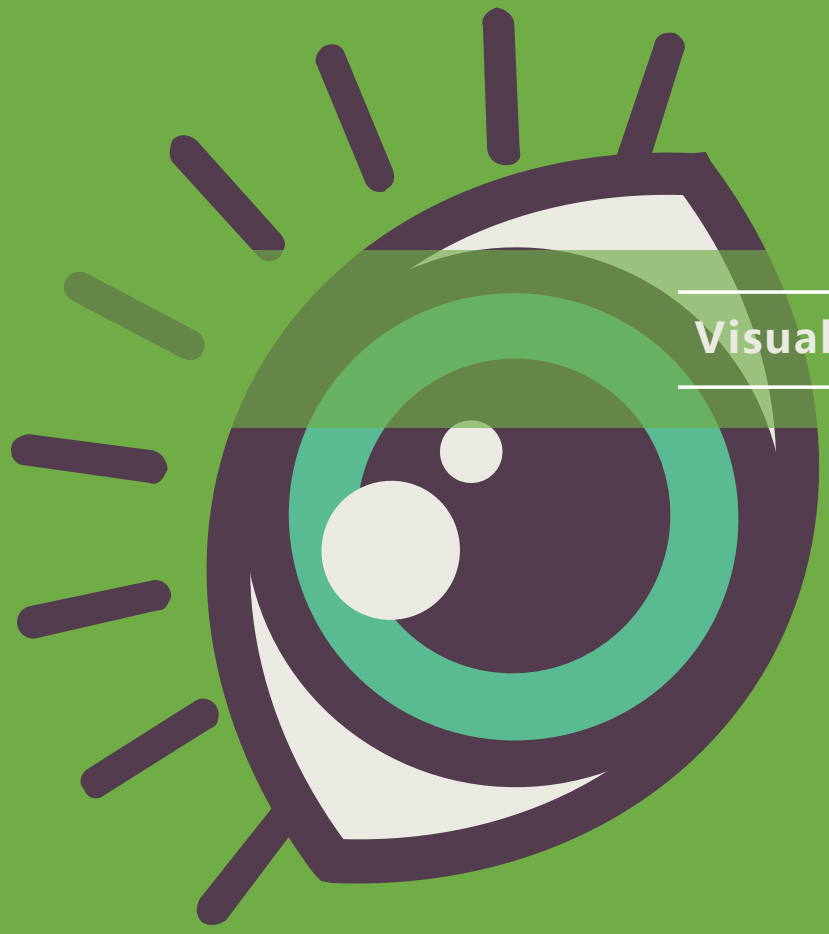

Visual Comfort Issues of Display Equipment & System

Xiaoying ZHAO

China
Electronics
Standardization
Institute

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what is visual comfort?

display everywhere, which changed the way we used our eyes

The way we use display equipment and system changed a lot

- the time we faced to computer and smartphone increased more dramatically than expected.
- display system and equipment are used everywhere, including public postboard, school, hospital...
- differet display technolgy appears, eg. 3D, HDR, AR/VR/MR, ...

visual comfort is not a new thing

American Optometric Association had defined video display terminal syndrome (VDTS) to describe the uncomfort feelings of people caused by using video display terminal for long time.
Normally, visual comfort issues are regarded as a thing related with medicine, safety, but not related too much with display equipment and system.

Some data from the survey we carried out in China

In 2015, we distributed over 6000 surveys to children from 3 to 18 in Beijing, just in order to find out
- the visual healthy status in different age
- their habbits for using VDT
- what is the most potential dangers to their visual healthy

% of shortsightedness increased fast

Age	3-6	7-12	13-18
% of shortsightedness	2.7%	35.76%	82.31%

source of visual fatigue differs

Age	3-6	7-12	13-18
source of visual fatigue	watching TV programms over 2hrs	after experiencing 3D movie and VR	using mobilephone /pad over 2hrs

Smart education will cause some potential problems for visual health

- different using case needs different display terminal
- there must be consideration about the relationship between dispaly and light system
- there must be consideration about content

visual comfort is gathering more attention

- over 70% of the family will not configue the display parameters of their VDT once they bought it.
- over 50% of the family will take visual health related functions in to consideration when they buy a new VDT.

2

Some Real Cases

different display system shows different character

- In typical classroom in Beijing, China.
  length 6m to 9m,   width 5m to 7m. with 2 to 3 windows in one side.

projector VS LCD

- the glare of large size LCD will cause some problem in certain position in the classroom
- if the curtains were not closed, projector will have problems in showing small detials.

