EBU6018
Advanced Transform Methods

Haar Functions/
Wavelet Transform
Quiz/Tutorial Answers

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Question 1

Q: Which of the following statements is false? Wavelet transforms:

1. Allow time-frequency analysis of both fast and slowly changing signals.
2. Use wavelet functions that are oscillatory with non-zero mean.
3. Allows us to detect discontinuities in a signal.
4. May use a family of wavelet functions that are not orthogonal.

Question 2

The Wavelet Transform may be more suitable than the Short-Time Fourier Transform for processing real-world signals because:

1. Its window width is fixed.
2. Many real-world signals are short duration with decaying oscillations.
3. There is no trade-off between time and frequency resolution.
4. The time-frequency resolution of the short-time Fourier transform varies with frequency.

Question 3

The Admissibility Condition for a wavelet implies:

1. The wavelet is orthogonal.
2. The tiling in the scalogram is equal area.
3. The wavelet's average value is zero.
4. The daughter wavelets are scaled versions of the mother wavelet.

Question 4

Haar wavelet functions are:

A. Orthonormal and have unlimited applications.

B. Not orthonormal and have unlimited applications.

C. Orthonormal and have limited applications.

D. Not orthonormal and have limited applications.

Question 5

The use of wavelet transforms:

A. Allows time-frequency analysis of both fast and slowly changing signals.

B. Allows time-frequency analysis of only fast changing signals.

C. Allows time-frequency analysis of only slowly changing signals.

D. None of the above.

Exercise 1

- Using scaled and translated Haar Functions, construct the function given by:

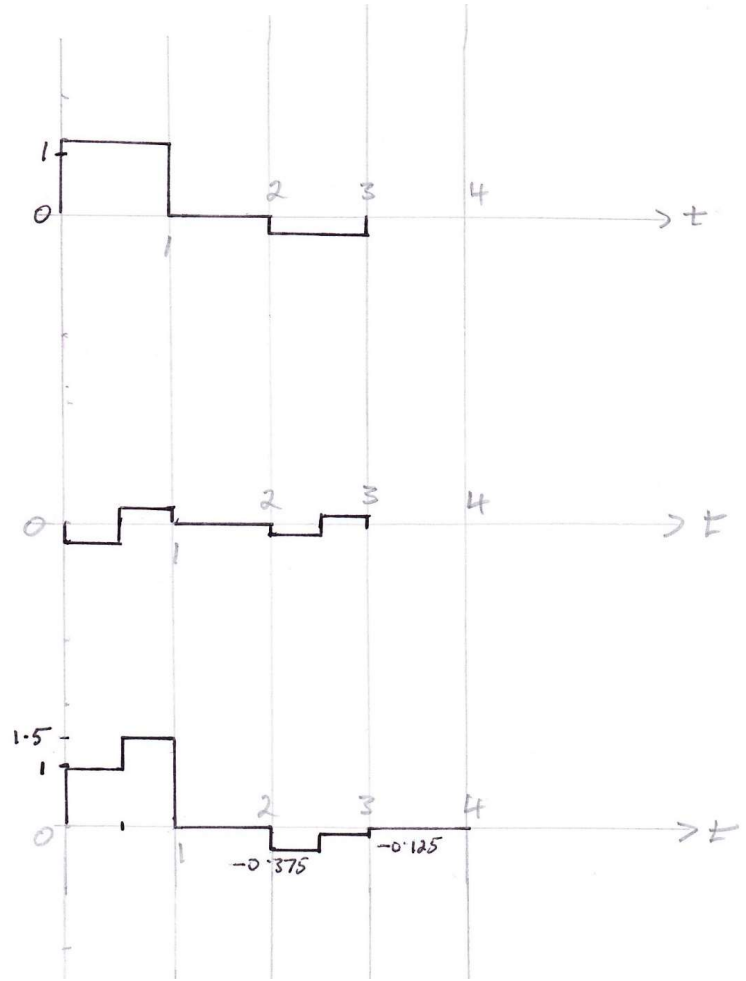
$$1.25\varphi_{0,0}(t)-0.25\varphi_{0,2}(t)-0.25\psi_{0,0}(t)-0.125\psi_{0,2}(t)$$

Exercise 1 Solution

$1.25\varphi_{0,0}(t) - 0.25\varphi_{0,2}(t)$

$-0.25\psi_{0,0}(t) - 0.125\psi_{0,2}(t)$

Sum



Exercise 2

Using scaled and translated Haar Functions, draw the constructed function given by:

$$\phi_{0,0}(t) - 0.5\phi_{0,2}(t) + 0.25\psi_{0,0}(t) - \psi_{0,1}(t)$$

Exercise 2 Solution