UNIVERSITY OF LONDON

IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1997

BEng Honours Degree in Computing Part III
BEng Honours Degree in Information Systems Engineering Part III
MEng Honours Degree in Information Systems Engineering Part III
for Internal Students of the Imperial College of Science, Technology and Medicine

This paper is also taken for the relevant examinations for the
Associateship of the City and Guilds of London Institute

PAPER 3.46 / I3.12

MULTIMEDIA SYSTEMS
Tuesday, April 29th 1997, 10.00 - 12.00

Answer THREE questions

For admin. only: paper contains 4
questions

1a List (but do not explain) the major steps in JPEG image compression, MPEG Audio compression and wavelet image compression. What techniques are used in common by all three to compress data ?

Explain how the underlying common techniques achieve compression.

b What inaccuracies (artifacts) may become visible/audible if very high compression ratios are used for:

i) Still images

ii) Video

iii) Sound

In each case *explain how the artifacts arise.*

c "Any give*n image compression technique w*ill compress some images but expand other *images. It cannot guarantee to* compress any image."

Is this true or false ? Why ? What are your assumptions ?

The three parts carry, respectively, 50%, 30%, 20% of the marks.

2a Define the compression ratio of an algorithm used to compress an image.

b For each of the following compression schemes, explain in detail which parameters of the algorithm can be adjusted to achieve a greater compression ratio than would normally be used with the method.

i) JPEG compression of a still colour image

ii) MPEG compression of moving colour images

iii) Wavelet compression of a greyscale image

iv) IFS fractal compression of several black and white images

v) Fractal transform compression of a greyscale image

vi) MPEG audio compression

c It has been suggested that a new version of JPEG compresses 1024 by 1024 pixel images using four 512x512 pixel blocks instead of lots of 8x8 pixel blocks. Discuss whether or not this would be a good idea.

The three parts carry, respectively, 20%, 60%, 20% of the marks.

3a Explain the difference between an *event driven* system and a *program driven* computer programming environment.

b i Describe the role of interrupts in real-time processing.

   ii Describe the importance of interrupts on a computer with an asynchronous multi-tasking operating system and how they are used for audio sampling and MIDI recording.

c Using your description in b(ii), write an example MIDI code reader interrupt routine and show how an application in an event driven system may use events to receive and send MIDI information. Give example source code for the program part too. (All source code can be written in a high-level imperative language such as C or Motorola 68000 assembly language.)

The three parts carry, respectively, 15%, 25%, 60% of the marks.

4 For each of the potential consumer electronic devices listed below (i-iii) discuss how a network-enabled, distributed and graphical user interface language such as Java may enhance and contribute to the product. Discuss the effect of using Java for each device taking into account bandwidth constraints of each device. How will the bandwidth influence service offering and quality of service (QOS) ? Your account should also include a specification of each device, including means of communications, communication bandwidth, assumed memory capacity and processor speed.

   i Personal Computer

   ii Interactive television set-top box

   iii GSM Mobile Phone

Each part (i-iii) carries equal proportion of the marks.

End of paper