

# Hermite subdivision and spectral conditions

Tomas Sauer

Chair of Mathematical Imaging & FORWISS, University of Passau

Fraunhofer IIS research group on “Knowledge Based Imaging”

`Tomas.Sauer@uni-passau.de`

*Hermite subdivision schemes* are stationary subdivision schemes that not only consider function values but consecutive derivatives which leads to a mild form of level dependence of the scheme. A fundamental property of such schemes is the so-called *spectral condition* from [1], a polynomial reproduction property that could be seen as the analogy of the *sum rule* property of classical subdivision, see also [2].

Whenever a scheme satisfies the spectral condition, there exists a factorization in terms of a generalized difference operator that gives rise to a “difference scheme” whose contractivity governs the convergence of the scheme. Due to that, it was assumed for some time that all convergent Hermite subdivision schemes must satisfy the spectral condition.

In the talk we will see that this is not the case by giving a more general class of spectral conditions and associated factorizations from which we construct convergent schemes, even of arbitrary regularity, that do not satisfy the classical spectral condition.

**Joint work with:** Jean-Louis Merrien

## References

- [1] S. Dubuc and J.-L. Merrien, *Hermite subdivision schemes and Taylor polynomials*, Constr. Approx. **29** (2009), 219–245.
- [2] B. Han, T. Yu, and Y. Xue, *Noninterpolatory Hermite subdivision schemes*, Math. Comp. **74** (2005), 1345–1367.
- [3] J.-L. Merrien, T. Sauer, *A Generalized Taylor Factorization for Hermite Subdivisions Schemes*, J. Comput. Appl. Math. **236** (2011), 565–574.
- [4] J.-L. Merrien, T. Sauer, *From Hermite to stationary subdivision schemes in one or several variables*, Adv. Comput. Math. **36** (2012) 547–579
- [5] J.-L. Merrien, T. Sauer, *Extended Hermite Subdivision Schemes*, J. Comput. Appl. Math., **317** (2017), 343–361.