ClearType Fonts
Colorfulness Analysis

Jiajing Xu

Advisor: Brian A. Wandell, Jon Winawer

March 17, 2007

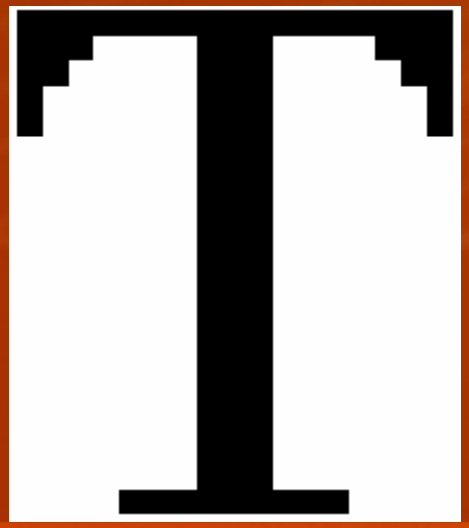
Outline

- History of ClearType
- Understanding ClearType
- Project Objective
- Results
- Acknowledgement
- Questions

History of Digital Font Technology

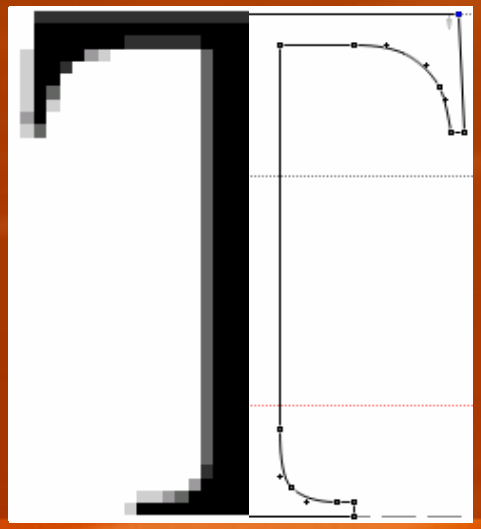
Bitmap Font

hand-tuned



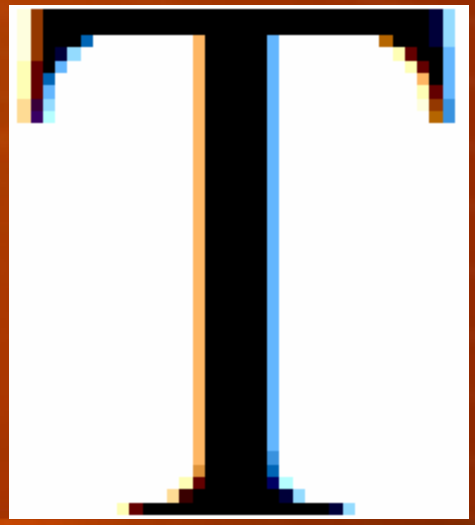
Outline Font

hinting
anti-aliasing



