

AbstractID: 8163 Title: Need for the liquid crystal displays having the capability of rendering higher than 8 bits in grayscale

Purpose: The purpose of this study was to examine the potential usefulness of liquid crystal displays (LCDs) having the capability of rendering higher than 8 bits in grayscale. **Method and Materials:** An LCD having the capability of rendering 8, 10, and 12 bits in grayscale was used. It was calibrated to the grayscale standard display function (GSDF) with a maximum luminance of 450 cd/m^2 and a minimum of 0.75 cd/m^2 . To examine the grayscale resolution of the human visual system, various test patterns having different combinations of brightness in 8, 10, and 12 bits were displayed on the LCD. These patterns were placed on different uniform background luminance levels, such as 0%, 50%, and 100% of maximum luminance. Then, the probability of detection for various differences in 8, 10, and 12 bits was examined. **Results:** All observers distinguished a smaller difference of luminance than a one-pixel value of 8 bits irrespective of background luminance levels. As a result of the adaptation processes of the human visual system, observers had a greater tendency to distinguish a small difference of luminance for the signal level of the test pattern to be nearer to the background luminance level. The smallest difference of luminance that observers were able to distinguish was a four-pixel value difference in 12 bits, i.e. the difference of a one-pixel value in 10 bits. **Conclusion:** Considering the human visual systems, medical images should be displayed on LCDs having 10 bits in grayscale or greater in order to detect low contrast objects with small differences of luminance and carry out smooth gradation expressions into practice.