Purpose:

Anomalous pixels may be defined as those pixels whose exposure response relationship is deviant from the typical, expected or calibrated response. A group of anomalous pixels may result in visible correlated artifacts. Here we demonstrate an approach to identify anomalous pixels and correlated artifacts using flat-field images.

Methods:

Using manufacturer specific calibration geometry, sets of four flat-field images per detector were obtained with varying input air kerma values (0.5 to 160 µGy) from 9 digital detectors at 6 institutions. Images obtained before and after calibration, with both proper and improper gain maps and structured artifacts were additionally acquired with some detectors. Image analysis methodology under consideration by AAPM Task Group 150 was used.

After eliminating 10mm borders, images were divided into square regions (100mm2). Anomalous pixels were identified as pixels within each region with values above or below Â±3 standard deviations (SD) relative to the mean value of the region. If these pixels were identified in all four images comprising a set, then they were reported as anomalous. Line artifacts were identified as rows and columns with cumulative profile values that were above or below Â±3 SD with respect to the mean value of neighboring profiles in the set of four flat-field images. Results were verified with visual inspection of the images.

Results:

For four sets of images, the algorithm did not identify any anomalous pixels, and none were spotted on visible inspection as well, while for five sets of images the identified anomalous pixels matched visual inspection results. Anomalous pixel detection failed in regions with an unusually large number of defects and structured noise, since those regions exhibited relatively large SD. Line artifacts consistent with visual analysis were identified correctly when present.

Conclusions:

A practical approach to identify anomalous pixels and correlated artifacts from flat-field images is demonstrated.