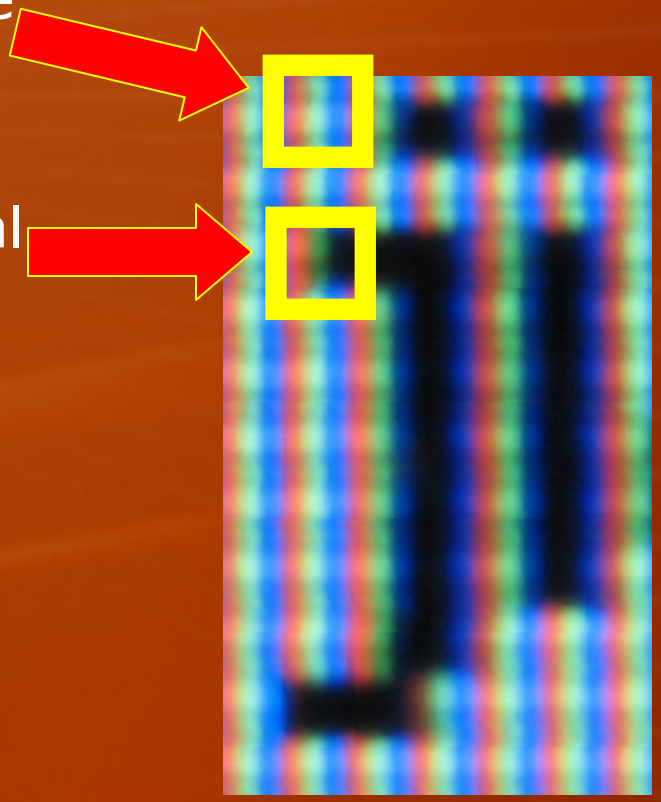
Sub-pixel rendering

increase resolution

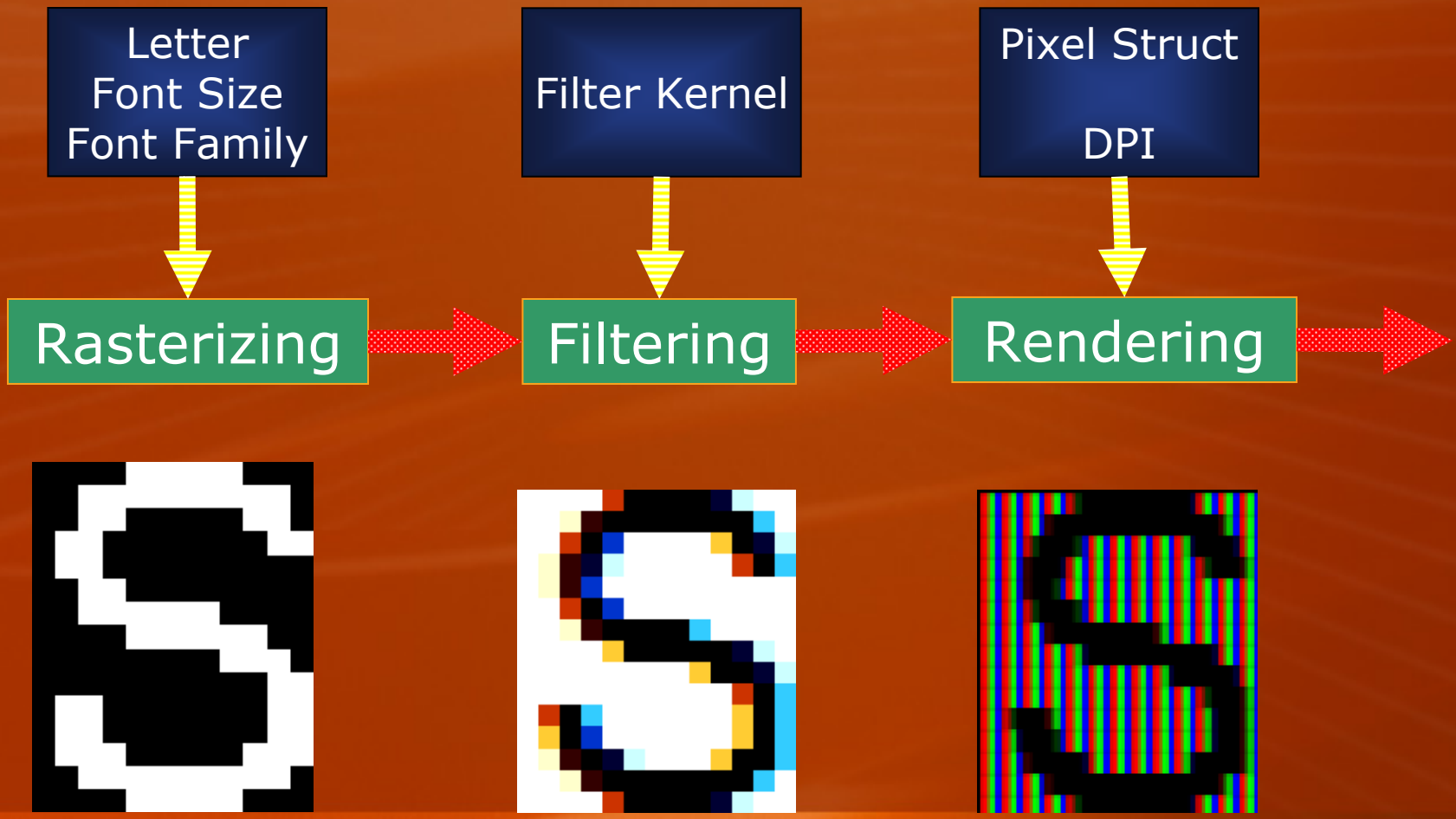


Understanding ClearType

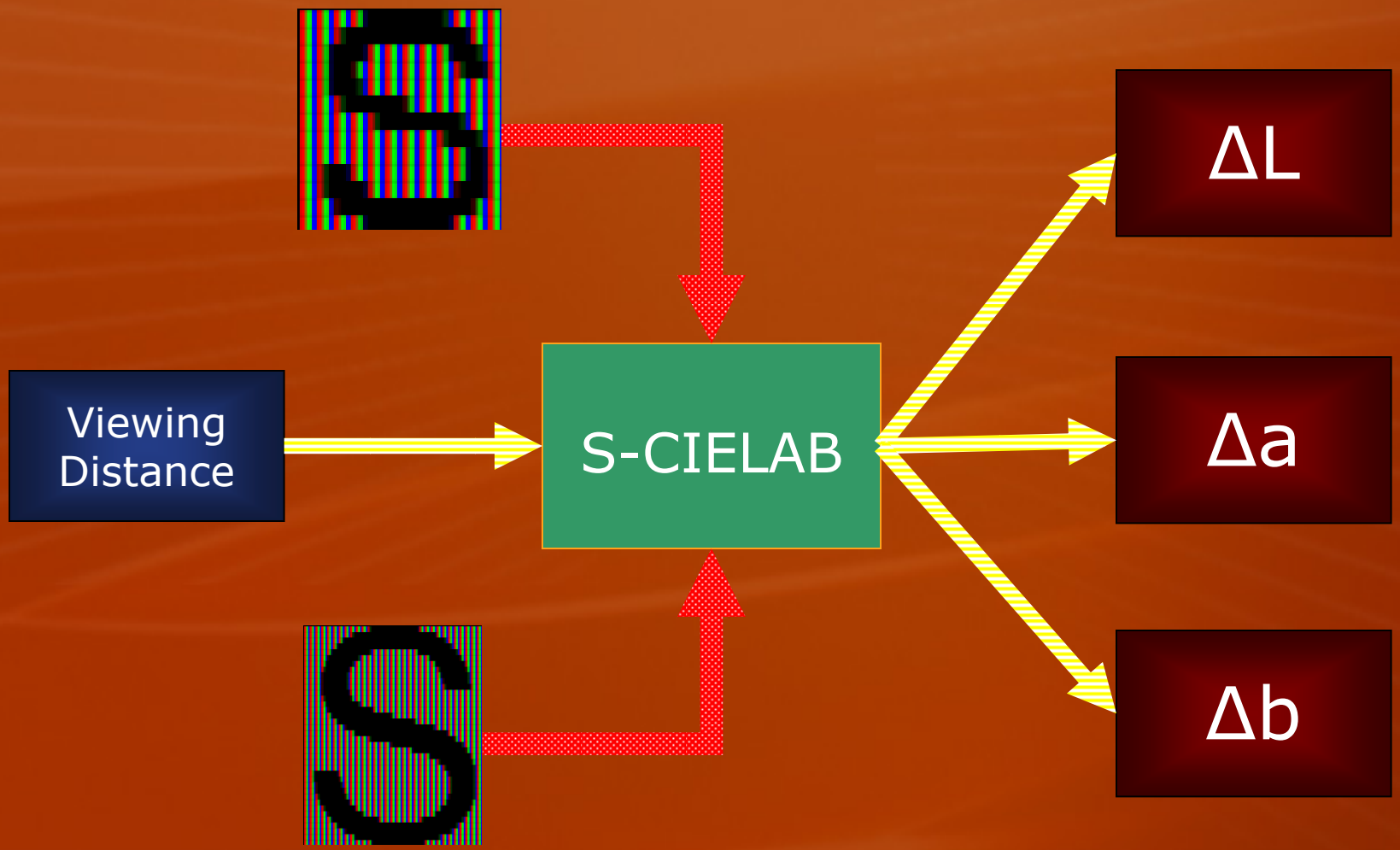
- Each LCD pixel consists of three stripes: Red, Green, Blue
- Tune intensity of each individual channel instead of turning one pixel on and off as a whole
- Remove jaggness and improve sharpness of the edge without taking too many hints from the TrueType



