

## ASSIGNMENT 1

# TECHNICAL REPORT

Version of 6<sup>th</sup> November 2006<sup>1</sup>

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**Hand-in date: week 12**

**This assessment constitutes 25% of the overall assessment for this unit.**

**A CRG for this assessment is available on the Virtual Campus.**

### Background

The Centre for Visual Surveillance and Machine Perception (CVS, for short) is a research centre in this faculty which is developing a range of approaches to the automated analysis of video and other sensor data, in application areas including security, automotive systems, medical screening, care of the elderly, autonomous robotic systems and environmental remote sensing. Many of their projects are concerned with the analysis of video data, including the detection of human subjects in video streams, and characterization of their behaviour. They use artificial intelligence techniques (in particular, neural networks) to classify the detected behaviour

One of their research projects is developing a system based around an FPGA-based module and special software that can be attached to a security CCTV camera in a car park or similar environment and which uses neural-network techniques to learn and recognise the “usual” behaviour of pedestrians. It is therefore able to signal when “unusual” behaviour is spotted.

### Scenario

Imagine that you have been commissioned by an established company making traditional CCTV equipment to investigate the feasibility of producing a new product by embedding this module and its companion software within a CCTV camera.

The company is keen to adapt a tried-and-tested CCTV camera design. The company has produced and sold thousands of this design of camera and it has proved exceptionally reliable in the field with an MTBF of 40,000 hours. Since reliability is very important in this market (and also to minimise design costs) the company is keen to change as little as possible of the existing design, so the camera CMOS sensor, lens, focussing mechanism, housing and power supply will be unchanged. This imposes some constraints on the design, which will need to squeeze the FPGA-module and a single-board computer (needed to run the special neural network software and to provide an ethernet connection) alongside the existing camera electronics. The company’s engineers tell you that after allowing for the FPGA module the maximum space available for the Single Board computer is 175mm x 210mm x 30mm. Furthermore, they say its maximum power dissipation must not exceed 50W to avoid the camera overheating.

CVS researchers tell you that in order to run their software the single-board computer must:

- Be capable of running Windows CE
- Provide an Ethernet port for the external connection
- Have at least 128MB memory
- Include a CPU which includes floating-point capabilities

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<sup>1</sup> This assignment is published subject to external examiners’ moderation, so it may change. Please check before submission that you are using the latest revision of this document.

Although not absolutely essential, they have also suggested investigating whether a dual core processor is available as they think this might have advantages.

They have also asked you whether you think it would be possible and desirable to boot from Flash memory, rather than using a hard disk.

**Your task is to produce a technical report with the following six sections:**

- 1) A title page containing a brief **management summary**, not to exceed 100 words, summarising the key points of your report.
- 2) An **introduction** to the project, not to exceed 2 sides, summarising the project requirements and setting out what design decisions you believe need to be taken. *If you feel you need to make any assumptions to complete this assignment (and you should feel free to do so – in the real world you'd probably be able to ask someone) you should explain clearly in this introduction what they are.*
- 3) An **indicative specification** for the single-board computer which will, in your expert opinion, meet the needs of the project. This should be in the form of a table and explanatory notes which should not exceed 2 sides. The notes should explain clearly how you derive the specification for each element and cover memory, processor, I/O, networking, storage, etc. It should explain any trade-offs or compromises, and if you are recommending a component of higher specification than absolutely necessary explain what benefit this will bring.
- 4) Assuming that
  - it is believed that there will be a market for 250 units in year 1, provided they can be produced for no more than £1,000 each
  - the unit cost of production of the existing camera is £375
  - the CVS requires a royalty of £25,000
  - the FPGA module (in reasonable production quantities) will cost £100give your recommendations on the **feasibility** of such a product and the **likely unit cost** of production. To do this you will need to locate a real SBC which meets the indicative specification above and obtain an estimate of its cost. You may find it helpful to include any details you have of this SBC as an appendix – see 6, below.
- 5) A **glossary** of terms. This **must** include a *brief* explanation (not exceeding 50 words) of each of the 10 terms underlined in the scenario and should also include an explanation of any other terms which you use and with which your audience (see below) may be unfamiliar which are not explained elsewhere in your report. If you are unable to provide a full explanation within the space available you may provide a URL for a web site with a fuller explanation.
- 6) If it is useful to do so, you may include up to 4 pages of appendices. These might include datasheets that you are able to download from the web.

**The audience for the report** will be technically-aware managers who know a great deal about traditional CCTV systems. You can expect them to be generally aware of computing technology (although perhaps not wholly up-to-date with new developments) but with no specialist knowledge of embedded computer systems.

As this is a technical report, you are aiming to be concise and it **is** appropriate to include tables, diagrams and bullet-point lists whenever this will convey information more effectively than English text. Note that although it is acceptable to include references to web pages, (for example as footnotes), you cannot assume that your readers will check them, so your report must include all essential information within the main body or the appendices.