Fractional and complex pseudo-splines and the construction of Parseval frames - DTU Orbit (11/12/2018)

**Fractional and complex pseudo-splines and the construction of Parseval frames**

Pseudo-splines of integer order \((m, ℓ)\) were introduced by Daubechies, Han, Ron, and Shen as a family which allows interpolation between the classical B-splines and the Daubechies’ scaling functions. The purpose of this paper is to generalize the pseudo-splines to fractional and complex orders \((z, ℓ)\) with \(α = \text{Re} \ z ≥ 1\). This allows increased flexibility in regard to smoothness: instead of working with a discrete family of functions from \(C^m, m\in\mathbb{N}_0\), one uses a continuous family of functions belonging to the Hölder spaces \(C^{α−1}\). The presence of the imaginary part of \(z\) allows for direct utilization in complex transform techniques for signal and image analyses. We also show that in analogue to the integer case, the generalized pseudo-splines lead to constructions of Parseval wavelet frames via the unitary extension principle. The regularity and approximation order of this new class of generalized splines is also discussed.

**General information**

State: Published  
Organisations: Department of Applied Mathematics and Computer Science, Mathematics, Universität Passau  
Contributors: Massopust, P., Forster, B., Christensen, O.  
Pages: 12-24  
Publication date: 2017  
Peer-reviewed: Yes

**Publication information**

Journal: Applied Mathematics and Computation  
Volume: 314  
ISSN (Print): 0096-3003  
Ratings:  
BFI (2018): BFI-level 1  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 1  
Scopus rating (2017): CiteScore 2.32 SJR 1.065 SNIP 1.441  
Web of Science (2017): Impact factor 2.3  
Web of Science (2017): Indexed yes  
BFI (2016): BFI-level 1  
Scopus rating (2016): CiteScore 1.88 SJR 0.944 SNIP 1.213  
Web of Science (2016): Impact factor 1.738  
BFI (2015): BFI-level 1  
Scopus rating (2015): CiteScore 1.7 SJR 0.95 SNIP 1.25  
Web of Science (2015): Impact factor 1.345  
BFI (2014): BFI-level 1  
Scopus rating (2014): CiteScore 1.86 SJR 0.961 SNIP 1.474  
Web of Science (2014): Impact factor 1.551  
BFI (2013): BFI-level 1  
Scopus rating (2013): CiteScore 1.92 SJR 1.137 SNIP 1.46  
Web of Science (2013): Impact factor 1.6  
BFI (2012): BFI-level 1  
Scopus rating (2012): CiteScore 1.77 SJR 1.02 SNIP 1.308  
Web of Science (2012): Impact factor 1.349  
BFI (2011): BFI-level 1  
Scopus rating (2011): CiteScore 1.78 SJR 1.05 SNIP 1.315  
Web of Science (2011): Impact factor 1.317  
BFI (2010): BFI-level 1  
Scopus rating (2010): SJR 0.842 SNIP 1.255  
Web of Science (2010): Impact factor 1.536  
BFI (2009): BFI-level 1  
Scopus rating (2009): SJR 0.751 SNIP 1.061  
BFI (2008): BFI-level 1  
Scopus rating (2008): SJR 0.778 SNIP 0.985  
Scopus rating (2007): SJR 0.869 SNIP 1.113