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reviewer1@nptel.iitm.ac.in ▼

Courses » Introduction to Time-Frequency Analysis and Wavelet Transforms

Announcements

Course

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## Unit 14 - Week 9: Discrete Wavelet Transforms

### Course outline

Registration for  
MATLAB ExamHow to access the  
portal

MATLAB Online Access

MATLAB Tutorials  
created by MathWorksWeek 1: Introduction,  
Basic definitions and  
ConceptsWeek 2: Fourier  
transforms (a review)Week 3: Duration and  
BandwidthWeek 4: Short-time  
Fourier transformWeek 5: Wigner-Ville  
DistributionsWeek 6: Wigner-Ville  
Distributions (Contd..)Week 7: Continuous  
Wavelet TransformsWeek 8: Continuous  
Wavelet Transforms  
(Contd..)Week 9: Discrete  
Wavelet Transforms

- Lecture 7.7 A:  
Applications of CWT  
(Part 1)
- Lecture 7.7 B:  
Applications of CWT  
(Part 2)
- Lecture 8.1 A: Discrete  
Wavelet Transform (Part  
1)
- Lecture 8.1 B: Discrete  
Wavelet Transform (Part  
2)
- Lecture 8.2 A:  
Orthogonal scaling  
function bases and  
MRA (Part 1)
- Lecture 8.2 B:  
Orthogonal scaling  
function bases and  
MRA (Part 2)
- Data file: a8\_cwt.mat
- Solutions to Week 9  
Assignment
- Quiz : Week 9  
Assignment

### Week 9 Assignment

The due date for submitting this assignment has passed.  
As per our records you have not submitted this assignment.

**Due on 2016-09-26, 23:59 IST**

- 1) 1 point
1. Which of the following is/are measure(s) of regularity of a function in functional analysis?
- (a) Lipschitz regularity.
  - (b) Holder exponent.
  - (c) Lyapunov exponent
  - (d) Hertz exponent.

- a
- b
- c
- d

No, the answer is incorrect.  
Score: 0

Accepted Answers:

a  
b

- 2) 1 point
2. For sum of two linear chirps, which of the following is/are TRUE?
- (a) The resolvability of wavelets at higher frequencies is poorer than at lower frequencies.
  - (b) The resolvability of wavelets at higher frequencies is better than at lower frequencies.
  - (c) The resolvability of wavelets at higher frequencies is same as that of at lower frequencies.
  - (d) The resolvability of wavelets at higher frequencies is better than STFT.

- a
- b
- c
- d

No, the answer is incorrect.  
Score: 0

Accepted Answers:

a

- 3) 1 point
3. Which of the following expression is equivalent to Fourier transform of the scaling function?
- (a)  $\int_0^\infty \frac{|\psi(s\omega)|^2}{s} ds$
  - (b)  $\int_1^\infty \frac{|\psi(s\omega)|^2}{s} ds$
  - (c)  $\int_0^1 \frac{|\psi(s\omega)|^2}{s} ds$
  - (d) None of the above.

- a
- b
- c
- d

Week 10: Discrete Wavelet Transforms (Contd..)

Week 11: Discrete Wavelet Transforms (Contd..)

Week 12: DWT (Contd..) and Closing Summary

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

4)

- a  
 b  
 c  
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

5)

5. A set of  $p$  vectors  $\{\gamma_n\}$ ,  $n = 1, \dots, p$  is being used to linearly decompose a vector  $\mathbf{x} \in \mathbb{R}^m$ , where  $\mathbb{R}^m$  is the  $m$ -dimensional Euclidean space. Then, identify the incorrect statement(s) from the following with regards to the set of vectors  $\{\gamma_n\}$ :

