EBU5305 - INTERACTIVE MEDIA DESIGN AND PRODUCTION

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ONLINE QUIZ SOLUTION (Reference Version)

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1. Simple sine waves are characterised by their:
Angular Frequency; Amplitude; Phase

2. When the signal reconstructed from a digital signal is distorted, this is probably due to:
Under sampling; Sampling errors; Aliasing

3. CD quality audio signals use the following sampling and quantisation rates:
44,1 kHz; 16 bits

4. Human perception of color derives from the eye's response to 3 different groups of wavelengths.
5. Identical perceptions of colour can be caused by different light spectra.
6. Any sensation of colour can be produced by mixing together suitable amounts of red, green and blue.
7. A given perceptual sensation of colour derives from the stimulus of three cone types.

8. According to HSV, a red colour (H = 0) which appears pink:
   Is mixed with white or Is not saturated (S < 100)
Q: Is mixed with magenta? Has a low value (V < 100)?

9. In the RGB model, which of the following triplets represent a dark grey colour?
(10, 10, 10) or (100, 100, 100)
Q: why not(200, 200, 200) or (128, 128, 128)

10. Vector-based images:

1) Vector-based images are easily editable
2) Vector-based images are very compact (small files)
3) Vector-based images must be converted to bitmaps for display
4) Vector-based images are high resolution images

11. A 200 by 300-pixel image will be smaller if stored in which of the following formats?

A grayscale image; An indexed format with a 256 color palette(调色板) ; A 8 bits indexed format;

Q： A true colour image?

12. Which of the following compression techniques are lossless?
Huffman; RLE
lossy: JPEG; MPEG
Huffman is is a type of variable length encoding andan example of statistical coding
RLE exploits spatial redundancy in an image
Efficient MPEG encoding requires slow changes in the images.

13. Frame
1) I frames is an intra-frame coded frame
2) Some macroblocks of a B frame may be intra-frame coded
3) Some macroblocks of a P frame may be intra-frame coded
4) P and B frames are inter-frame coded frames
5) I frame are intra-frame coded frames
6) B frames are the most computationally expensive frames
7) I frames are the best quality frames

14. Motion estimation is performed on 16x16 macroblocks

15. Ultra-sound is from 20 KHz to 1 GHz
Human hearing frequency range is from 20 Hz to 20 KHz
Infra-sound is from 0 Hz to 20 Hz

16. Psychoacoustics is the scientific study of the subjective human perception of sound

1. The basic principles underlying user-centric software design are : Derived from empirical(经验主义的) data regarding human performance characteristics
2. After determining what you want your application to do, the best next step in software development is to: Get to know your target users
3. User-centric software development requires the talents and participation of: Programmers; User Interface Designers; Graphic Artists; Instructional Materials Developers
4. The best predictor of a software application's usability is: Self-evidency, which means users can use the application right away and won't make mistakes.
5. In the earliest stages of interface design, the best strategy for the use of colour is: Use no colour at all
6. The very best kind of "Help" is: Needing none at all, "Help" desk is for large application.
7. Usability testing can be performed with: Hand-drawn designs; Illustrations of navigational controls; Final graphical representations; Detailed screen designs.
8. Important factors leading to usable software includes: An understanding of user needs; Early usability testing; In-house design standards

9. Which of the following four heuristics <u>corresponds best</u> to the following description:

1) Minimise user memory overload by making objects, actions and options visible?
Recognition rather than recall
It is not clear how to modify one's address in "MyAccount".
 User control and freedom
A reminder should be displayed before the time is out.
Error prevention
How to meet user's expectations:
Match between system and real-world Consistency & standards; Help and documentation
Users should be able to find the information they want within 3 mouse clicks.
Flexibility and efficiency of use
Users shouldn't need to wait more than 2 seconds for a system's response.
Visibility of system status
The time required from a user to rapidly move the mouse to a target area, is a function of the distance to the target and the size of the target.
Aesthetic and minimalist design.

1. The task of the interactive media designer is to:

1) Deal with the aesthetic of the interactive media presentation.
2) Ensure the good usability of the interactive media presentation
3) Create a presentation that convey an idea to other people

2. What does it mean that "graphics is passive"?
The user must actively look around the visual space to perceive graphics and users can easily overlook graphics

3. which of the following sound characteristics must be carefully designed?
length, lead-in, volume

4. Right colour statement:
   1) Complementary colours should be avoided next to each other's
   2) Complementary colours are opposite on the colour wheel

5. What does it mean that "visual perception is active"?
Visual perception depends on a person's prior knowledge and the combination of physical sensations and brain activity

6. How can the Gestaltists laws be used in design?
   1) They can help us understand how people will perceive the organisation of a screen
   2) They can help us understand how to achieve "grouping" on a screen
   3) They can help us understand how to create "pop-out" effects

7. How can cognitive psychology help the interactive media designer?
   1) It helps us understand how humans perceive the world around them
   2) It helps us understand the capabilities and limitations of the human user
   3) It helps us understand how people store and process information

8. Recognition is easier than recall
9. A linear structure is suitable for a "story telling" type of interactive media application
10. A tree structure is suitable for a "news" application

