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## An adaptive Linear Quadratic Regulator for Three-phase UPS system Powering Nonlinear Loads

A. Benaissa<sup>a</sup>, B. Rabhi<sup>b</sup>, M. F. Benkhoris<sup>c</sup>, L. Zellouma<sup>d</sup>

<sup>a</sup>LAADI Laboratory, University of Djelfa, Algeria

<sup>b</sup>LMSE Laboratory, University of Biskra, Algeria

<sup>c</sup>IREENA-CRTT Laboratory, Department of Electrical Engineering, Ecole Polytech Nantes, University of Nantes, Saint Nazaire, 44600, France

<sup>d</sup>LEVRES Laboratory, University of El-Oued, Algeria

### Abstract

This paper presents a control strategy applied to three-phase uninterruptible power supplies with a low switching frequency (1500 Hz). In The controller design, the gains are determined by minimizing a cost function, which reduces the tracking error and smoothes the control signal. A recursive least square estimator identifies the parameters model at different load conditions. Then the linear quadratic controller gains are adapted periodically. The output voltage is the only state variable measured. The other state variables are obtained by estimation process. Simulation results show that the proposed control strategy offers good performances for either linear and non-linear loads with low total harmonic distortions (THD) even at low frequencies making it very useful for high power applications.

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### Nomenclature

UPS	uninterruptible power supplies
THD	total harmonic distortions
LQR	linear quadratic regulator
RLS	recursive least square estimator
PWM	pulse width modulation