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MINE-050

M.Tech. IN ADVANCED INFORMATION TECHNOLOGY - EMBEDDED SYSTEM DESIGN (MTECHSD)

00348

Term-End Examination

December, 2014

MINE-050 : ADVANCE SIGNAL AND IMAGE PROCESSING

Time : 3 hours *Maximum Marks : 100*

Note :

(i) *Section I is* ***compulsory****. Answer any* ***five*** *questions from Section II.*

(ii) *Assume suitable data wherever required.*

(iii) *Draw suitable sketches wherever required.*

(iv) *Italicized figures to the right indicate maximum marks.*

(v) *Use of scientific calculator is allowed.*

(vi) *In questions where program is to be written, Library functions can be used only for reading and displaying an image.*

SECTION I

1. Answer the following questions : *10×3=30*

(a) Define m-adjacency.

(b) List two different distance functions with equations.

(c) Write an algorithm for histogram equalization.

(d) State and explain any non-linear spatial filtering techniques.

(e) Explain the application of image processing.

(f) Write the conditions to be satisfied by any waveform to be considered as wavelet.

(g) What is wavelet transform and what is its advantage over Fourier transform ?

(h) How is the coherent structure analysis done using wavelet transform ?

(i) Is the Gaussian function to be used as wavelet ? Explain in brief.

(j) How can frequency resolution be improved in short-time Fourier transform analysis ?

SECTION II

2. Describe the steps involved in image restoration. How is it different from the image enhancement ? Write a pseudo program/algorithmic procedure to do image restoration in the presence of noise using any special filter. *14*

3 Write an algorithm for labelling the objects in the figure given below. Define equivalence class too. Also, write an algorithm to trace the boundary of the first object and derive the chain code for it. *8+3+3*

				1		1	1
1	1	1	1	1		1	1
		1	1	1		1	1
		1	1	1			1
		1	1		1	1	1
1	1	1					
				1	1	1	1
		1	1				
	1	1	1			1	1
						1	
		1	1	1	1	1	

4. Write a program and explain the theory for the following : *5+4+5*

(a) Temporal median technique in a video sequence.

(b) Approximate temporal median technique in a video sequence.

(c) Gaussian Model technique for a video sequence.

5. (a) Write the classification of the wavelet families with possible mathematical formulas and properties.

(b) How do we identify the coherent structures using wavelets ? Explain with any signal. *7+7*

6. Derive the daughter wavelet from the mother wavelet function $\psi(t) = (1 - t^2)e^{-t^2/2}$ for the dilation factor of 2 and translation factor of 3. Compute the energies of both mother and the derived daughter wavelets. Compare and comment on the energy values. *6+6+2*

7. Explain the difference between CWT and DWT. How can we make wavelet more flexible to use it in signal analysis ? What are the mathematical criteria for a signal to be considered as a wavelet ? *3+5+6*

8. Describe the various colour spaces used in colour image processing. Write an algorithmic procedure to convert a RGB image to HSV. *6+8*