I 帧：帧内编码帧，I 帧表示关键帧，你可以理解为这一帧画面的完整保留；解码时只需要本帧数据就可以完成（因为包含完整画面）

I 帧特点：

1) 它是一个全帧压缩编码帧。它将全帧图像信息进行 JPEG 压缩编码及传输；

2) 解码时仅用 I 帧的数据就可重构完整图像；

3) I 帧描述了图像背景和运动主体的详情；

4) I 帧不需要参考其他画面而生成；

5) I 帧是 P 帧和 B 帧的参考帧(其质量直接影响到同组中以后各帧的质量)；

6) I 帧是帧组 GOP 的基础帧(第一帧),在一组中只有一个 I 帧；

7) I 帧不需要考虑运动矢量；

8) I 帧所占数据的信息量比较大。

　（2）P 帧

P 帧：前向预测编码帧。P 帧表示的是这一帧跟之前的一个关键帧（或 P 帧）的差别，解码时需要用之前缓存的画面叠加上本帧定义的差别，生成最终画面。(也就是差别帧，P 帧没有完整画面数据，只有与前一帧的画面差别的数据)

P 帧的预测与重构: P 帧是以 I 帧为参考帧,在 I 帧中找出 P 帧"某点"的预测值和运动矢量,取预测差值和运动矢量一起传送。在接收端根据运动矢量从 I 帧中找出 P 帧"某点"的预测值并与差值相加以得到 P 帧"某点"样值,从而可得到完整的 P 帧。

P 帧特点:

1) P 帧是 I 帧后面相隔 1~2 帧的编码帧；

2) P 帧采用运动补偿的方法传送它与前面的 I 或 P 帧的差值及运动矢量(预测误差)；

3) 解码时必须将 I 帧中的预测值与预测误差求和后才能重构完整的 P 帧图像；

4) P 帧属于前向预测的帧间编码。它只参考前面最靠近它的 I 帧或 P 帧；

5) P 帧可以是其后面 P 帧的参考帧,也可以是其前后的 B 帧的参考帧；

6) 由于 P 帧是参考帧,它可能造成解码错误的扩散；

7) 由于是差值传送，P 帧的压缩比较高。

　（3）B 帧

B 帧：双向预测内插编码帧。B 帧是双向差别帧，也就是 B 帧记录的是本帧与前后帧的差别（具体比较复杂，有 4 种情况，但我这样说简单些），换言之，要解码 B 帧，不仅要取得之前的缓存画面，还要解码之后的画面，通过前后画面的与本帧数据的叠加取得最终的画面。B 帧压缩率高，但是解码时 CPU 会比较累。

B 帧的预测与重构: B 帧以前面的 I 或 P 帧和后面的 P 帧为参考帧,"找出"B 帧"某点"的预测值和两个运动矢量,并取预测差值和运动矢量传送。接收端根据运动矢量在两个参考帧中"找出(算出)"预测值并与差值求和,得到 B 帧"某点"样值,从而可得到完整的 B 帧。

B 帧特点

1) B 帧是由前面的 I 或 P 帧和后面的 P 帧来进行预测的；

2) B 帧传送的是它与前面的 I 或 P 帧和后面的 P 帧之间的预测误差及运动矢量；

3) B 帧是双向预测编码帧；

4) B 帧压缩比最高，因为它只反映丙参考帧间运动主体的变化情况,预测比较准确；

5) B 帧不是参考帧,不会造成解码错误的扩散。

注: I、B、P 各帧是根据压缩算法的需要，是人为定义的,它们都是实实在在的物理帧。一般来说，I 帧的压缩率是 7（跟 JPG 差不多），P 帧是 20，B 帧可以达到 50。可见使用 B 帧

能节省大量空间，节省出来的空间可以用来保存多一些 I 帧，这样在相同码率下，可以提供更好的画质。

h264 的压缩方法：

（1）分组：把几帧图像分为一组(GOP，也就是一个序列)，为防止运动变化,帧数不宜取多。

（2）定义帧：将每组内各帧图像定义为三种类型,即 I 帧、B 帧和 P 帧;

（3）预测帧：以 I 帧做为基础帧，以 I 帧预测 P 帧,再由 I 帧和 P 帧预测 B 帧;

（4）数据传输：最后将 I 帧数据与预测的差值信息进行存储和传输。

帧内（Intraframe）压缩也称为空间压缩（Spatial compression）。当压缩一帧图像时，仅考虑本帧的数据而不考虑相邻帧之间的冗余信息，这实际上与静态图像压缩类似。帧内一般采用有损压缩算法，由于帧内压缩是编码一个完整的图像，所以可以独立的解码、显示。帧内压缩一般达不到很高的压缩，跟编码 jpeg 差不多。

帧间（Interframe）压缩的原理是：相邻几帧的数据有很大的相关性，或者说前后两帧信息变化很小的特点。也即连续的视频其相邻帧之间具有冗余信息,根据这一特性，压缩相邻帧之间的冗余量就可以进一步提高压缩量，减小压缩比。帧间压缩也称为时间压缩（Temporal compression），它通过比较时间轴上不同帧之间的数据进行压缩。帧间压缩一般是无损的。帧差值（Frame differencing）算法是一种典型的时间压缩法，它通过比较本帧与相邻帧之间的差异，仅记录本帧与其相邻帧的差值，这样可以大大减少数据量。

顺便说下有损（Lossy ）压缩和无损（Lossy less）压缩。无损压缩也即压缩前和解压缩后的数据完全一致。多数的无损压缩都采用 RLE 行程编码算法。有损压缩意味着解压缩后的数据与压缩前的数据不一致。在压缩的过程中要丢失一些人眼和人耳所不敏感的图像或音频信息,而且丢失的信息不可恢复。几乎所有高压缩的算法都采用有损压缩,这样才能达到低数据率的目标。丢失的数据率与压缩比有关,压缩比越小，丢失的数据越多,解压缩后的效果一般越差。此外,某些有损压缩算法采用多次重复压缩的方式,这样还会引起额外的数据丢失。