

# Appendix A

## List of variables

$x$	The horizontal image coordinate
$y$	The vertical image coordinate
$\Delta x$	Spatial increment in the $x$ direction
$\Delta y$	Spatial increment in the $y$ direction
$I(x, y)$	The original two-dimensional image
$t$	The scale of smoothing
$\Delta t$	The scale step
$I(x, y, t)$	The image smoothed to scale $t$
$\nabla I$	The spatial gradient of $I$
$ \nabla I(x, y, t) $	The magnitude of the spatial gradient of $I$ at the point $(x, y)$ and scale $t$
$\phi(x, y, t)$	The direction of the spatial gradient of $I$ at the point $(x, y)$ and scale $t$
$\Delta I$	The Laplacian of $I$
$G(x, y, t)$	Gaussian kernel of variance $t$
$div$	The divergence operator
$\mathcal{C}(x, y, t)$	The diffusion (conduction) coefficient

$\xi$	Unit vector parallel to the gradient direction
$\eta$	Unit vector perpendicular to the gradient direction
$\beta$	Angle of the local orthogonal coordinate system $(\xi, \eta)$
$I_\xi$	Directional derivative in the direction of $\xi$
$I_\eta$	Directional derivative in the direction of $\eta$
$I_{\xi\xi}$	Diffusion term in the direction of $\xi$
$I_{\eta\eta}$	Diffusion term in the direction of $\eta$
$g$	The non-negative monotonically decreasing function used to choose the conduction coefficient $\mathcal{C}(x, y, t)$
$K$	Perona-Malik constant
$curv$	The curvature function
$\kappa$	The curvature of a curve
$F$	Curvature motion function
$i$	$x$ coordinate of a point in the image
$j$	$y$ coordinate of a point in the image
$n$	Number of iterations of the smoothing equation required to reach scale $t$
$\chi$	Radius of a disk that disappears after $n$ iterations
$T$	Threshold for image segmentation
$H$	Hough accumulator array
$H_N$	Normalised Hough accumulator array
$m$	Line slope
$c$	Line $y$ intercept

$\theta$	Angle of the normal with the positive $x$ axis
$\rho$	Length of the normal to the line segment from the image origin
$\Delta\theta$	Sampling interval for $\theta$
$\Delta\rho$	Quantisation interval for $\rho$
$\mathcal{R}$	Radon transform
$\mathcal{D}$	The $x - y$ plane
<i>radius</i>	Radius for Hough circle parameterisation
$r$	Match range for $\theta$
$N_\rho$	Maximum amount of peak spreading expected in the $\rho$ direction
$N_\theta$	Maximum amount of peak spreading expected in the $\theta$ direction
$d$	Diagonal line length
$b_a$	Line width
$S_i$	Sum of the cells in region $i$
$i$	Peak index
$e$	Number of peaks to be detected
$\delta$	The fractional part of $\rho$ used in the triangular smoothing window for Hough Transform calculation
$M$	Number of pixels to include in the line post processing technique for line finding
$E_i(x, y, t, \theta)$	The gradient magnitude $ \nabla I(x, y, t) $ modified to match only where $\phi(x, y, t)$ is close to $\theta$
$T_1$	Magnitude threshold for line endpoint detection
$T_2$	Length threshold for line endpoint detection

$\theta_c$	The $\theta$ value corresponding to the bone centre-line
$\rho_c$	The $\rho$ value corresponding to the bone centre-line
$\Delta\rho_1$	The inter-peak distances between peaks 1 and 2
$\Delta\rho_2$	The inter-peak distances between peaks 3 and 4
$\omega_{shaft}$	Long-bone shaft width
$\omega_{epiphysis}$	Long-bone epiphyseal width
$C(x, y, t, \rho, \theta, p)$	Gradient composite measure
$R(x, y, t, \theta, p)$	Importance rank
$D(x, y, \rho, \theta, p)$	Distance rank
$\alpha$	The angle of interest in the importance rank calculation
$p$	The power used in the importance rank and distance rank calculations
$T_3$	Magnitude threshold for fracture detection
$T_4$	Cluster sum threshold for fracture detection
$L_x$	Number of horizontal sub-image tiles to create when dividing the image
$L_y$	Number of vertical sub-image tiles to create when dividing the image
$B_w$	Boundary stripe width
$C_w$	Centre stripe width
$B_h$	Boundary stripe height
$C_h$	Boundary stripe height
$P$	The number of processors available in the multi-processor system