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## Implicit Interval Methods for Solving the Initial Value Problem

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### Abstract

Explicit interval methods for solving the initial value problem have been considered and analysed in a number of paper and monographs (see e.g. [1], [4], [6], and [7]). Such methods are interesting due to interval-solutions obtained which contain their errors. Computer implementation of interval methods in floating-point interval arithmetic together with the representation of initial data in the form of intervals yield interval-solutions which contain all possible numerical errors. We want to present implicit interval methods of Runge-Kutta and Adams-Moulton type. A reason to do this follows from a well-known fact concerning conventional implicit methods - higher orders of accuracy can be obtained than for explicit methods. It can be proved that the exact solution of the initial value problem belongs to interval-solutions obtained by both kinds of implicit methods. Moreover, some approximations of the widths of interval solutions can be obtained. At present, efforts are being made to develop an appropriate software which would provide interval-solutions of both explicit and implicit interval methods. For interval methods of Runge-Kutta type such a software is ready.

**Keywords:** the initial value problem, interval methods, floating-point interval arithmetic

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