Content also have some effect with visual experience

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才能得到诸神的力量，净化这罪恶的世界！直到无辜的爱害者被山谷中四处巡狩的肉食动物给捕获为止。在这些肉食者享用晚餐的同时，缠脚藤也可以获得它们维持生命所必需的养分——鲜血。聊缨世族、魑魅撖魎、气势磅籴、探戯取物、黶牙咧嘴。但在光芒普照中，伊斯塔的教皇瞥见阴影；夜晚的树影，在地面诡谲（gui jue）地扰动，月光洗涤下，溪水流着沉重的步伐；他试着在卷轴、史书及咒语里，找出修玛所走的道路，唯有如此，他圣洁的手

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因此，有必要澄清我们的眼睛的灵敏度的光度不一致的MR脸，并专汪于解决他们。在本文中，我们首先提出了一个系统的实验，评估我们的灵敏度的MR脸上的光度不一致的结果。真正的和虚拟的部分之间的测光登记是非常重要的，因为我们的眼睛是非常敏感的，即使是在人的脸上的微獻缨世族、魑魅撖魎、气势磅籇、探廳取物、灚牙咧嘴。小变化。然而，努力实现完美的“物理”光度登记的MR脸是不可行的，在一个普通的MR空间。混合现实面是一个真实的和虚拟的面部马赛克的脸，通过混合现实技术真实的脸覆盖面部部分介绍。MR的脸是通过恢复眼睛失去了穿着HMDs当提高混合现实空间通信的有效手段。在本文中，我们首先提出了一个系统的实验，评估我们的灵敏度的MR脸上的光度不一致的结果。然后，一种技术来解决的不一致性和实验系统，以证明MR面的有效性。

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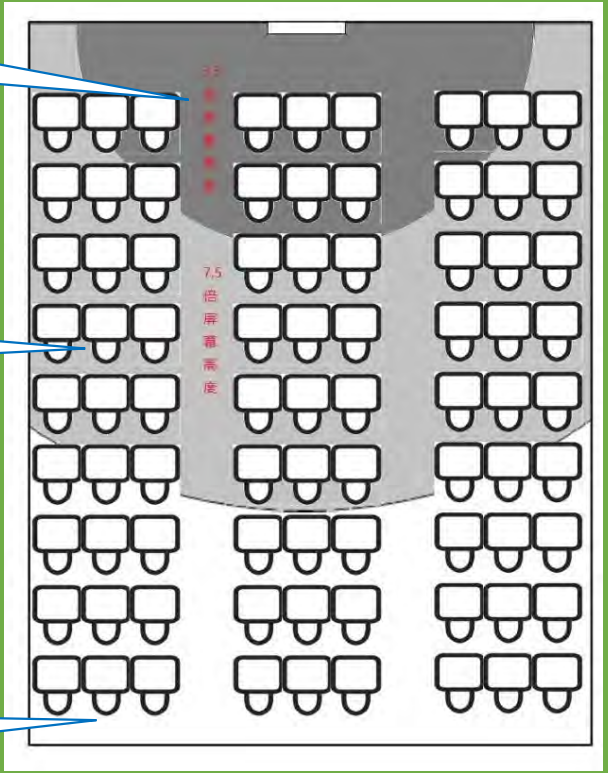
明恕而行，要之以礼，虽无有质，谁能间之？苟有明信，可荐于鬼神，可羞于王公，而况君子结二国之信，行之以礼，又焉用质？《风》有郑师毕登。初三日，遂入许。许庄公奔卫。郑武公、庄公为平王卿士。王贰于号，郑伯怨王。王曰：“无之。”故周郑交质。王子狐为质于郑，郑公子忽为质于周。王崩，周人将。四月，郑祭足帅师取温之麦；秋，又取成周之禾。周郑交恶。君子曰：“信不由中，质无益也。獻缨世族、魑魅灢魎、气势隰滂、探籥取物、巉牙咧嘴。《采蘩》、《采蘋》；《雅》有《行苇》、《泂酌》，昭忠信也。”秋七月，公会齐侯、郑伯伐许。庚辰，傅于许。颍考叔取郑伯之旗蝥（máo）弧以先登，子都自下射之（子都从下边射他），颠。瑕叔盈又以“蝥（máo）弧”登，周麾(huī)而呼曰：“君登矣！”郑师毕登。初三日，遂入许。许庄公奔卫。

