## Title (EN): Cosine-/Sine-Modulated Filter Banks: General Properties, Fast Algorithms and Integer Approximations

## Title (SK): Kosínusovo/sínusovo modulované diskrétne blokové transformácie: vlastnosti, efektívne algoritmy a celočíselné aproximácie

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Scientific projects: VEGA 2/0184/14, VEGA 2/0165/17

<u>Annotation</u>: It was published the monograph by publisher Springer International Publishing AG. Perfect reconstruction cosine-/sine-modulated filter banks as discrete block transforms are basic processing components for the time-to-frequency transformation of an audio data block, and vice versa, in many sub-band/transform-based schemes and communication technologies for the high quality compression of digital audio signals. In general, the computation of these block transforms is the most time-consuming operation (typically, requires approximately 70% of the whole computational processing time). Therefore, the fast algorithms for their efficient real-time hardware and software implementation are very important. It was the main motivation to prepare a monograph based on the own research conducted during more than 20 years. The monograph consists of 9 chapters and 7 appendices (each chapter ends with exercises and problems), and from mathematical point of view is devoted to:

- Definitions, general mathematical properties of perfect reconstruction cosine-/sine-modulated filter banks, relations between them, as well as their (block) matrix factorizations.
- Theory and design of fast algorithms for the computation of these block transforms in subband/transform-based schemes and communication technologies: MPEG audio coding standards (MP3), Digital Broadcasting standards, Dolby Digital (Plus) systems, SBR compression technology,
- Theory of algorithm complexity (the minimum number of arithmetic operations, regularity, recursivity, ...) for a potential software or hardware implementation.
- Methods to integer approximation of these block transforms for the lossless compression of digital audio signals.

The monograph summarizes the research results achieved by the reserach community over three decades of this hot research topic. The monograph contains many research results which were not published up to now. It is aimed at students, engineers, researchers, and scientists at research institutes, universities, and companies who are interested in theoretical aspects cosine-/sine-modulated filter banks and practical aspects in design audio coding systems.

Main scientometric outputs:

1. Vladimir Britanak and K. R. Rao: *Cosine-/Sine-Modulated Filter Banks: General Properties, Fast Algorithms and Integer Approximations,* Springer International Publishing AG, Cham, Switzerland, xxvi, 645 p., 2018, ISBN 978-3-319-61078-8. Typ AAA