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[including a combined TSMAD-CSMWG meeting on 7 May]

Subject: Reproduction of Colour palettes on LCD displays
Date: Thu, 31 Jan 2008 09:47:19 -0500
From: McFadden, Sharon <Sharon.McFadden@drdc-rddc.gc.ca>
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Dear Mathias and Mike,

I just received the following observation from a UK colleague. He was wondering if I could provide additional information. My current thinking about the source of the problem and what after his observations. Have either of you encountered this issue and if so is anything being done?

"To follow up the exchange of e-mails last year about night vision compatible palettes for ECDIS and other navigation packages, recent work here suggests to me that most palettes are actually designed for implementation on Cathode Ray Tubes rather than the now more prevalent LCDs. In particular it seems that in the cases I have looked at that, instead of using dim greens, reds and browns, it is better on an LCD to use something similar to the normal daytime palette with blues.

Certainly my experience with RN WECDIS using the IHO/IMO night palette in dark adapted conditions was that a considerably higher level of LCD backlighting was needed for the display to be legible when compared with a proprietary design (OSI Inc) intended for our Warship AIS equipment and which used similar colours to the daytime palette."

In this case they are using ECDIS on an LCD display with variable backlighting. Variable backlighting means that you can achieve much blacker screen for use under low ambient illumination than is normally possible with LCDs used in office applications. A couple of years back I characterized an avionics LCD display with variable backlighting. I noted that not only did the minimum luminance decrease but so did the maximum luminance. Thus, at the highest backlighting levels, the maximum luminance was over 400 Cd/m², but at the lowest levels it was around 10 Cd/m². If a manufacturer characterized the display using a high backlight and generated the RGB values for all of the colour tables, the darkest colours in the night table would probably be too bright.

However, if those values were used with a lower backlight the accuracy of the darkest colours would improved but the whole range of luminances would be compressed. I think that is what happened here. Actually I wouldn't be surprised if they used RGB values based on a characterization of a CRT, but I will give them the benefit of the doubt.

If all LCDs with variable backlighting work this way, then the ECDIS standard needs to at least make users aware of this fact and require characterization at each backlighting level the manufacturer is using. I also think it now becomes necessary to require at least a check of the output of some of the night table colours and this should be done under the backlighting levels that the manufacturer recommends for use with each table.

I have CC'd Matt on this. I know he is not working on ECDIS, but he may have some other insights.

Regards

Sharon

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Note from Mike Eaton 24 Feb 2008

It sounds quite serious - the now-dominant LCD displays are apparently not as well suited to colour displays as CRTs, especially on night colour tables

I have been in touch Sharon McFadden and Matt Cowan over this (Matt wrote the original appendix B on colour calibration), and I have asked them to contribute an explanatory note for C&S 18. I think this is rather more important than symbolising individual trees for example! So I hope you and Mathias can put it on the agenda.