Rigorous integration of differential inclusions.

Tomasz Kapela[a]

[a]Jagiellonian University, Kraków, Poland

We study the following nonautonomous ODE

$$x'(t) = f(x(t), y(t)), \quad x(0) = x_0$$

where $x \in \mathbb{R}^n$, $f : \mathbb{R}^n \times \mathbb{R}^m \to \mathbb{R}^n$ is C^1 and $y : \mathbb{R} \supset D \to \mathbb{R}^m$. Assume that we have some knowledge about $y(t)$, for example $|y(t)| < \epsilon$ for $0 \leq t \leq T$. We would like to find a rigorous enclosure for $x(t)$.

We describe a modification of the Lohner algorithm which allows us effectively compute rigorous upper bounds for:

- reachable sets for control systems,

- solutions of ordinary differential inclusions,

- perturbations of ODEs.

Two different approaches of handling perturbations: first based on componentwise estimates and the second one using logarithmic norms are compared and merged into one method.