Model Order Reduction by Routh Stability Array with Stability Equation Method for SISO and MIMO Systems

D. K. Sambariya, A. S. Rajawat

Department of Electrical Engineering, Rajasthan Technical University, Kota

Presented By

Priyadarshinee Das

Introduction

- Dynamic stability analysis of a large interconnected

  power system is extremely time consuming and laborious and may even exceed the storage capacity of modern fast computers because of the high order of the system.
- The simplification of higher-order transfer function by low-order models is often helpful in the analysis, simulation and design complex control system.
- The methods discussed are mainly use the transfer function and are applicable to both single-input single-output(SISO) and multi-input multi-output(MIMO) systems.

Objective

- The main objective of this research is to present a technique for obtaining reduced-order models for higher-order continuous time systems.
- The step response performance of the reduced models gets compared to the original system as well as reduced models in literature in terms of rise- time, settling-time of the system

- To obtain a reduced order approximants of a complex high order system that retains and reflects the important characteristics of the original system.

Literature review

Sl. No.	Title	Author	Year	Remark
1	Model order reduction by integral squared error minimization using bat algorithm	D.K. Sambariya H. Manohar	IEEE 2014	Higher order system reduced to lower order system by using bat algorithm
2	Preservation of stability for reduced order model of large scale systems using differentiation method,	D.K. Sambariya H. Manohar	British Journal of Mathematics & Computer Science,2016	Differentiation method is used for reducing both numerator as well as denominator

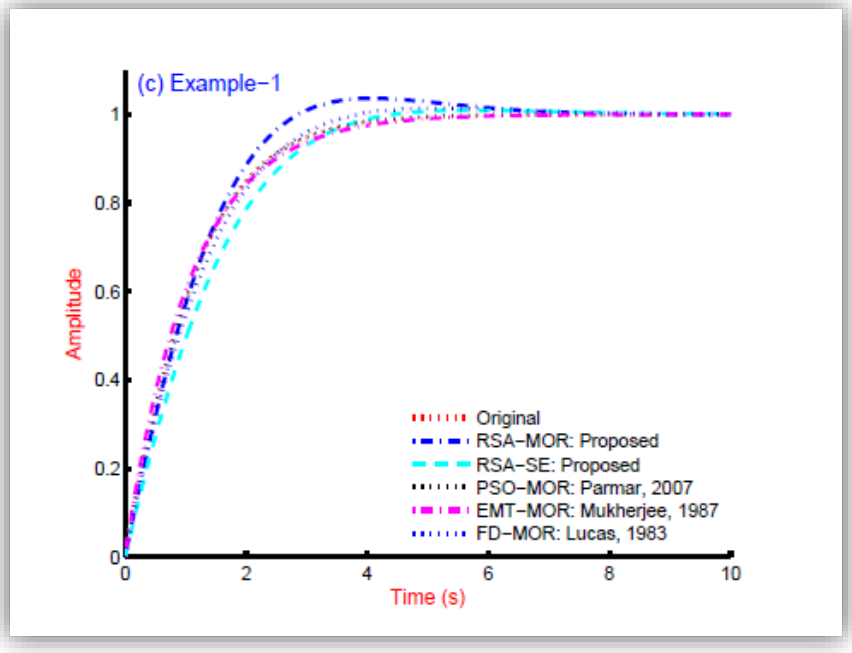
Methodology

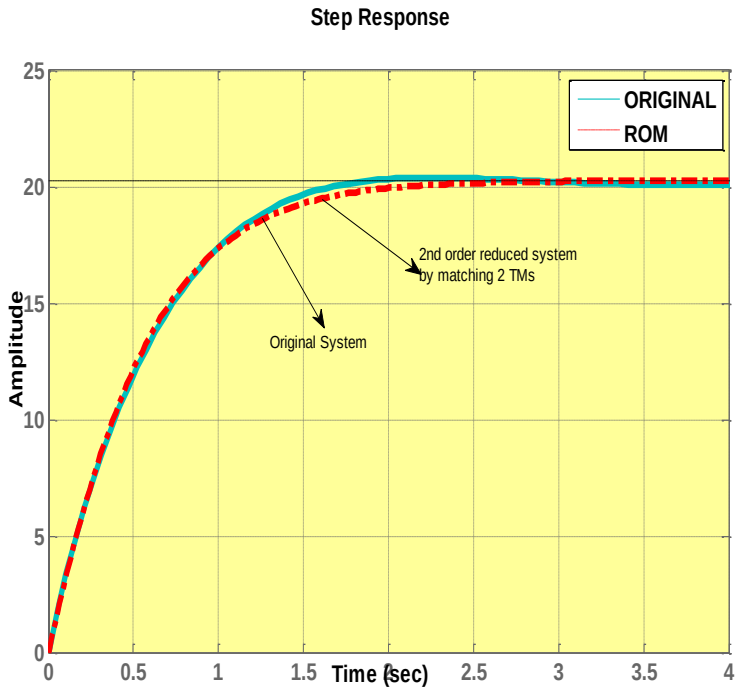
- The methods used are Routh stability array (RSA) method and stability equation (SE) method to get the reduced model of systems.

- The step response performance of the reduced models gets compared to the original system as well as reduced models.

Results and Finding

Considering a 4th order single input single output system has reduced to a 2nd order system and comparison of step response with original system to reduced order system.





CONTRIBUTION OF THE RESEARCH

- Some new mixed methods can be used to obtain a reduced order transfer function from the original transfer function.

LIMITATIONS

- Poor matching in high frequency zone.
- Error has not been calculated.

FUTURE RESEARCH

- Some new mixed methods for reduced-order modeling are proposed. These methods uses (i) Dominant pole (ii) RSA

(iii) successive differentiation approaches to determine denominator and TMs/MPs matching technique to find numerator for better steady state matching.

THANK YOU