

Improving the robustness of the iterative solver in state-space modelling of guitar distortion circuitry

Ben Holmes and Maarten van Walstijn

Problem

Emulating distortion requires finding the solution of a nonlinear equation

Objective

Reduce the cost of iterative solvers and improve their robustness

Approach

Derive information from the nonlinear equation

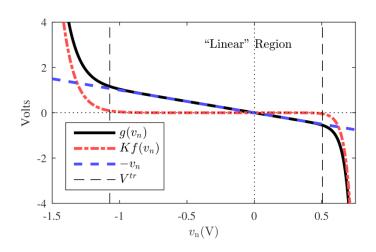
Methods

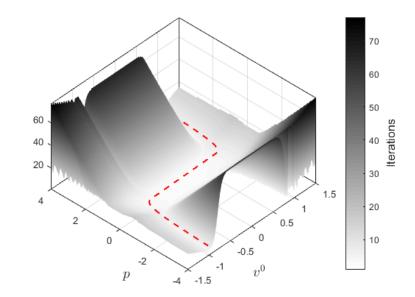
- Find an initial iterate based upon an approximation
- Apply a cap to the step of the solver based upon the gradient of the nonlinear equation



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Asymmetric diode clipper nonlinearity: $Kf(v_n)$ shows an analytic invertible approximation, V^{tr} shows the values of the capping.

Antiparallel diode clipper nonlinearity: constant offset p and the initial iterate v^0 against iterations required to find the root, which is marked in red.