CARDIFF UNIVERSITY
EXAMINATION PAPER

Academic Year:	2003-2004
Examination Period:	Postgraduate
Examination Paper Number:	CMP632
Examination Paper Title:	Multimedia Systems
Duration:	2 hours

Do not turn this page over until instructed to do so by the Senior Invigilator.

Structure of Examination Paper:
There are **THREE** pages.
There are **FOUR** questions in total.

There are **NO** appendices.

The maximum mark for the examination paper is 100% and the mark obtainable for a question or part of a question is shown in brackets alongside the question.

Students to be provided with:
The following items of stationery are to be provided:
One answer book.

Instructions to Students:
Answer THREE questions.

The use of translation dictionaries between English or Welsh and a foreign language bearing an appropriate departmental stamp is permitted in this examination.

1. (a) Give a definition of a *Multimedia Authoring System.* [2]

   (b) Briefly describe **five** ways in which *content* can be *formatted* and *delivered* in a *Multimedia Authoring System.* [10]

   (c) What extra information is multimedia good at conveying with respect to conventional media.

   (i) What can spoken text convey that written text cannot?
   (ii) When might written text be better than spoken text?

   [12]

2. (a) Briefly explain how the *human visual system* senses *colour*. How is *colour exploited* in the *compression* of multimedia *graphics*, *images* and *video*?

   [5]

   (b) List **three** distinct *models* of *colour* used in multimedia. *Explain* why there are a number of *different colour models* exploited in multimedia data formats.

   [9]

   (c) Suppose we have 24 bits per pixel available for a colour image. We also note that humans are more sensitive to red and green than to blue, by a factor of approximately 1.5. How may we design a simple colour representation to make use of the bits available?

   [4]

   (d) Briefly explain why we need to have less than 24-bit colour representations (typically down to 8-bit) and why this is sometimes a problem. Give one example where 8-bit colour representation has an advantage in terms of image/video processing?

   [6]

3 (a) Give **one** example *each* of a *lossless* and a *lossy compression technique*.

[2]

(b) Briefly explain the basic approach of *entropy coding algorithms*. Give **two** examples of entropy coding algorithms.

[7]

(c) Briefly state the *Huffman coding* algorithm. Show how you would use *Huffman coding* to encode the following set of tokens:

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AAABDCEFBBAADCDF
```

[9]

(d) Briefly explain how the Huffman coding algorithm can be *adapted* for the *streaming of live token streams*.

[6]

4. (a) What **two** *broad classes* of *data compression* techniques are applied to *video compression*? How does each class type typically get applied in video compression methods?

[4]

(b) What is meant by a *group of pictures* in H.261 and MPEG video encoding? Briefly explain how each type of frame, in the group of pictures, achieves some form of video compression.

[7]

(c) Briefly explain why a *bidirectional B-frame* improves video compression rates. What *drawbacks* are there with using B-frames?

[8]

(d) If the *display order* of a group of pictures is IBBPBBPPBBI, what is the *order of transmission* and *coding* of this group?

[5]