

# Regularization of chattering phenomena via bounded variation controls

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## Abstract

In optimal control there may be bad oscillatory phenomena. For instance, this is the case for Fuller's phenomenon [2] where the optimal control is bang-bang with an infinite number of switchings in finite time. In problems with state constraints of high order, there are examples in which the optimal trajectory touches the boundary of the constraint at an infinite number of points over a finite time interval [4]. Likewise, in the framework of hybrid systems, there are optimization problems where the discrete part of the dynamics switches infinitely many times in finite time [3] (and this is known as Zeno's phenomenon.)

In [1] we provide a technique to regularize chattering controls. Given a general optimal control problem, we define a perturbed problem introducing a term of total variation in the cost and prove that the solution to the perturbed problem is quasi-optimal for the reference problem. We estimate the decay of the error, when the total variation of the control grows. Finally we prove a regularization result for state-constrained problems and for hybrid systems.

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## References

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