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15. Numerical Analysis and Scientific Computing

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VANI : A package for Validated, Adaptive Numerical Integration in one and more dimensions

Validated, adaptive numerical integration has the purpose to compute enclosures of definite integrals according to the requested accuracy by taking into account the truncation error and all round-off errors that have an influenence on the exactness of the results. For this purpose, interval arithmetic and self-validating algorithms have to be used. In VANI, the global subdivision strategy is adopted, but the order adaption and the way of how the truncation error is handled are different from the general approaches. The program is implemented with PASCAL-XSC because of its facilities for interval computation, for maximal accurate dot product and for different modern programming concepts. The algorithm and the hierarchical orgnization of VANI are to be presented.