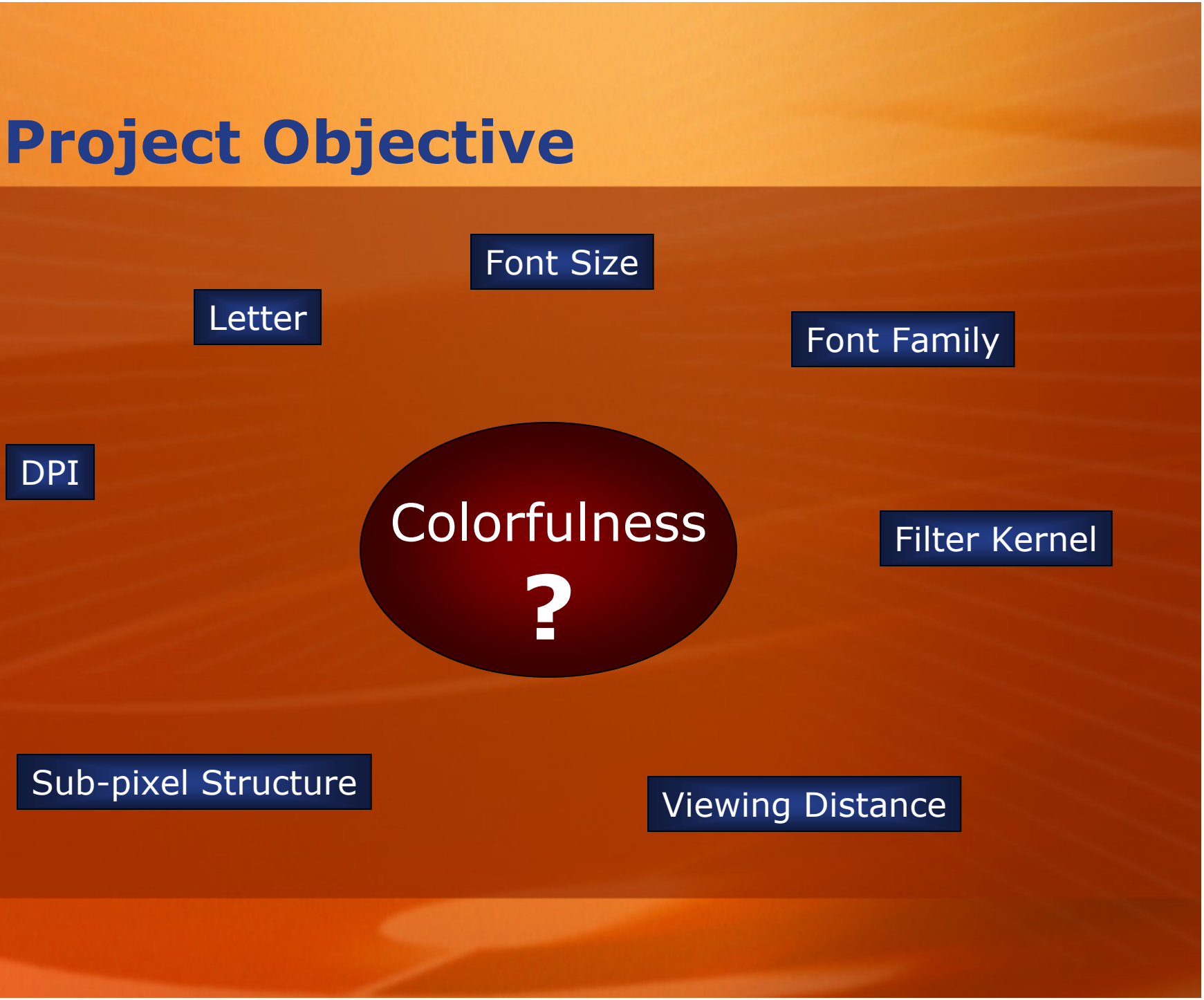
ClearType Simulation Flow



(cont.) S-CIELAB Analysis



Project Objective



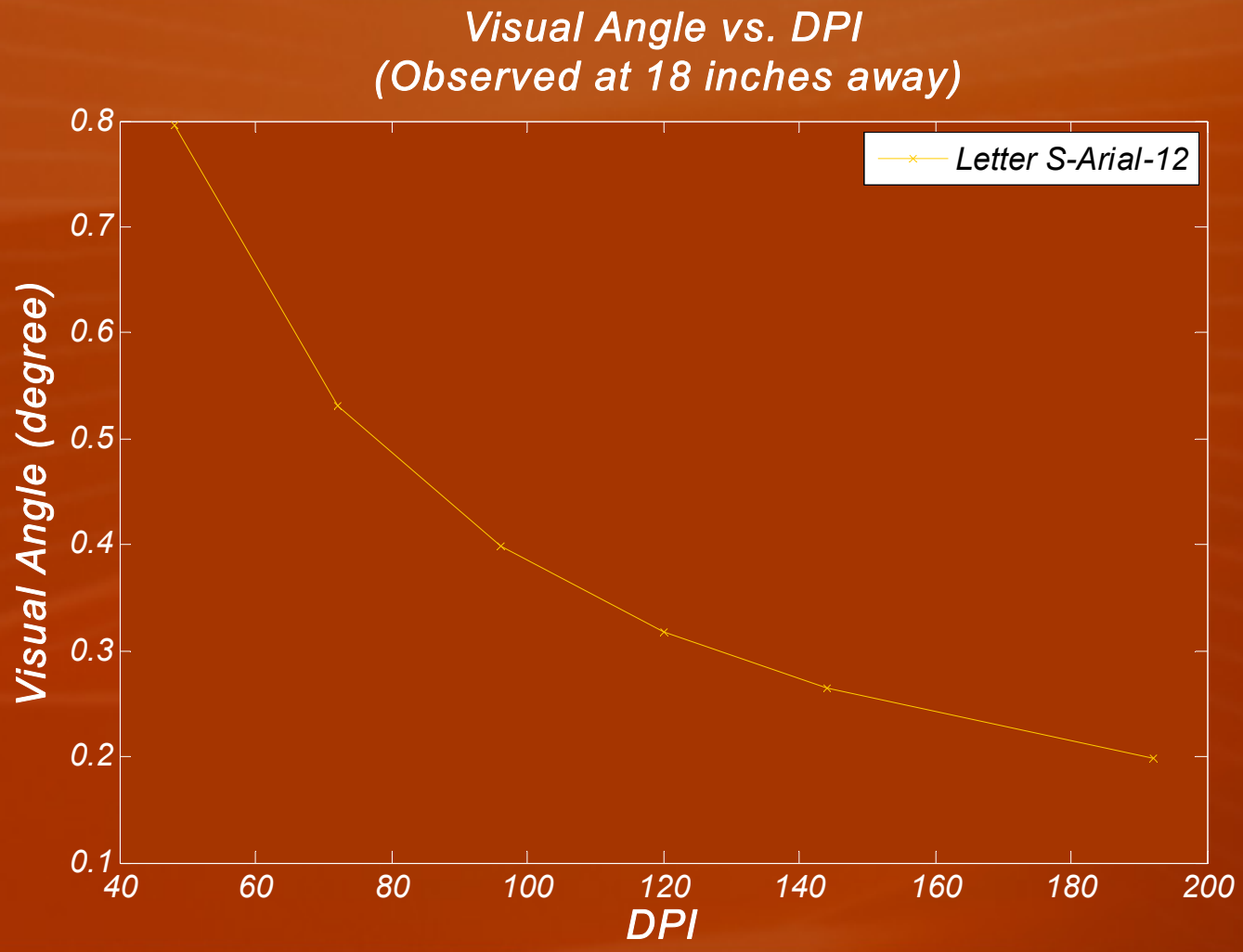
Metrics on DPI

We regard the rendered letter on high resolution display as the ideal image, as well as a reference to the lower resolution rendered image.

