

THE UNIVERSITY OF CALGARY
DEPARTMENT OF COMPUTER SCIENCE

ENEL/CPSC 555

Mid-Term EXAM

November 8, 1999

Open Book, calculators are permitted. The questions carry equal weight. Attempt four questions only. Please return the finished papers to MS247 by 10am on Tuesday, 9th November.

1. (a) Bspline segment one is defined by the control points: (a, b, c, d) and Bspline segment two is defined by the control points: (b, c, d, e) where the points are defined as:
 - i. $a(-0.9, -0.9)$
 - ii. $b(-0.45, 0.45)$
 - iii. $c(0.0, 0.0)$
 - iv. $d(0.45, -0.45)$
 - v. $e(0.9, 0.9)$

Show that the segments are both G^1 and G^2 continuous.

- (b) Which control point is intersected by the curve and why?
 - (c) What changes would have to be made to the basis functions to make the curve pass through the start and end control points? What would happen to the continuity between the segments?
2. (a) Using the Bresenham mid-point algorithm, calculate the points on the line connecting the vertices: $(0, 0)$ and $(-5, 4)$
 - (b) Derive an algorithm for finding points at intervals of $\delta t = 0.1$ along the curve: $t^2 + 4t + 5 = 0$
 3. Design a simple 2D model of a wheeled vehicle. Describe the data structure and transformations which have to be made to animate the vehicle so that the wheels rotate and the vehicle is translated an appropriate distance.
 4. A monitor made by "Bargain Mons" is advertised to display at a resolution of 800 by 600 and a refresh rate of 60Hz non-interlaced using their own 50ns VRAM. Bargain Mons. hardware reads only one pixel per memory access. Can this hardware operate in a non-interlaced mode? State any assumptions you make and show your working.
 5. Line a in eye space is defined by the points: $(0, 0, D+1)$ $(4, 4, D+2)$ and is scan converted in red using z-buffer. Line b is defined by the points: $(0, 0, D)$ $(4, 4, F)$ and is similarly scan converted in green. $D = 5$ and $F = 50$. The Z_s value of the end points of the lines is calculated and intermediate values are found by linear interpolation of these Z_s values. Comment on the scan conversion and the colours that would appear in the rendered version of the two lines.