**Paper for Consideration by TSMAD28/DIPWG6**

**[Colour Tables in S-100 Part 9 Portrayal Catalogue]**

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| *Submitted by:* | CARIS |
| *Executive Summary:* | Encoding/transfer of colour tables as part of a Portrayal Catalogue |
| *Related Documents:* | S-100 Part 9 draft |
| *Related Projects:* | Completion of S-100 Part 9 |

**Introduction / Background**

Consideration of how to encode and deliver colour table information as part of S-100 Part 9 portrayal catalogue. Consideration of the use of sRGB colour definitions.

**Analysis/Discussion**

The colour tables from S-52 could easily be encoded in an XML structure.  For example:

```
<colourTable name="Day" >
   <colour name="grey">
          <token>NODTA</token>
          <cie>
           <x>0.280</x>
           <y>0.310</y>
           <L>40.0<L>
          <cie>
   </colour>
    <colour name="orange">
          <token>CURSR</token>
          <cie>
           <x>0.50</x>
           <y>0.40</y>
           <L>32.0<L>
          <cie>
   </colour>
    …
</colourTable>
```

If we added sRGB to this it could be just an additional element to the colour record.

Presently S-100 Part 9 describes colour tables being encoded as SVG color profiles. This document is meant to propose that a simple XML colour table would suffice.  The use of SVG for symbols etc can be endoded such that the colours can be identified by colour tokens which can then be populated using the information in the applicable colour table.

The S-52 CIE xyL values are also known as xyY.  These can be converted to more commonly used XYZ values using some calculations.

See:

http://en.wikipedia.org/wiki/SRGB

**REF CIE 15 (2004)**

**xyY to XYZ**

$$X = \frac{xY}{y}$$

$$Y = Y$$

$$Z = \frac{(1 - x - y)Y}{y}$$

**Note:**
1. If $y = 0$, i.e. Black, set $X = Y = Z = 0$.
2. $Y = L$, luminance in cd/m$^2$

The cie XYZ values can then be converted to sRGB.
http://www.color.org/srgb.pdf

There are sample codes and even converters available online such as
http://davengrace.com/dave/cspace/

A sample using the orange day colour of x = 0.50, y = 0.40, L = 32.0
X = 40, Y = 32, Z = 8
sRGB = 227,128,57
**sRGB = #E38039**

Description of sRGB from Wikipedia:
*The sRGB color space has been endorsed by the <u>W3C</u>, <u>Exif</u>, <u>Intel</u>, <u>Pantone</u>, <u>Corel</u>, and many other industry players. It is used in proprietary and open <u>graphics file formats</u>, such as <u>SVG</u>.*
*The sRGB color space is well specified and is designed to match typical home and office viewing conditions, rather than the darker environment typically used for commercial color matching.*
*Much software is now designed with the assumption that an 8-bit-per-channel image file placed unchanged onto an 8-bit-per-channel display will appear much as the sRGB specification recommends. <u>LCDs</u>, <u>digital cameras</u>, printers, and scanners all follow the sRGB standard.*

A little investigation identifies that sRGB was originally defined by HP in 1996 to match display characteristics of CRT monitors and that the characteristics of LCD monitors are different. LCD Monitors have difficulty producing a true black and colours are not quite the same. LCD monitors also don't have the same range of blues as CRTs have. Similar to the problems identified with CRTs when S-52 was being developed, LCDs also will drift in their colour calibration over time.

Some colour test panels can be used to help determine if a monitor is poorly calibrated but to be certain monitor calibration equipment is needed.

**Recent developments**

This paper was reviewed at the S-100 Technical focus group meeting in Hamburg week of March 10, 2014 and the group reached a consensus about using a simple XML format for conveying colour profiles as part of a portrayal catalogue. The group agreed to continuing to use CIE xyL values as well as sRGB. Since the meeting an XML colour profile definition (xml Schema) has been developed by 7Cs and added to the updated Part 9 Portrayal document submitted under TSMAD28 11.1A.

**Conclusions**

Colour tables can be encoded in a simple XML format.
sRGB may be a useable alternative to CIE for colour specification but some investigation by colour experts and consideration of the use of LCD rather than CRT displays. It seems that the bigger question is regarding whether the newer LCD technology requires the same level of concern and calibration as was evident with CRT screens.

**Recommendations**

Transfer colour tables in a simple XML format

Continue to include CIE xyL color definitions as were used in S-52. Also include sRGB values in colour palettes. Optionally CIE XYZ values could also be used.

**Justification and Impacts**

Simple is better. A simple XML encoding will be easier for implementers.

sRGB is commonly accepted and used and devices come from the factory with some form of sRGB calibrations. The question is whether ECDIS needs a more exact calibration.

**Action Required of DIPWG**

The DIPWG is invited to:

a. endorse the proposal to convert the existing S-52 colour tables into XML and include in an S-101 Portrayal Catalogue as documented in TSMAD28 11.1A

b. Consider and seek consultation on the use of sRGB as opposed to CIE colour encoding.