A robust algorithm for spikes elimination from 2D CCD low-level lightoutput measurements in the presence of ionizing radiation field

2D and 3D radiation dosimetry methods, based on detection of scintillation light images require both highly efficient and low noise image detectors. By cooling charge-coupled device (CCD) detectors, for low light level measurements integration times can be prolonged in order to improve precision. However, integration times are limited by the "spike" noise, which is due to cosmic rays as well as by scattered x- and γ- rays. We present a simple and efficient method for eliminating spike noise without losing the original signal information using multiple images and a time averaging approach. This permits light to be integrated for a long periods of time near ionizing sources. Spikes are identified at particular points by comparying of the standard deviations computed over repeatedly acquired images with the square root of the time averaged signal intensity. Values idntified as spikes were replaced with the mean value of the remaining values for that point. The method was tested for plastic and liquid scintillator radiation dose measurements, which are characterized by a large number of stray γ-rays that may strongly contaminate the effective image.
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