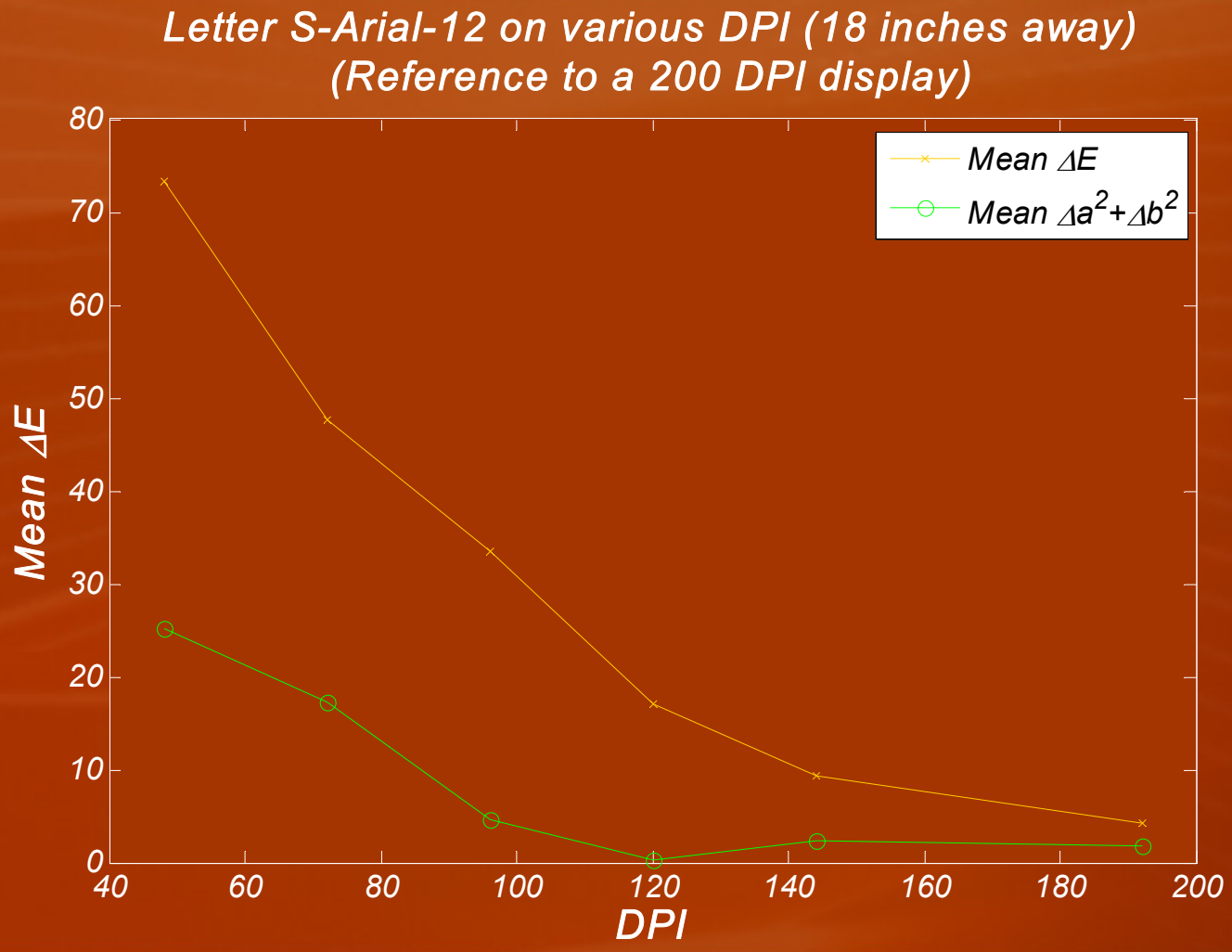
Low Resolution

High Resolution

Visual Angle vs. DPI



S-CIELAB (varying DPI)



