

2011 Paper 4 Question 3

Computer Graphics and Image Processing

You are writing code for a new graphics card that is software programmable, rather than having the algorithms embedded in hardware. You want to write a fast triangle-drawing program to test the card.

- (a) Provide pseudocode, or similar, that draws a triangle with a constant colour. Assume that the inputs are the colour of the triangle and three two-dimensional points, representing the three vertices of the triangle. Further, assume that all three vertices lie on the visible screen and that no anti-aliasing is required. You may assume that there is a function to set a pixel, (x, y) , to a particular colour, c , e.g. `setpixel(x,y,c)`, but you must provide pseudocode for any other functions that you require. Your answer should be sufficiently detailed that it could be transferred directly into a language such as Java but your answer does not, itself, have to be syntactically correct. [13 marks]
- (b) Outline the extra steps required to draw a triangle specified by three-dimensional points in world space, where the triangle may extend beyond the edges of the screen after conversion to screen space. [4 marks]
- (c) Outline the steps required to calculate the triangle's colour, assuming diffuse shading, with multiple point lights, but still producing a single colour for the whole triangle. [3 marks]