# University of Stirling

## Department of Computing Science & Mathematics

## Computing Science Examination
## Spring Semester 2001

## IT82 : Multimedia

## Friday 22nd June 2001 1500-1700 hours

Attempt **FOUR** questions.

You must attempt **Question1** from the **Sound** section of the paper.

All questions carry equal marks.

The approximate distribution of marks among the parts of each question is indicated.

You may use an electronic calculator.

**IMPORTANT NOTE**

It is essential that you write your registration number on the front of each answer book.

Also, when you have completed the examination, the number of answer books which you have used must be prominently written on the front of one book.

# Sound

**Question 1**

a) A 30 second long sound clip has been recorded in stereo. A sampling rate of 44,100 samples per second was used, with a 16-bit sample size and linear sampling.

i) Approximately how long is the raw sound file, in bytes? **[2]**

ii) What is the maximum frequency that is faithfully captured and why? **[1,2]**

iii) Approximately, what is the dynamic range of the recorded sound (in dB), and what does this mean? **[2,2]**

b) The recording parameters, such as sampling rate and size, and the compression algorithms used when creating digital sound files, depend on the nature of the sound being recorded. Describe the differences between recording human speech and classical music, giving examples of appropriate recording parameters and compression algorithms in each case. **[6]**

c) Often certain background tasks, such as copying folders to a floppy disk or downloading a large file over the Internet, take a long time. So we usually get on with other things while these tasks are completing. Systems such as Windows on a PC use visible *progress bars* to indicate the progress of these tasks.

i) Discuss how sound could be used to augment the visible progress bars, paying attention to both the successful completion of a task and the possibility of errors. **[6]**

ii) What are the advantages and disadvantages of using sound in this way? **[4]**

# Graphics

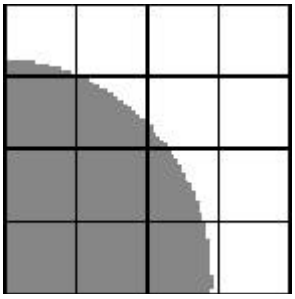
**Question 2**

a) Animation in both 2D and 3D can be done by making use of *keyframes*.
   i) What are *keyframes* and how are they used to create animation? In your answer also give details of the state information that must be maintained by keyframes in 2D and 3D. **[8]**
   ii) What is track-based animation? **[2]**

b) Consider the following scene: a car pulls away from a set of traffic lights while a flock of birds flies overhead and smoke rises from the chimney of a nearby house. Discuss how this scene could be animated using automated techniques. **[9]**

c) Realistic movement of animals is difficult to generate automatically for animation. How can the use of *bones* help with this problem? **[6]**

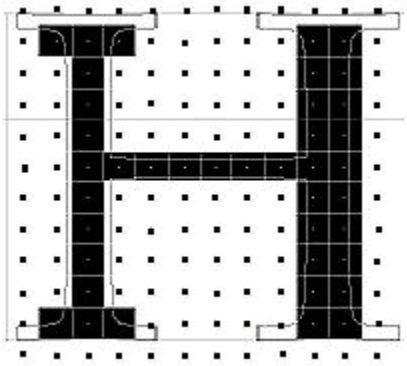
**Question 3**

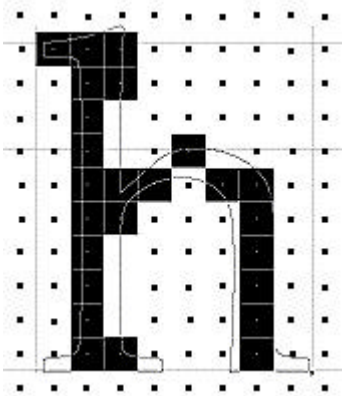


a) The above picture shows a quarter of a grey circle superimposed over a grid of sixteen pixels. Draw a grid similar to the above and use it to illustrate how the circle would be rendered as a bitmap. What rule did you use in generating the bitmap? **[3,2]**

b) What are *fonts* and *glyphs*? **[2]**

c) Computer-based fonts are either *bitmapped* or *vector-based*. What are these two different representations for fonts and what are the advantages and disadvantages of each? **[4,4]**





d) The above two characters (an upper and lower case ‘h’) have been rendered as bitmaps (the dots show the centre of each pixel and the light lines show the desired character shape in outline). Suggest two *hints* for the rendering process that would improve their appearance. **[6]**

e) Would *anti-aliasing* help with the appearance of these characters? Give reasons for your answer. **[4]**

**Question 4**

a) What is the *trichromatic theory* of colour representation? Describe two different colour models based on this theory. **[3,4]**

b) Why is the RGB colour model device-dependent? **[4]**

c) A photograph showing mostly a blue sky over a blue sea has been scanned using 24-bit colour, but is to be shown on a computer monitor that only has a restricted colour palette of 256 colours. The scanned image actually contains 1,156 different colours.

i) How should the 256 colour palette be chosen to provide the best visual results? **[6]**

ii) How does *dithering* increase the apparent number of colours displayed? **[4]**

iii) What is an appropriate file format for the original 24-bit image and why? **[4]**

# Multimedia

## Question 5

You have been contracted to develop a multimedia presentation of "A tourist's view of Stirling". An initial brainstorming session has come up with the idea of an introductory screen that shows an aerial view of Stirling. As the presentation progresses, pictures of Stirling castle, the Wallace monument and other points of interest fade in at their correct locations on the aerial view. Music from the film "Braveheart" plays while this is happening. When all the pictures are visible, the user is able to click on any of them to go to screens giving more detail about that particular point of interest.

a) What is *brainstorming* and how is it used in the multimedia design process? **[2]**

b) Sketch a *storyboard* of the initial screen described above, including any features that are not described but may aid the usability of the presentation. **[6]**

c) Produce a *NavMap* of the presentation, including some screens for the details of particular points of interest. What form of navigation are you using? **[5,1]**

d) Macromedia's Director uses a *time-line* based approach to multimedia authoring.
   i) What does this mean? **[4]**
   ii) Briefly describe how this approach could be used to implement the above presentation. **[7]**

**Question 6**

a) *Hierarchical tasks analysis, knowledge-based task analysis* and *entity-relationship analysis* are three different forms of task analysis. What are they and how are they used in the design of a multimedia presentation? Illustrate your answer with examples of each type of analysis for the task, "getting ready to go to work in the morning – from getting up to leaving the house". **[12]**

b) What is *usability testing* and how is it used in the testing of a multimedia presentation? Include in your answer a description of the different groups of users that may be tested, how the testing may be organised and how feedback may be obtained. **[7]**

c) What technical issues need to be considered when finally delivering your completed multimedia presentation to your client? **[6]**

## END OF EXAMINATION