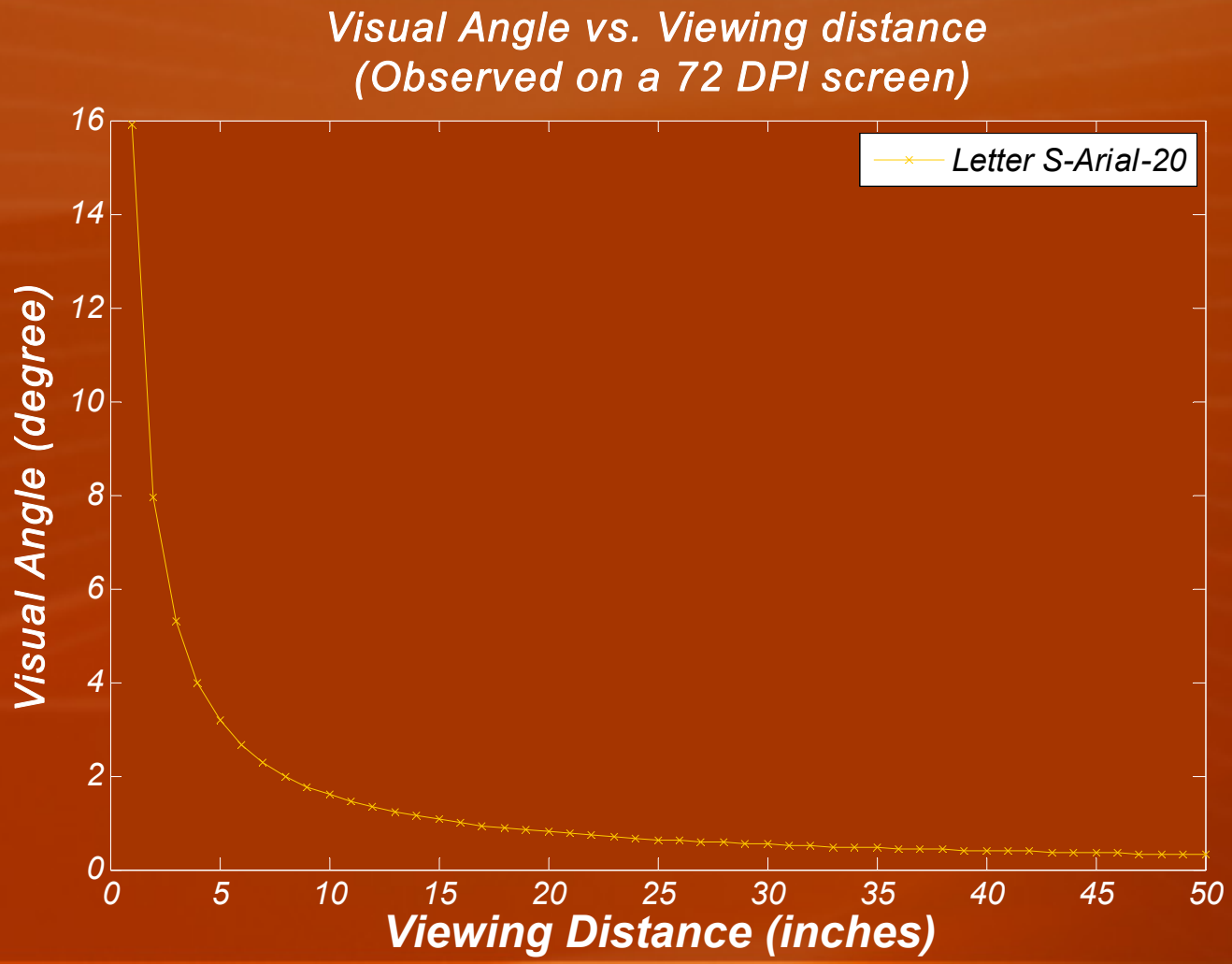
Metrics on Viewing distance

S-CIELAB is very sensitive on image's spatial frequency (determined by viewing distance and DPI in my project).

