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### Title

GRYD: Generalized Reduced-Order Wye-Delta Transformation: User's Manual for Reduction Engine and Applications

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### Authors

Qin, Zhanhai  
Cheng, Chung-Kuan

### Publication Date

2003-07-31

Peer reviewed

UNIVERSITY OF CALIFORNIA, SAN DIEGO

GRYD: Generalized Reduced-Order Y- $\Delta$  Transformation  
*User's Manual for Reduction Engine and Applications*

Zhanhai Qin, Chung-Kuan Cheng  
Department of Computer Science and Engineering  
UCSD Technical Report No. xxxx-xx

April 2003

## Abstract

GRYD is a multi-port linear RCLK-VJ network reduction software package. The package features:

1. an efficient linear network reduction engine based on the generalized Y- $\Delta$  transformation algorithm [2];
2. GRYD simulator, which evaluates transient response waveforms to typical input signals, e. .g., impulse, piecewise linear, and exponential functions;
3. GRYD pole analyzer, which evaluates the system transfer function matrix, poles and zeros, and a reduced-model stabilization mechanism[4];
4. GRYD network synthesizer, which realizes the reduced network and outputs a SPICE-compatible netlist file.

The reduction engine takes as input a SPICE[1] netlist file and generates a reduced admittance network in  $s$  domain. An important feature of the reduction engine is that each reduced admittance is a *rational function* of  $s$ , and the transfer functions of reduced network are *exact* up to a user-specified order  $\beta$ [2][3]. This user's manual covers both the engine and the applications.

**Keyword:** Y- $\Delta$  transformation, interconnect model order reduction, symbolic network analysis, pole analysis, network synthesis.

## Contents

A copy of this technical report can be obtained by sending a request to [zqin@cs.ucsd.edu](mailto:zqin@cs.ucsd.edu)

## Summary and Support

This user's manual specifies the usage of GRYD package developed here at UC San Diego. The package contains two parts: the reduction engine and the applications. The reduction engine is a prerequisite of any of the applications included; while the applications are independent from each other. For a complete reference of the package, please see [5].

GRYD package is written and currently maintained by Zhanhai Qin with UC San Diego. To report bugs or send comments, please contact us by email: [zqin@cs.ucsd.edu](mailto:zqin@cs.ucsd.edu), or by phone: 1-858-534-8174.

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