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A High-Order interpolation for the Finite Volume Method: the Coupled Least Squares Reconstruction

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**Highlights**

- A new cubic reconstruction for the finite volume method is proposed.
- The new method is presented in the general  $d$ -dimensional case.
- This reconstruction uses the Least Squares method in a coupled way.
- An algorithm efficiently calculating the successive derivatives is presented.
- Numerical illustrations with several hyperbolic problems in gas dynamics are given in dimensions 1, 2 and 3.

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