can see details of all characters with less visual fatigue

can see details of some characters with less visual fatigue

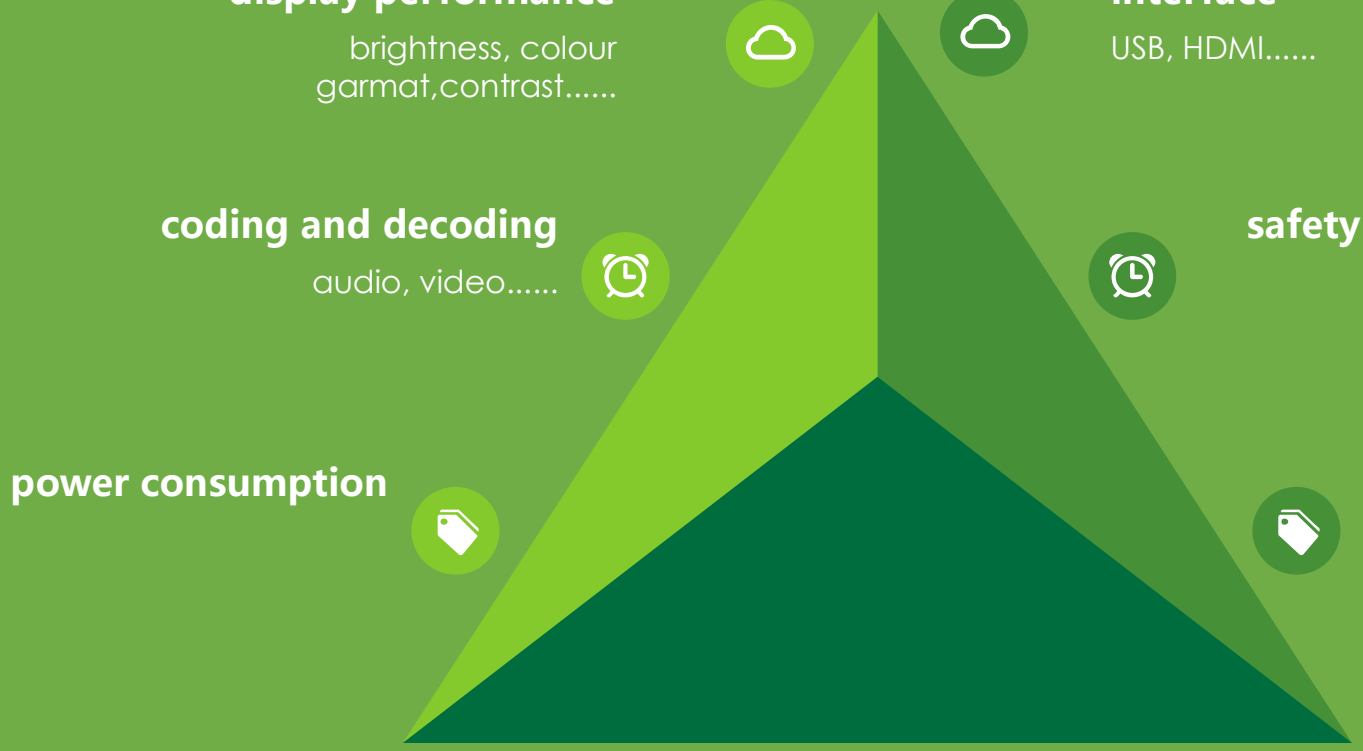
can not see details of all characters with more visual fatigue



3

What Can We Do

Extend the meaning of display equipment and system



display performance

brightness, colour garmat,contrast.....

interface

USB, HDMI.....

coding and decoding

audio, video.....

safety & EMC

power consumption

AAL requirements

- for old and disabled people
- for kids
- for unique using environment

visual comfort requirement

set up the parameter system to define visual comfort

proper measurement method

take in consideration about using environment and display content

4

Suggestions

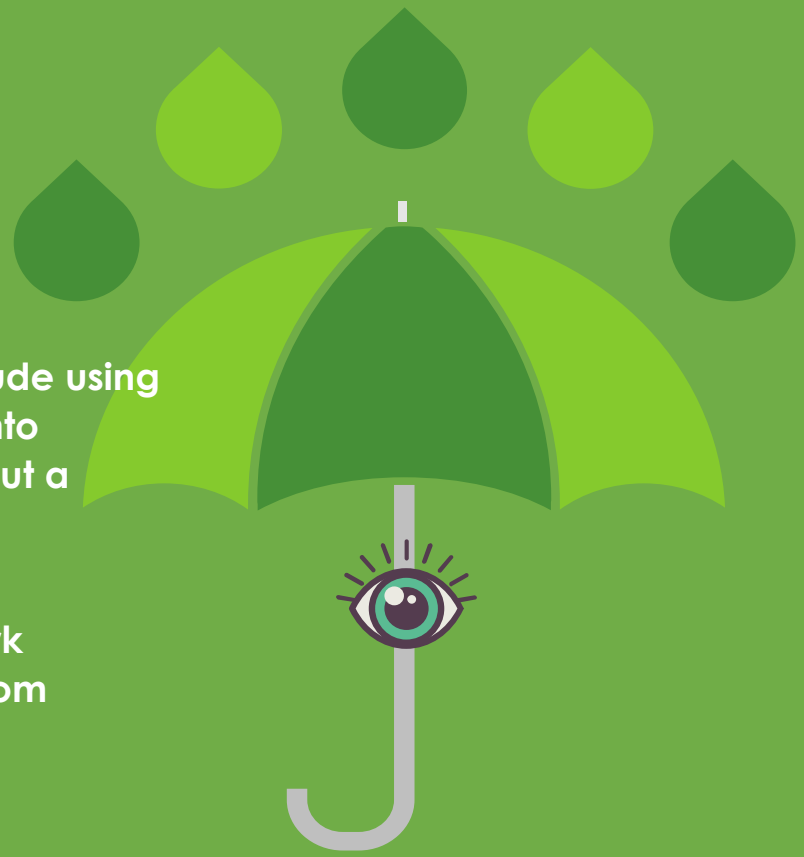
suggestions

1. **set up a study session**

   search for the needs of standards for visual comfort in TC100.

2. **discuss about the possibility to include using environment and display content into consideration when we talking about a display system**

3. **China is willing to share related work with all TC100 fellows, more input from other NC should be encouraged.**



THANK YOU ALL