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NPTEL

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Courses » Introduction to Time-Frequency Analysis and Wavelet Transforms

Announcements

Course

Ask a Question

Progress



Unit 10 - Week 5: Wigner-Ville Distributions

Course outline

Registration for
MATLAB Exam

How to access the
portal

MATLAB Online Access

MATLAB Tutorials
created by MathWorks

Week 1: Introduction,
Basic definitions and
Concepts

Week 2: Fourier
transforms (a review)

Week 3: Duration and
Bandwidth

Week 4: Short-time
Fourier transform

Week 5: Wigner-Ville
Distributions

- Lecture 6.1: Wigner-Ville Distributions
- Lecture 6.2: Properties of WVD - I
- Lecture 6.3: Properties of WVD - II
- Lecture 6.4: Discrete WVD
- Lecture 6.5: Pseudo- and Smoothed- WVD

Data file:
a5_sigData.mat

Solutions to Week 5
Assignment

Quiz : Week 5
Assignment

Week 6: Wigner-Ville
Distributions (Contd..)

Week 7: Continuous
Wavelet Transforms

Week 8: Continuous
Wavelet Transforms
(Contd..)

Week 9: Discrete
Wavelet Transforms

Week 10: Discrete
Wavelet Transforms
(Contd..)

Week 11: Discrete
Wavelet Transforms
(Contd..)

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

Week 5 Assignment

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

Due on 2016-08-29, 23:59 IST

1) 1 point

1. Select the correct statement with regard to Wigner-Ville distributions:

- (a) The WVD may be thought of as the local auto-covariance function of the signal's Fourier transform.
- (b) The WVD may be thought of as the Fourier transform of a local auto-covariance function.
- (c) Both (a) and (b).
- (d) Neither (a) nor (b).

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

2) 1 point

2. Which of the following is TRUE regarding WVD?

- (a) It assumes real values when the signal is real and complex values when the signal is complex.
- (b) It always assumes complex values regardless of whether signal is real or complex.
- (c) It always assumes real values regardless of whether the signal is real or complex.
- (d) None of the above.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

3) 1 point

3. Select the correct statement(s) from the following:

- (a) WVD cannot assume negative values in T-F plane since it is a bilinear distribution.
- (b) WVD always satisfies time-frequency marginals.
- (c) Any bilinear distribution which satisfies marginal requirements cannot be positive through the T-F plane.
- (d) None of the above

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b
c

4)

1 point

4. Which of the following are correct regarding the global averages computed using WVD and from the signal?

- (a) $\langle t \rangle^{(WV)} = \langle t \rangle$ (Mean time computed from WVD is same as that of the signal).
 (b) $\langle \omega \rangle^{(WV)} = \langle \omega \rangle$ (Center frequency computed from WVD is same as that of the signal).
 (c) $(\sigma_\omega^2)^{(WV)} (\sigma_t^2)^{(WV)} > \sigma_\omega^2 \sigma_t^2$
 (d) All of the above.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a
b

5)

1 point

5. Which of the following expressions correctly evaluate instantaneous frequency and delay using WVD ?

- (a) $\omega_i(t) = \dot{\phi}(t) = \frac{1}{2\pi} \int \omega W(t, \omega) d\omega$
 (b) $\omega_i(t) = \dot{\phi}(t) = \frac{1}{2\pi |x(t)|^2} \int \omega W(t, \omega) d\omega$
 (c) $t_g(\omega) = -\psi'(\omega) = \frac{1}{2\pi} \int t W(t, \omega) dt$
 (d) $t_g(\omega) = -\psi'(\omega) = \frac{1}{|X(\omega)|^2} \int t W(t, \omega) dt$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b
d

6)

1 point

6. Suppose $W_1(\tau, \xi)$ & $W_2(\tau, \xi)$ are WVD's of the signals $x_1(t) = e^{j\omega_1 t} + e^{j\omega_2 t}$ and $x_2(t) = \sin(\omega_1 t) + \sin(\omega_2 t)$ respectively. Then:

- (a) $W_1(\tau, \xi)$ contains interference terms whereas $W_2(\tau, \xi)$ does not.
 (b) $W_2(\tau, \xi)$ contains interference terms whereas $W_1(\tau, \xi)$ does not.
 (c) Both $W_1(\tau, \xi)$ and $W_2(\tau, \xi)$ contain interference terms.
 (d) Neither of them contains interference terms.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

7)

1 point

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c
d

8)

1 point

8. The benefit(s) of Pseudo WVD over WVD is/are:

- (a) It addresses the issue of the non-local nature of the WVD.
- (b) It improves the time-frequency localization.
- (c) The interference terms are eliminated to some extent as a result of smoothing in frequency.
- (d) All of the above.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a
c

9)

1 point

9. Which of the following are possible consequences of smoothing WVD ?

- (a) It can enforce positivity.
- (b) It can reduce the interference terms.
- (c) It can reduce the smearing.
- (d) It can preserve the marginality property of WVD.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a
b

10)

1 point

10. Select the correct statement(s) from the following with respect to discrete-WVDs.

- (a) WVD follows same discretization scheme as that of STFT.
- (b) Analytic form of representation reduces the interferences due to aliasing.
- (c) Spectral aliasing can be avoided by adding sufficient zeros at high frequencies.
- (d) None of the above.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

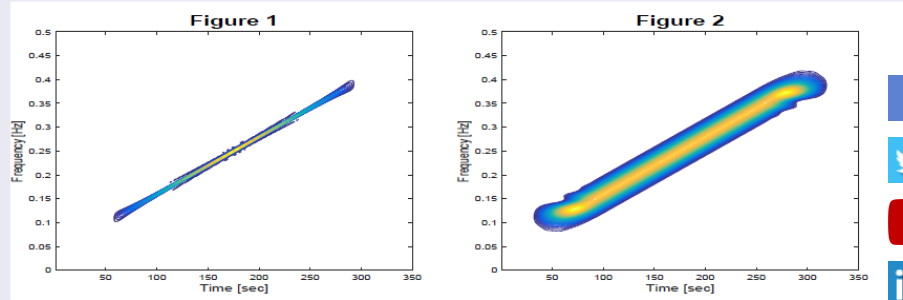
Accepted Answers:

b
c

11)

1 point

11. A signal is made up of three segments. The initial segment has a zero activity, the cent segment contains a chirp and the final segment also has zero activity. Two different T-F distributions of the signal are given below. Choose the correct inference(s) from the following.



- (a) Figure 1 represents spectrogram while figure 2 represents WVD.
- (b) There is some activity in the signal before 50 sec.
- (c) The signal activity starts only after 50 sec.
- (d) Smearing is more in case of WVD than in spectrogram.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

c

12)

A multi-component signal is given in the data file a5_sigData.mat. Use this dataset to answer the questions 12 to 14. The answers to these questions are to be filled as an integer.

12. The WVD for the given signal has _____ interference terms.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 3

1 point

13)

13. The pseudo-WVD for the given signal has _____ interference terms.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 2

1 point

14)

14. The center frequency corresponding to the highest frequency component present in signal is f cycles/sample. The value of $10f$ is _____.

No, the answer is incorrect.

Score: 0

Accepted Answers:

(Type: String) 4

1 point

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