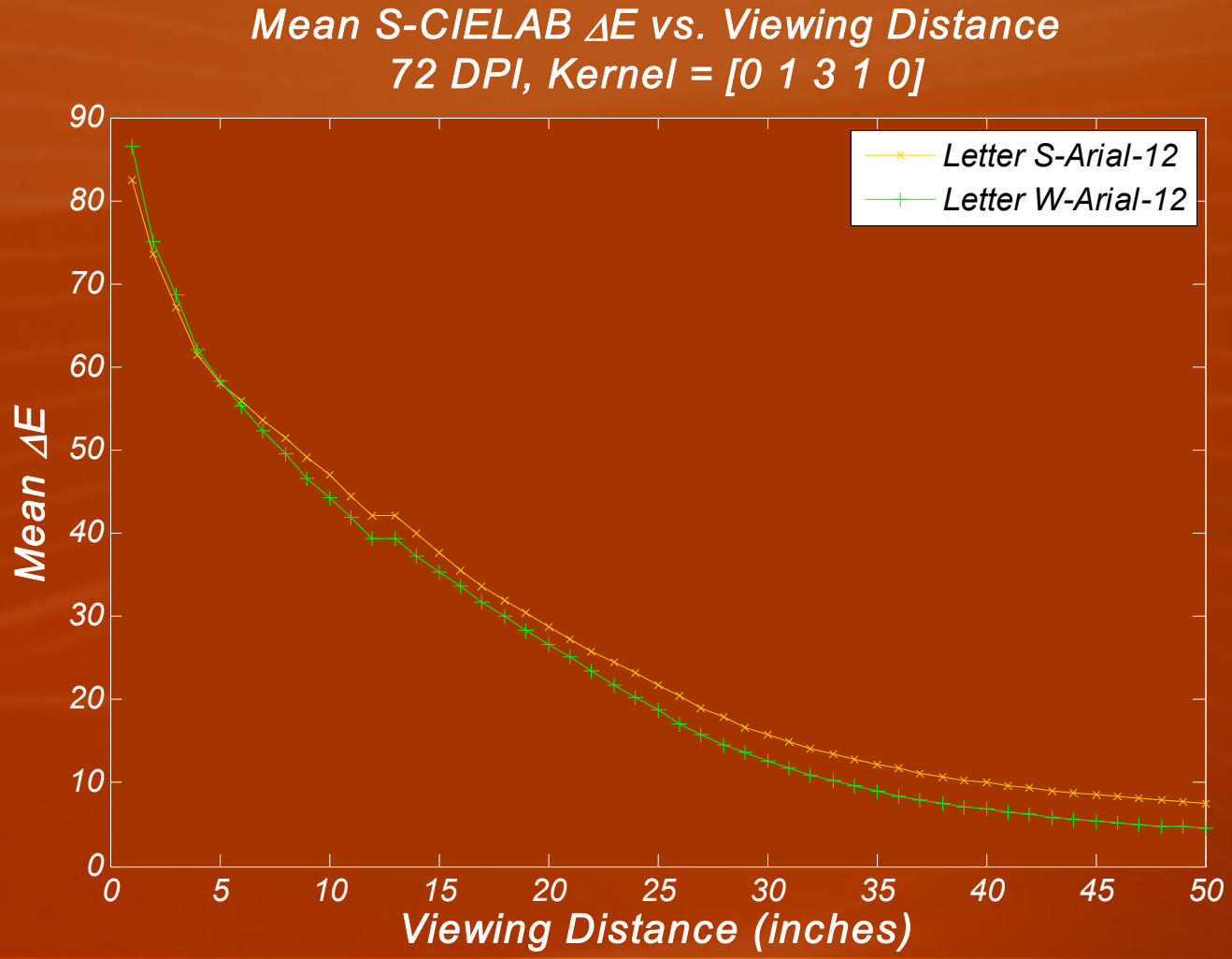
10 inches away

18 inches away

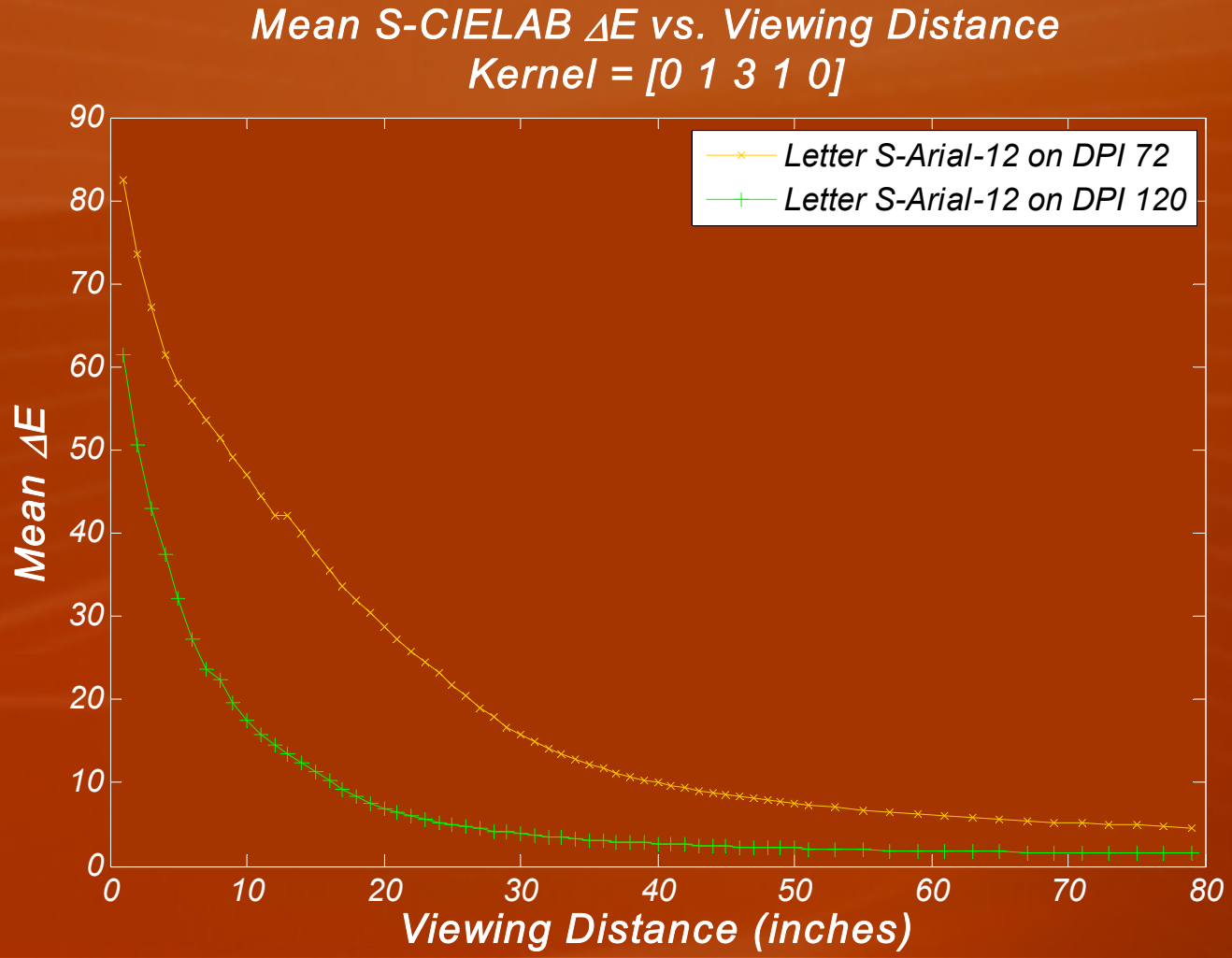
Visual Angle vs. Viewing Distance



Varying viewing distance



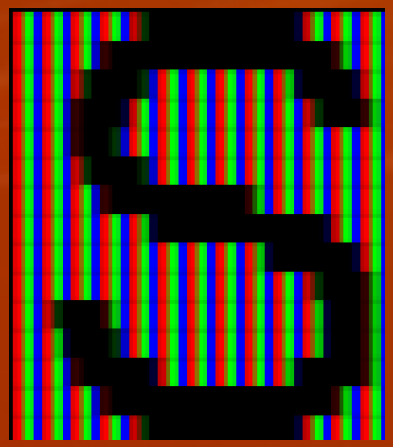
(cont.) on higher DPI screen



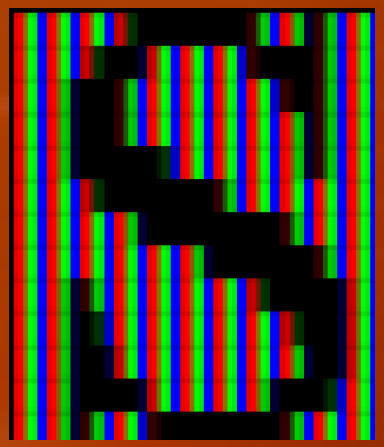
Metrics on Font Family

Different font families have their own characteristics, i.e. sharper edge, various width, heavier natural weights, etc.

