# Approximation of continuous systems by piecewise linear systems

Jean-Luc Gouzé*[1]

[1]Inria Sophia Antipolis - Méditerranée (CRISAM) – Institut National de Recherche en Informatique et en Automatique – 2004 route des Lucioles BP 93 06902 Sophia Antipolis, France

**Résumé**

Piecewise affine models often provide a good approximation to describe continuous systems, but may involve a high degree of simplification. To compare solutions of the continuous and piecewise affine models, it is important to quantify the differences between solutions in each region of the state space. As an approach, we will use enveloping "bands" to characterize continuous activation or inhibition functions, and then describe the differences between continuous and piecewise affine solutions in terms of the width $\delta$ of these bands. As a case study, we will consider the negative feedback loop, a classical motif in two dimensions which results in oscillating behaviour. For this example, it is shown that the two types of models may differ only on a compact invariant set (the interior of a limit cycle), whose diameter is a function of the bandwidth $\delta$. We give some generalizations to higher dimensions. This is common work with Madalena Chaves and Camille Poignard (Inria Biocore).

*Intervenant