

Appendix A

List of variables

x	The horizontal image coordinate
y	The vertical image coordinate
Δx	Spatial increment in the x direction
Δy	Spatial increment in the y direction
$I(x, y)$	The original two-dimensional image
t	The scale of smoothing
Δt	The scale step
$I(x, y, t)$	The image smoothed to scale t
∇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
ΔI	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

ξ	Unit vector parallel to the gradient direction
η	Unit vector perpendicular to the gradient direction
β	Angle of the local orthogonal coordinate system (ξ, η)
I_ξ	Directional derivative in the direction of ξ
I_η	Directional derivative in the direction of η
$I_{\xi\xi}$	Diffusion term in the direction of ξ
$I_{\eta\eta}$	Diffusion term in the direction of η
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
κ	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
χ	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

θ	Angle of the normal with the positive x axis
ρ	Length of the normal to the line segment from the image origin
$\Delta\theta$	Sampling interval for θ
$\Delta\rho$	Quantisation interval for ρ
\mathcal{R}	Radon transform
\mathcal{D}	The $x - y$ plane
<i>radius</i>	Radius for Hough circle parameterisation
r	Match range for θ
N_ρ	Maximum amount of peak spreading expected in the ρ direction
N_θ	Maximum amount of peak spreading expected in the θ 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
δ	The fractional part of ρ 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 θ
T_1	Magnitude threshold for line endpoint detection
T_2	Length threshold for line endpoint detection

θ_c	The θ value corresponding to the bone centre-line
ρ_c	The ρ 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
ω_{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
α	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