

# Automatic Adaptation of the Computing Precision

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## **Abstract**

When a given computation does not yield the required accuracy, the computation can be done (either restarted or continued) using an increasing computing precision. A natural question is how to increase the computing precision in order to minimize the time overhead, compared to the case where the optimal computing precision is known in advance and used for the computation. Kreinovich and Rump have proven that when the computation must be restarted from scratch, then the minimal overhead is a factor 4. In this presentation, we study the case where the computation can benefit from results obtained with a lower precision and thus is not restarted but rather continued. Our first main contribution is to show that in such cases, the overhead is less than 4: for instance the minimal overhead is 2 for the Newton algorithm. Then we present our second main contribution, an asymptotically optimal strategy for adapting the computing precision, which has an overhead tending to 1 when the optimal (unknown) precision tends to infinity.