INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Automated Measurement of Brain Injury Indices Using Brain CT Images, Injury Data, and Machine Learning

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Overview

Advanced Traumatic Brain Injury (TBI) diagnosis and assessment methodology
- Consistent, Reliable, Accurate, Predictive, Actionable and Objective Methodology

BACKGROUND

Traumatic brain injuries (TBI) are sustained by up to 1.5 million people each year in the United States, with over 50,000 patients left dead and a large majority left permanently disabled. An increase in intracranial pressure (ICP) due to blood clot formation (hematoma) that compresses brain tissue can be life-threatening and requires immediate treatment. While computed tomography (CT) scans are used for non-invasive monitoring for signs of increased ICP, visual inspection of the scans is prone to inaccuracies or inconsistencies in image reading that can underestimate the actual severity of the injury. Shifting of brain tissue (midline shift) can be detected on a CT scan and is a critical indicator of brain swelling requiring urgent treatment. However, visual detection of small midline shifts is elusive and can be easily missed before a patients condition worsens. Currently, there is a no system that can be used to measure brain injury indices, such as midline shift, automatically.

INNOVATION

A decision-support system and computer implemented method can be used to measure a patients brain midline shift automatically from CT images via machine learning methods. An estimate of the intracranial pressure is derived based on a variety of brain injury parameters, including the detected midline shift, brain tissue texture, and blood accumulation volume. Advanced signal processing methods are used to increase the speed and accuracy of identifying the brains anatomical features in the CT scan that are typically assessed using visual inspection. A novel multiple regions shape matching algorithm permits for the estimation of the actual midline detected on CT scans, allowing for a comparison to the ideal midline in order to determine the midline shift.

PATENT APPLICATION

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