- (a) It is said to be a redundant frame if there exist constants  $1 < A \leq B$  such that  $A\|\mathbf{x}\|_2^2 \leq \sum_{n=1}^p |\langle \mathbf{x}, \gamma_n \rangle|^2 \leq B\|\mathbf{x}\|_2^2$ .
- (b) It is said to be a tight frame if there exists a constant  $A > 1$  such that  $A\|\mathbf{x}\|_2^2 < \sum_{n=1}^p |\langle \mathbf{x}, \gamma_n \rangle|^2 < B\|\mathbf{x}\|_2^2$ .
- (c) It is said to be orthonormal if there exists constants  $B > A > 1$  such that  $A\|\mathbf{x}\|_2^2 \leq \sum_{n=1}^p |\langle \mathbf{x}, \gamma_n \rangle|^2 \leq B\|\mathbf{x}\|_2^2$ .
- (d) It is said to be linearly independent if and only if there exists constants  $A \leq 1 \leq B$  such that  $A\|\mathbf{x}\|_2^2 \leq \sum_{n=1}^p |\langle \mathbf{x}, \gamma_n \rangle|^2 \leq B\|\mathbf{x}\|_2^2$ .

- a  
 b  
 c  
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

c

6)

6.  $(\mathbf{e}_1, \mathbf{e}_2)$  constitute an orthonormal basis of the 2-D Hilbert space. If constructing functions are chosen as  $\gamma_1 = -\frac{1}{3}\mathbf{e}_1 + \frac{2\sqrt{2}}{3}\mathbf{e}_2$ ,  $\gamma_2 = \frac{1}{3}\mathbf{e}_1 + \frac{2\sqrt{2}}{3}\mathbf{e}_2$  and  $\gamma_3 = \mathbf{e}_2$ , then of the following is/are correct?

- (a) The frame is linearly independent.
- (b) The frame is orthonormal.
- (c)  $A = B$
- (d)  $A = \frac{2}{9}$  and  $B = \frac{25}{9}$

- a  
 b  
 c  
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

d

1 point



1 point

7)

1 point

7. Select correct option(s) regarding the signal recovery from wavelet coefficients. (A are as per the notations used in lecture 8.1 )

- (a) Recovery error is less when  $B/A$  ratio is large.
- (b) Recovery error is less when  $B/A$  ratio is close to unity.
- (c) Recovery error is independent of  $B/A$  ratio.
- (d) Recovery error is zero when  $B/A$  ratio is equal to unity.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b  
d

8)

1 point

8. Which of the following is/are TRUE regarding MRA?

- (a) At each scale the approximation is given by the orthogonal projection of  $x(t)$  on a space  $V_m \in \mathbf{L}^2(\mathbb{R})$ .
- (b) From filtering point of view, the role of a scaling function is that of a low pass filter.
- (c) Scaling function and its translates constitutes orthonormal basis.
- (d) Coefficients at level  $m$  contain details that are necessary to move to a finer scale  $m - 1$  help to construct approximation at that scale.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a  
b  
c  
d

9)

1 point

9. Select correct statement(s) from the following.

- (a) CWT is highly redundant transform.
- (b) Dyadic DWT is an orthogonal transform..
- (c) All tight frames are orthonormal frames.
- (d) Morlet wavelet cannot be used for DWT.
- (e) Orthonormal wavelet bases have compact representation.

- a
- b
- c
- d
- e

No, the answer is incorrect.

Score: 0

Accepted Answers:

a  
b  
d  
e

10)

1 point

Questions **10** to **11** are based on the data file `a8_cwt.mat`. The data file consists of CW signal. The datafile is of type structure and contains all necessary details such as CWT coefficients, scales, etc. The signal contains two frequencies corrupted with noise. Low frequency component is present through out the signal while the high frequency component is present only in a short interval. Answer the following questions based on the given information.

10. The time interval in which the high frequency component is present is (report the answer)

- (a) (0.1 0.3) sec
- (b) (0.2 0.5) sec
- (c) (0.3 0.7) sec
- (d) (0.6 0.9) sec

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

11)

11. If it is given that the amplitude of high frequency component present in the signal is an integer, then the value of the amplitude is \_\_\_\_\_

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 3

1 point

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