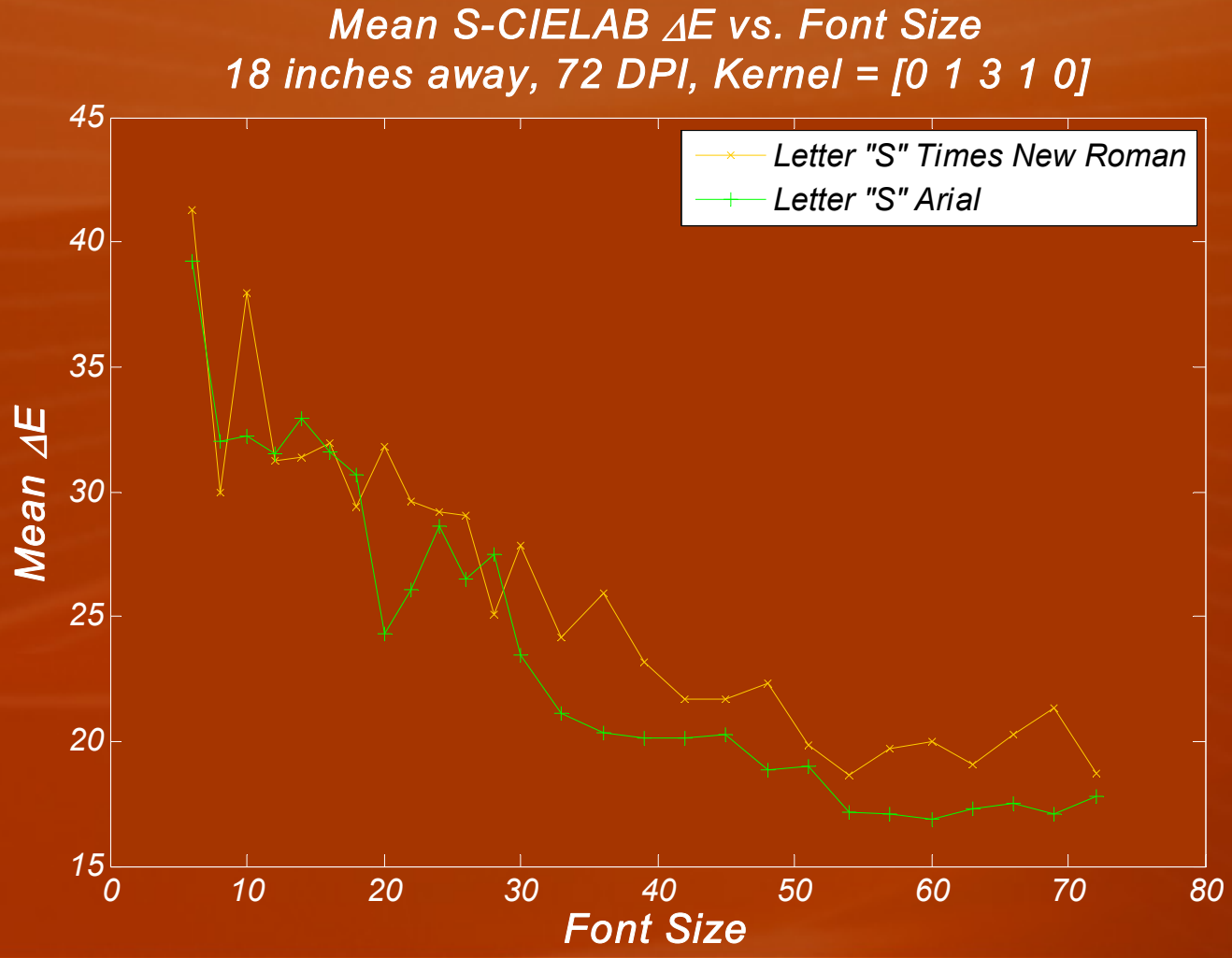
Arial



Times New Roman



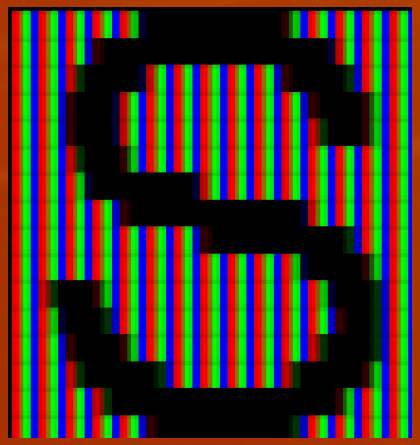
Comparing Letters from two Font Families



Metrics on Font Size

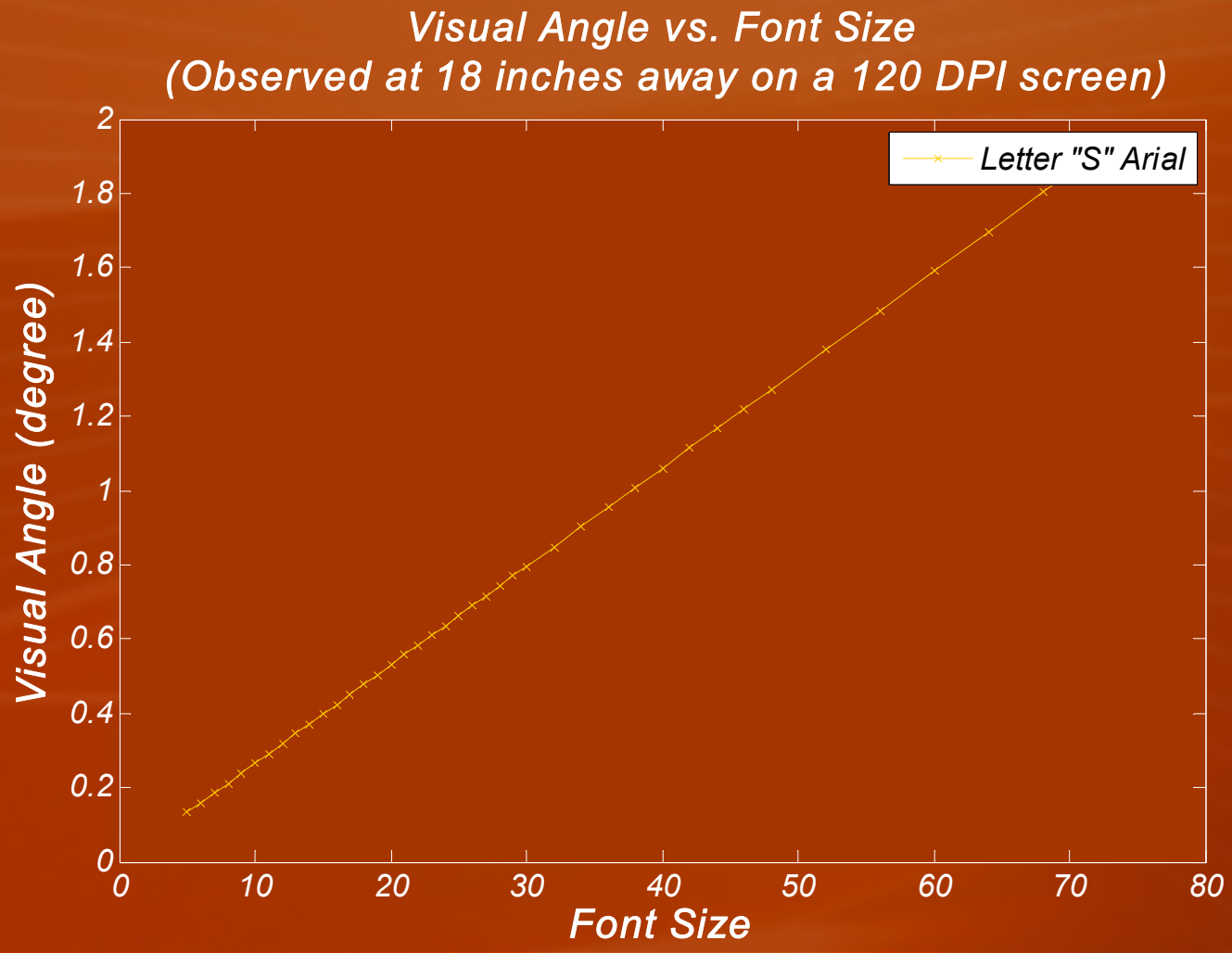
We also want to investigate how well ClearType performs on various font sizes.

