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★ - Author stated no financial disclosure

▲ - Disclosure information unavailable

CODE: SST16-03**SESSION: Physics (Digital Imaging, PACS)**
Increasing Image Quality of Medical LCD Displays by Removing Spatial Noise and Luminance Non-uniformities

DATE: Friday, December 03 2004
START TIME: 10:50 AM
END TIME: 11:00 AM
LOCATION: S401AB

PURPOSE

Modern medical LCD displays suffer from substantial spatial noise and luminance non-uniformities. By using pixel-based correction we can compensate for the spatial noise and this significantly improves image quality.

METHOD AND MATERIALS

Medical flat panel displays consist of several millions of pixels and large differences in the behavior of individual pixels have been observed. Equally driven pixels can have luminance differences of more than 30%. This phenomenon is also called spatial noise and can be described as a random stationary image superposed on top of the medical image being displayed. It is obvious that noise can mask subtle structures present in medical images. Especially small abnormalities of only a few pixels in size can be completely hidden by noise.

Because the differences between individual pixels are typically stationary it is possible to measure the noise pattern and to compensate for it.

RESULTS

We used a 5 Mega Pixel monochrome LCD-panel with 1024 shades of gray. By means of a high-resolution scientific-grade CCD-camera we measured the transfer curve of each pixel. The noise map for a specific video level was obtained by subtracting the mean luminance value for that level from the individual pixel luminance responses. When comparing the noise patterns for multiple video levels we noticed significant variation. Therefore a different compensation is needed for different video levels. Once the noise map is known for all video levels we can easily calculate correction values for all pixels so that after adding these values to the pixel data the noise is compensated for. Because each pixel has its own correction values there is absolutely no spreading of noise to neighboring pixels.

We developed specialized hardware to perform real-time and user-transparent reduction of spatial noise and non-uniformities. Performance measurements show an increase in SNR of over 15dB and a luminance uniformity of over 95%.

CONCLUSIONS

We presented techniques to measure and compensate for spatial noise present in medical LCD displays and this on individual pixel-basis. Implementing these compensation schemes results in both a significant improve of SNR and a visual improvement of image quality.

DISCLOSURE

T.R.K.,P.M.,A.X.,L.D.: Authors work for Barco.

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