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MRI Quality Control Using Texture Analysis and Spatial Metrics

Authors : Kumar Kanudkuri, A. Sandhya

Abstract : Typically, in a MRI clinical setting, there are several protocols run, each indicated for a specific anatomy and disease condition. However, these protocols or parameters within them can change over time due to changes to the recommendations by the physician groups or updates in the software or by the availability of new technologies. Most of the time, the changes are performed by the MRI technologist to account for either time, coverage, physiological, or Specific Absorbtion Rate (SAR) reasons. However, giving properly guidelines to MRI technologist is important so that they do not change the parameters that negatively impact the image quality. Typically a standard American College of Radiology (ACR) MRI phantom is used for Quality Control (QC) in order to guarantee that the primary objectives of MRI are met. The visual evaluation of quality depends on the operator/reviewer and might change amongst operators as well as for the same operator at various times. Therefore, overcoming these constraints is essential for a more impartial evaluation of quality. This makes quantitative estimation of image quality (IQ) metrics for MRI quality control is very important. So in order to solve this problem, we proposed that there is a need for a robust, open-source, and automated MRI image control tool. The Designed and developed an automatic analysis tool for measuring MRI image quality (IQ) metrics like Signal to Noise Ratio (SNR), Signal to Noise Ratio Uniformity (SNRU), Visual Information Fidelity (VIF), Feature Similarity (FSIM), Gray level co-occurrence matrix (GLCM), slice thickness accuracy, slice position accuracy, High contrast spatial resolution) provided good accuracy assessment. A standardized quality report has generated that incorporates metrics that impact diagnostic quality.

Keywords : ACR MRI phantom, MRI image quality metrics, SNRU, VIF, FSIM, GLCM, slice thickness accuracy, slice position accuracy
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