Implementing Taylor Model Arithmetic with Floating-Point Arithmetic

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The implementation of Taylor models arithmetic may use floating-point arithmetic to benefit from the speed of the floating-point implementation. In this paper, we assume that the floating-point arithmetic is compliant with the IEEE-754 standard; we show how to bound roundoff errors and how to take these roundoff errors into account into the interval remainder part.

This work is based on well-known algorithms such as TwoSum by Dekker or TwoMult, and also on recent results by Ogita, Rump and Oishi on the accurate computation of sums and dot products.