2006 Paper 8 Question 6

Computer Vision

(*a*) Explain the method of *Active Contours.* What are they used for, and how do they work? What underlying trade-off governs the solutions they generate? How is that trade-off controlled? What mathematical methods are deployed in the computational implementation of Active Contours? [10 marks]

(*b*) When trying to detect and estimate visual motion in a scene, why is it useful to relate spatial derivatives to temporal derivatives of the image data? Briefly describe how one motion model works by these principles. [5 marks]

(*c*) Provide a 3×3 discrete filter kernel array that approximates the Laplacian operator. Explain what the Laplacian might be used for, and what is the significance of the sum of all of the taps in the filter. [3 marks]

(*d*) When visual sequences are encoded into an `.mpeg` video stream, typically about what percentage of the compression achieved is intra-frame (compression within individual still frames), and what percentage is inter-frame? Name a key feature that is extracted and estimated for purposes of prediction and, therefore, compression. [2 marks]