Image Quality Evaluation Between Hardware Calibration and Software Calibration on the Display

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This research aims to evaluate the calibration performance of the display depending on the display calibration method. To ensure objectivity of this research, four monitors from four different manufacturers that support hardware calibration were used. We also investigated the difference in calibration quality that could be caused by the backlight type's specific properties. Colorimeter and spectrophotometer were used to measure standard color gamut and wide color gamut displays.

In order to measure and evaluate the image quality for each calibration method, white-point and tone reproduction were the analysis factors that were compared, and in order to increase the objectivity of the results, all displays were normalized to the same target luminance level.

The results of the experiment showed that for some calibration conditions, it was confirmed that hardware calibration did not show a clear difference compared to software calibration. For the tone reproduction characteristics, when the data was analyzed based on gamma, it was showed that there was a statistical significance in the difference of the results that hardware calibration slightly showed a better correctional effect, as shown in Table 1. and Table 2.

Table 1. Average gamma result between hardware calibration and software calibration

Average Gamma	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Hardware Calibration	2.2000	2.1867	2.2267	2.1700	2.1667
Software Calibration	2.1883	2.1700	2.1733	2.1500	2.1767

Table 2. T-Test average verification

	Average		Standard Deviation		t	p
	HW Cal.	SW Cal.	HW Cal.	SW Cal.		
Whitepoint	5.446	3.966	4.076	3.454	1.729	0.088
Blackpoint	0.653	1.097	0.535	0.867	-2.716	0.008
TRC as combined deltaE	3.313	2.606	2.158	2.037	1.121	0.266
TRC as average gamma	2.199	2.178	0.301	0.277	3.286	0.002
White luminance	118.91	119.86	3.40	5.32	-0.93	0.35

*$p<0.05$

References

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