Supplementary Material for Chapter 7:
"TFD Measures, Performance, and Enhancement" [1]

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The zip files contained in this directory contain the supplementary materials[2] (SM) for each Section of the Chapter separately. The user is advised to read the read me file for each Section to get a good overview of contents of its SM. Below is a brief overview of the Chapter in the book. Part 2 is the actual inventory of the SM provided for this chapter.

1. Book Chapter SM Overview:

This chapter describes a number of time-frequency ((t, f)) performance quality measures specifically developed as criteria for performance enhancement for a given application. The adopted performance measures are defined using objective criteria followed by TFD enhancement methods to improve the (t, f) concentration, resolution and readability of TFDs. The topics for which SM is available are described below.

An general procedure for enhancing the time-frequency resolution and readability of TFDs is the reassignment principle (7.2: see page 2). Techniques for measuring the concentration of TFDs and for automatic optimization of their parameters based on entropy measures (7.3: see page 2). Another approach defines a resolution performance measure using local measurements in the (t, f) domain, such as relative amplitudes of auto-terms and cross-terms (7.4: see page 2). Then, attempts to unify time-frequency, time-scale, filter banks, wavelets and the discrete-time Gabor transform using product functions and cascaded frames are presented briefly as they may assist in the selection of the best-performing method for a given application (7.5: see page 2). The last topics focus on (1) Time-frequency compressive sensing (7.6: see page 2); (2) Signal complexity estimation using (t, f) entropy measures (7.7: see page 2).

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[1] B. Boashash (ed.), Time-Frequency Signal Analysis and Processing, 2nd Edition (London: Elsevier / Academic Press, December 2015); ISBN 978-0-12-398499-9.

[2] All of the book supplementary materials can be found here.

2. Book Chapter SM Main Script Inventory:

Supplementary material	Brief Description
7.1: TFD Design Based on the Affine Group	
Mathematical proofs and clarifications are provided in this section SM	
7.2: Time-Frequency Reassignment	
Fig_7_2_1.m	This script produces similar results to the ones that are depicted in Fig. 7.2.1, on page 399 of the book.
7.3: Measuring Time-Frequency Distributions Concentration	
Fig_1_SPEC.m	This script produces similar results to the ones depicted in Fig. 7.3.1 (a)-(f), on page 406 of the book.
Fig_1_SMethod.m	This script produces similar results to the ones depicted in Figs. 7.3.1 (g)-(l) and 7.3.2, on pages 406-407 of the book.
Fig_1_SM_with_Concentration_ OneFrame_of_the_SM_movie .m	This script calculates the S-Method with a given number of terms L (Figure 1) or given level Q (Figure 2) and their concentration measures.
Section 7.4: Resolution Performance Assessment for Comparing and Selecting Quadratic TFDs	
Fig_7_4_1.m	This script produces similar results to those depicted in Fig. 7.4.1 on page 409 of the book.
Fig_7_4_5.m	This script reproduces the results that are depicted in Fig. 7.4.5 on page 415 of the book
Section 7.5: Postprocessing In the (t,f) Domain: Methods and Performance Comparison	
Figure_1.m	This script is the implementation of the Fig. 7.5.1 on page 422 of the book.
Figure_2.m	This script is the implementation of Fig. 7.5.2 on page 423 of the book.
Figure_3.m	This script is the implementation of the Fig. 7.5.3 on page 424 of the book.
Section 7.6: Time-Frequency Compressive Sensing	
TFSAP_SUP_MAT_CHAP_7_6 _figure_2.m	This script is the implementation of the Fig. 7.6.2 on page 429 of the book.
TFSAP_SUP_MAT_CHAP_7_6 _figure_3.m	This script is the implementation of Fig. 7.6.3 on page 430 of the book.
Section 7.7: Signal Complexity Estimation Using Time-Frequency Short-Term Entropy	
TFSAP_SUP_MAT_CHAP_7_7 _Algorithm_Source.m	This script is the implementation of the Fig. 7.7.2 on page 436 of the book, and it also produces results that are similar to those depicted in Figs. 7.7.3 and 7.7.4 on pages 437 and 438 of the book.