OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND, CORK

COLÁISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK

AUTUMN EXAMINATION 2012

BSc in Computer Science

CS4405: Multimedia Compression and Delivery

Professor Ian Gent
Professor James Bowen
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The use of electronic calculators is permitted

Full marks for *THREE* questions

$1\frac{1}{2}$ Hours

1. **Topic: Images** (27 MARKS)

   a) Explain by highlighting the relevant parts of the algorithm, why the GIF format is not the most compact format for representing images with natural content. (*9 marks*)

   b) JPEG (baseline) is a standard for lossy compression of still images. Describe the elements of the JPEG (baseline) compression algorithm that discard data while maintaining perceived image quality. (*9 marks*)

   c) Image Quality Assessment is a measure of perceived image degradation. Describe how a JPEG encoder could incorporate a quality assessment metric to indicate the quality of the output image it creates. Describe any weaknesses in the scheme that you describe.

   (*9 marks*)

2. **Topic: Video** (27 MARKS)

   a) Explain how the operation of a *block-based* difference encoder can be improved through the use of *motion compensation.* (*9 marks*)

   b) An encoder when encoding a macroblock in a P- or B- picture can decide to encode it as an INTER mode or INTRA mode macroblock.

      - Explain why the MPEG standard allows such a choice. (*3 marks*)
      - Describe an algorithm for choosing the macroblock mode. (*6 marks*)

   c) For chromakey content, explain why the presence of flesh colours in the foreground causes difficulties for extracting the uncomposited foreground colour. Describe a technique for overcoming this problem. (*9 marks*)

3. **Topic: Audio** (27 MARKS)

   a) Describe how an audio signal is digitised, be sure to describe the role of Nyquist's Theorem in the digitisation process. (*9 marks*)

   b) For encoding music content list (giving reasons) a suitable sampling rate, bit depth and format for storing a good quality digital audio representation. (*9 marks*)

   c) When performing lossy audio encoding there is a trade-off between the amount of space used and sound quality. Describe the MPEG approach to lossy audio compression.

   (*9 marks*)

4. **Topic: Delivery** (27 MARKS)

   a) Explain how HTTP Live Streaming differs from RTSP Streaming. (*9 marks*)

   b) It is not always possible to reliably deliver a media stream via a data network such as the internet. Describe techniques at the server *and* client that can be used to add resilience to the media stream. (*9 marks*)

   c) A media player can conceal errors in a video frame using spatial and temporal error concealment techniques. Describe how these can be implemented. (*9 marks*)