

Interval Analysis for guaranteed detection of Robots' specific singular points

BENOIT Romain, DELANOUE Nicolas, LAGRANGE Sébastien, WENGER Philippe

20th of June 2014

1 Abstract

This study is part of the context of classifying the comportment of industrial *serial* robots. This classification is done according to the topology of the singular set of a *kinematic function* describing the considered industrial robot.

This study is proposing a methodology and an algorithm, based on Interval Analysis, to *enclose in a guaranteed way, several types of specific singular points*, for serial robot that can be described by a kinematic function $f : \mathbb{R}^2 \rightarrow \mathbb{R}^2$.

The searched points are the pairs of singular points $\{x_1, x_2\}$ such that $f(x_1) = f(x_2)$ (the *nodes*) and the points x , triple roots of f (the *cusps*). It is to be noted that the presence of a cusp point can allow the robot to follow a trajectory, going around this point, *with a posture change, without this trajectory crossing the singular set of the robot*.