

# Time-invariant and Time-varying Filters Versus Neural Approach Applied to DC Component Estimation in Control Algorithms of Active Power Filters

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## Abstract

This paper presents application of digital filters and neural networks to extraction of a DC component of a signal. This problem rises for example in control of active power filters (APF) [4] used for power quality improvement [1]. Solutions to the basic problem of DC component estimation are well-known and so the difficulty of the task comes rather from the required minimization of the calculation time which should be as low as possible. It ensures fast reaction of the control system to load changes and finally results in less THD coefficient of the current and better efficiency of the APF [3]. The paper includes propositions of both time-varying [5] and neural filters [2] as well as comparison with classical approach to the DC component estimation based on: finite impulse response (FIR) low-pass filters, cascaded integrator-comb (CIC) filters, infinite impulse response (IIR) low-pass elliptic filters. The results obtained by simulations have been presented. The future work will be devoted to digital signal processor implementation of APF control algorithms based on the best solution.

## References

1. H. AKAGI. Modern active filters and traditional passive filters. Bulletin of the Polish Academy of Sciences. Technical Sciences, vol. 54, no. 3 (2006), pp. 255–269.
2. A. CICHOCKI AND R. UNBEHAUEN. Neural Networks for Optimization and Signal Processing. New York, J.Wiley, (1994).
3. MACIAZEK M. Power theories applications to control active compensators. in: Benysek G., Pasko M.: Power Theories for Improved Power Quality. Power Systems Series, Springer, London (2016), pp. 49–116.
4. M. PASKO AND M. MACIAZEK AND D. BULA. Significance of signal filters in control system of Active Power Filters. vol. 84, no. 6 (2008), pp. 101-104.
5. A. PIOWAR AND J. WALCZAK . Models of n-th order linear-time varying systems. Archives of Electrical Engineering, vol. 64, no. 2 (2015), pp. 315-332.