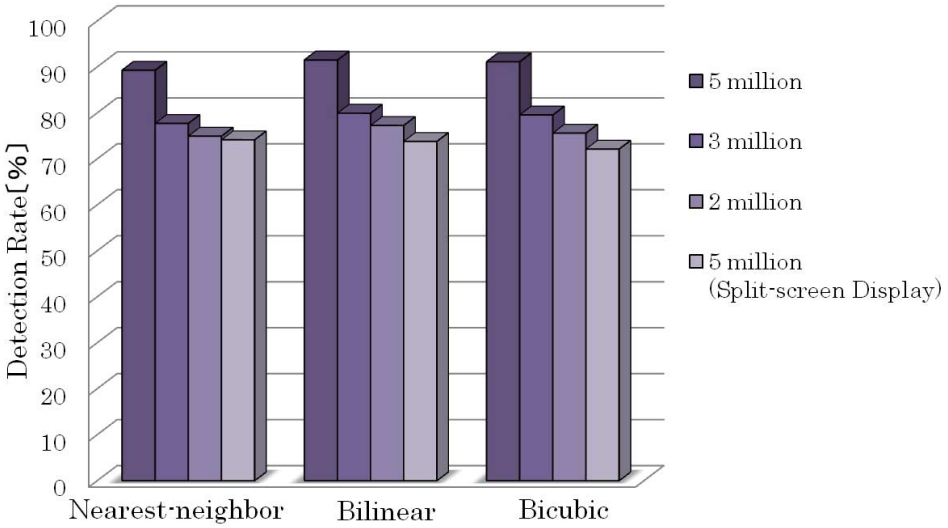

Fig. 3. Results of the observational experiment for comparing the signal-detection performances among the image-reduction rates.

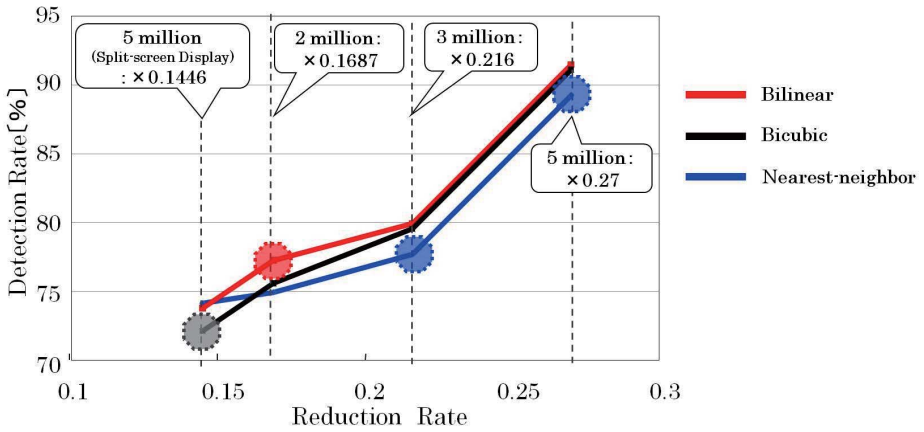

Fig. 4. Results of the observational experiment for comparing the detection performances among the interpolation methods. The circles indicate values significantly different from those obtained with the other methods.

2.3.2 Bilinear method For separated bilinear interpolation, the values of both direct neighbors are weighted by their distance to the opposite point of interpolation. For linear interpolation, the interpolation kernel is as follows:

$$ {}^{\text{Bilinear}}h(x) = \begin{cases} 1 - |x|, & 0 \le |x| < 1 \\ 0, & \text{elsewhere,} \end{cases} \tag{2} $$

where x is the distance between the point to be interpolated and the grid point being considered. The triangular function corresponds to a modest low-pass filter in the frequency domain. Therefore, the main disadvantages of linear interpolation are attenuation of the high-frequency components and aliasing of the data beyond the cutoff point into the low frequencies (Parker *et al.*, 1983).

2.3.3 Bicubic method Cubic convolution interpolation determines the grey level value from the weighted average of the 16 closest pixels to the specified input coordinates and assigns that value to the output coordinates. The kernel is positive in the interval from zero to 1 and negative from 1 to 2. Frequencies directly below the cutoff point are amplified slightly, and the transition between the pass band and the stop band is quite sharp. The cubic convolution interpolation kernel is as follows:

$$ {}^{\text{Bicubic}}h(x) = \begin{cases} (a+2)|x|^3 - (a+3)|x|^2 + 1, & 0 \le |x| < 1 \\ a|x|^3 - 5a|x|^2 + 8a|x| - 4a, & 1 \le |x| < 2 \\ 0, & \text{elsewhere,} \end{cases} \tag{3} $$

where x is the distance between the point to be interpolated and the grid point being considered and a is usually set to -0.5 or -0.75. In this study, we set a to -0.5.

2.4 Observational experiments

For the observational experiments, the room illumination was set to about 50 lx. The window width was a difference between the maximum value and the minimum value of the pixel value obtained from the histogram of the simulation picture. The window level was center values between the maximum value and the minimum value. The window width and level were fixed at 847 and 531, respectively. We set the maximum luminance of the LCD to 500 cd/m^2, and the viewing distance from the LCD was arbitrary. The reduced images were randomly displayed on a 5-million-pixel LCD by using the same software and the signal-detection