

MATLAB/SIMULINK Simulation Tool for Power Systems

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Abstract - This paper describes the modeling and simulation library for power systems simulation under SIMULINK environment. The different features of MATLAB Toolboxes used in the analysis of power systems are described. Software introduces SIMULINK environment of MATLAB for implementing user friendly and future expansion. To illustrate the capabilities of SIMULINK simulation tool, a case study based on a test system is presented.

Keywords - Modeling; Protective relaying; Power System Blockset.

I. INTRODUCTION

A product of The MathWorks, Inc. MATLAB started life as a program designed to perform matrix mathematics, but over the years it has grown into a flexible computing system capable of solving essentially any technical problem. MATLAB can manipulate and invert large matrices and can be used in many numerical applications. MATLAB's capabilities can be extended with addition called SIMULINK, a program which is normally used in the analysis and synthesis of modern systems.

SIMULINK, now incorporated into MATLAB, can also be used to analyze and design of power systems. During last four decade's simulation of power systems have gained more importance. Recently published IEEE paper discussing different approaches to modeling protective relays and related power system events indicates a variety of possible software tools that may be used for this purpose [1]. But rather than MATLAB/SIMULINK software it is difficult to add the modeling and simulation features to teach specific protective relaying concepts that go beyond the level of detail originally provided by the software. The MATLAB software package with SIMULINK support and Power System Blockset (PSB) [2, 3] is utilized to develop customized model libraries for teaching protective relaying concepts.

In this paper the section II describes the reasons for using MATLAB compared with EMTP/ATP; section III

describes features of MATLAB toolboxes; section IV focused on block libraries of Power System Blockset and section V describes a case study.

II. MATLAB DE-FACTO STANDARD

When we compare MATLAB/SIMULINK with EMTP/ATP, we will see which one is better for the power systems simulation. The following items summarize their most important differences in protection-systems simulation [4]:

1. The EMTP/ATP is specific software to simulate power system transient problem, whereas the MATLAB/SIMULINK can be used to simulate power system faults and protective relay algorithm at the same time.
2. ATP/EMTP is designed to simulate the physical processes of transmission lines and transformers quickly and in a convenient way but MATLAB/SIMULINK offers more possibilities in power electronics, signal processing and control.
3. Users can easily create new relay model with MATLAB/SIMULINK, whereas EMTP/ATP doesn't have such capacity.
4. MATLAB/SIMULINK encompasses better graphic function tools than EMTP/ATP of pcpilot, plotxy and so on.

Therefore, for automatic interactive systems MATLAB/SIMULINK is selected.

Matlab Simulink Simulation Tool For Power Systems

Victor M. Corman



Matlab Simulink Simulation Tool For Power Systems:

Methods and Applications for Modeling and Simulation of Complex Systems Wenhui Fan, Lin Zhang, Ni Li, Xiao Song, 2022-12-22 The two volume set CCIS 1712 and 1713 constitutes the proceedings of the 21st Asian Simulation Conference AsiaSim 2022 which took place in Changsha China in January 2023 Due to the Covid pandemic AsiaSim 2022 has been postponed to January 2023 The 97 papers presented in the proceedings were carefully reviewed and selected from 218 submissions The contributions were organized in topical sections as follows Modeling theory and methodology Continuous system discrete event system hybrid system intelligent system modeling and simulation Complex systems and open complex and giant systems modeling and simulation Integrated natural environment and virtual reality environment modeling and simulation Networked Modeling and Simulation Flight simulation simulator simulation support environment simulation standard and simulation system construction High performance computing parallel computing pervasive computing embedded computing and simulation CAD CAE CAM CIMS VP VM VR SBA Big data challenges and requirements for simulation and knowledge services of big data ecosystem Artificial intelligence for simulation Application of modeling simulation in science engineering society economy management energy transportation life biology medicine etc Application of modeling simulation in energy saving emission reduction public safety disaster prevention mitigation Modeling simulation applications in the military field Modeling simulation applications in education and training Modeling simulation applications in entertainment and sports