Font 8

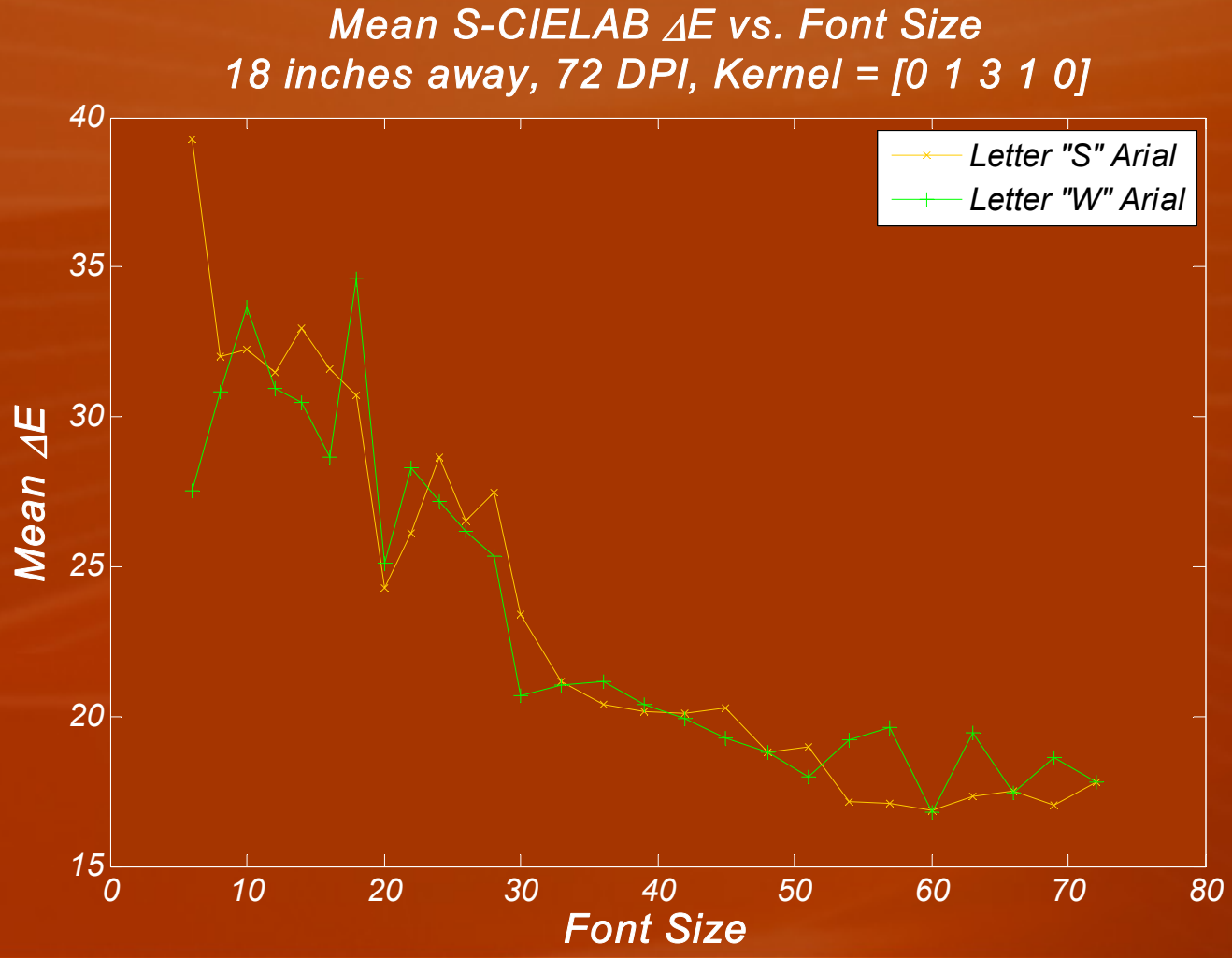


Font 18

Visual Angle vs. Font Size



S-CIELAB (varying font size)



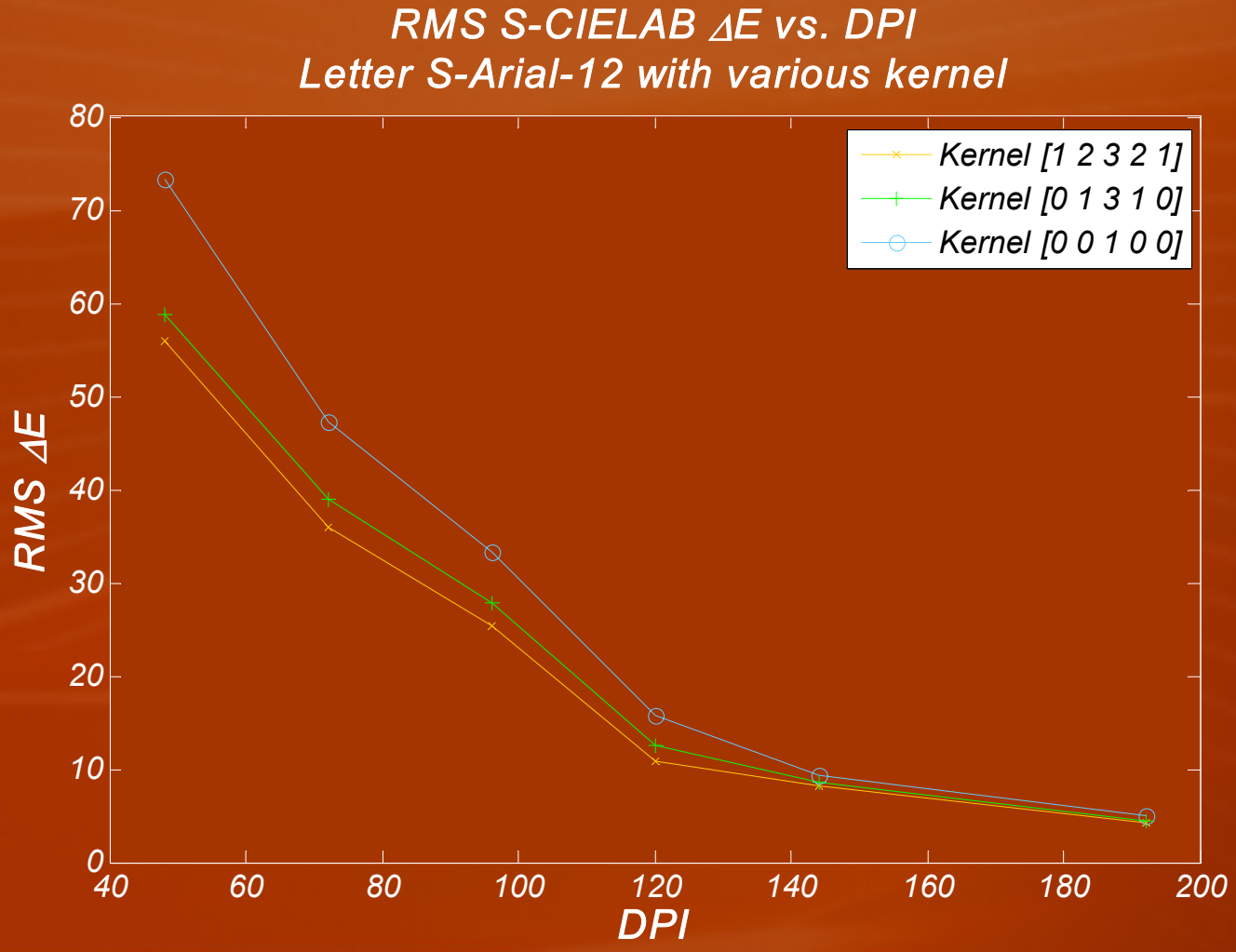
Metrics on Filter

Filter is critical in ClearType. It determines the weight and sharpness of the letter. It is one of the key factors affecting colorfulness.

Kernel [0 1 3 1 0]

Kernel [1 2 3 2 1]

(Cont.) different filter kernel



Summary

- ClearType technology is still not perfect in rendering small font on low resolution display.
- Edgy fonts will introduce more color artifacts than the others
- Increase DPI is more efficient than leaning back!

Acknowledgement

- Prof. Brian Wandell
- Jon Winawer
- Joyce Farrell

Questions and Feedback

Thank you all!

Good luck on the finals

&

Have a nice spring break!