neurological conditions, diagnosis of cerebral vasospasm conditions (conditions which might lead to a stroke). Usually, in this case, a trained human expert qualitatively evaluates the symmetry of perfusion-weighted CT or MRI images in order to find problems with blood flow in on of the brain hemispheres. But there is an urgent need for developing a system for quantitative assessment of the pathological content in order to assist a human observer with correct diagnosis.
The authors developed a method and related software for analyzing images such as computerized tomography images obtained from a standard perfusion CT software package. Perfusion-weighted imaging is analyzed and quantified by detecting side-to-side asymmetry of cerebral blood flow, cerebral blood volume and time to peak maps. The method uses mathematical analysis and advanced statistical techniques to generate a map of relative meaningful differences between symmetrical parts of the image and quantitatively represent side-to-side asymmetry.

Application area

Quantification of symmetry of CT and MR brain perfusion for evaluating ischemic conditions of the brain and the diagnosis and management of delayed cerebral vasospasm (CVS). This quantitative assessment could lead to more rapid and accurate diagnoses.
Quantification Assurance of symmetric CT, MRI and other image modality scans. An imaging technician who attempts to perform an asymmetric scan of a patient would be warned, by the method, that the patient should be re-adjusted to yield symmetric images. This might decrease the probability of clinical error due to quality improvement of acquired radiological images.

Advantages

The method provides objective quantitative assessment of symmetry and does not rely exclusively on a human observer, who is prone to natural limitation of perception, and whose ability to perceive symmetry can be biased.
The application could also be used during data acquisition process and improve the quality of diagnostic images.
The method provides an ability to calculate the degree of asymmetry in specific regions of interest (i.e. vascular territory, cerebral hemisphere, half of body) for higher accuracy of diagnosis.
The results of quantitative analysis can be presented in a specific output format pertinent to the relevant application.
The application can be integrated into existing radiological imaging software packages and work with standard image formats.

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