AI and Blockchain in Smart Grids Shrikant Tiwari, Amit Kumar Tyagi, 2025-03-28 AI and Blockchain in Smart Grids Fundamentals Methods and Applications examines the cutting edge solution that combines artificial intelligence AI blockchain technology and digital twin concepts to innovate the management and optimization of electrical power distribution This innovative approach enhances the resilience efficiency and security of electricity grids while providing real time insights for grid operators and stakeholders The book covers such key elements as using Digital twins in smart grids to gather real time data from various grid components AI powered analytics to process the data generated by digital twins and to analyze this information to detect patterns predict grid failures and recommend adjustments to enhance a grid s performance Blockchain based security to ensure the secure and transparent management of data within a smart grid especially a tamper resistant ledger to store information related to energy production distribution and consumption Decentralized data sharing to allow grid data to be shared securely among various stakeholders including utilities regulators and consumers Grid optimization techniques to improve electricity distribution reduce energy waste and balance supply and demand efficiently Select real world case studies and practical examples demonstrate how AI and blockchain are currently being applied to enhance grid management energy distribution and sustainability By explaining to researchers academics and students how AI and blockchain can revolutionize electricity distribution and make grids smarter more secure and environmentally friendly the book points to a future where grid operators regulators and consumers will

benefit from real time data and a resilient efficient energy ecosystem

Holonic and Multi-Agent Systems for Manufacturing Vladimír Mařík,Pavel Vrba,Paulo Leitão,2011-08-19 This book constitutes the refereed proceedings of the 5th International Conference on Industrial Applications of Holonic and Multi Agent Systems HoloMAS 2011 held in Toulouse France August 29 31 2011 The 25 revised full papers presented were carefully reviewed and selected from 36 submissions The papers are organized in topical sections on industrial agents simulation and modelling planning and scheduling smart technical systems and MAS for unmanned aerial vehicles

Securing Cyber-Physical Systems Al-Sakib Khan Pathan,2015-10-06 Think about someone taking control of your car while you re driving Or someone hacking into a drone and taking control Both of these things have been done and both are attacks against cyber physical systems CPS Securing Cyber Physical Systems explores the cybersecurity needed for CPS with a focus on results of research and real world deploy

Matlab - Modelling, Programming and Simulations Emilson Pereira Leite,2010

Transients in Power Systems Lou van der Sluis,2001 Covering the fundamentals of electrical transients this book will equip readers with the skills to recognise and solve transient problems in power networks and components Starting with the basics of transient electrical circuit theory and moving on to discuss the effects of power transience in all types of power equipment van der Sluis provides new insight into this important field Recent advances in measurement techniques computer modelling and switchgear development are given comprehensive coverage for the first time An electromagnetic transients calculation program is included and will prove valuable to both students and engineers in the field

Simulating Power Systems Using Matlab and Simulink Levy P.,2016-11-20 MATLAB SimPowerSystems software is a modern design tool that allows scientists and engineers to rapidly and easily build models that simulate power systems It uses the Simulink environment allowing you to build a model using simple click and drag procedures Not only can you draw the circuit topology rapidly but your analysis of the circuit can include its interactions with mechanical thermal control and other disciplines This is possible because all the electrical parts of the simulation interact with the extensive Simulink modeling library Since Simulink uses the MATLAB computational engine designers can also use MATLAB toolboxes and Simulink blocksets SimPowerSystems software belongs to the Physical Modeling product family and uses similar block and connection line interface SimPowerSystems software and other products of the Physical Modeling product family work together with Simulink software to model electrical mechanical and control systems

Advances in Power System Control, Operation & Management ,1997

Smart Grid and Enabling Technologies Shady S. Refaat,Omar Ellabban,Sertac Bayhan,Haitham Abu-Rub,Frede Blaabjerg,Miroslav M. Begovic,2021-07-27 SMART GRID AND ENABLING TECHNOLOGIES Discover foundational topics in smart grid technology as well as an exploration of the current and future state of the industry As the relationship between fossil fuel use and climate change becomes ever clearer the search is on for reliable renewable and less harmful sources of energy Sometimes called the electronet or the energy Internet smart grids promise to integrate renewable energy information and

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