

# Computer Vision

## Exercise Sheet 2

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### Exercise 1: Homogeneous Coordinates (10 Points)

- What is the inhomogeneous coordinates of the points with homogeneous coordinates  $x_1 = (6, -4, 2)$ ,  $x_2 = (3, -2, -1)$  and  $x_3 = (6\lambda, -2\lambda, 2\lambda)$  with  $\lambda \neq 0$ . (1 Points)
- Verify if the following points  $b_1 = (1, -1, 1)$  and  $b_2 = (1, 1, 1)$  are located on the line  $x = (-1, 1, -1)$ ; (2 Points)
- Explain what is a line at infinity. Can you mention at least two of its properties? (3 Points)
- The null-space of a  $m \times n$  matrix  $A$  is the set

$$\mathcal{N}(A) = \{x \in \mathbb{R}^n; Ax = 0\}$$

that is, all the  $x$  for which the multiplication  $Ax$  gives the zero vector. Explain why the intersection point (in homogeneous coordinates) of the lines  $l_1 = (1, 1, 1)$  and  $l_2 = (3, 2, 1)$  is in the null-space of the matrix

$$M = \begin{pmatrix} 3 & 2 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

(2 Points)

- A line having homogeneous coordinates  $(2, 3, 7)$  intersects with a point at infinity. Give the homogeneous coordinates of this point.

(2 Points)