Dynamic reconfiguration of distribution network considering the uncertainty of distributed generation and loads

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This study presents a new methodology to perform the distribution network dynamic reconfiguration (DNDR), taking into consideration the stochastic variations of loads and distributed generation (DG) of power. To solve the heavy computational burden that exists in traditional algorithms of the DNDR, this study first establishes the nodal sensitivity models to calculate the nodal variations caused by nodal power variations. Then, the DNDR is executed utilizing a co-evolutionary algorithm with the goal of loss minimization. The stochastic power flow calculations (PFCs) based on the nodal sensitivity are performed in the DNDR to handle the power fluctuations of the DGs and loads. Finally, the modified IEEE 33-bus test system and a practical distribution system are used for simulations. The simulation results validate the quickness and effectiveness of the proposed DNDR method.

KEYWORDS

dynamic reconfiguration, distributed generations, uncertainty, sensitivity, co-evolution

1 Introduction

1.1 Literature review

The distribution network reconfiguration (DNR) can adjust the network topology and improve the performance of distribution networks by combining the open/closed states of line switches. The goals of the DNR include reducing the power losses (Lotfi et al., 2020), improving system reliability (Kianmehr et al., 2019), enhancing system resilience (Sun et al., 2023), reducing voltage drops (Song et al., 2020), and managing energy (Gao et al., 2022a). The DNR plays an important role in the distribution automation of the system.

It is usually formulated as a complex non-linear optimization problem. The solution algorithms for the DNR include intelligent optimization algorithms, heuristic algorithms, and mathematical programming algorithms. Intelligent optimization algorithms, such as the genetic algorithm, honeybee mating optimization algorithm, particle swarm optimization algorithm, and harmony search algorithm, have been successfully applied in DNR (Roosta et al., 2019; Jakus et al., 2020; Lotfi and Ghazi, 2021; Hizarci et al., 2022). However, the tremendous amount of computation of intelligent optimization algorithms greatly limits their engineering applications. The heuristic algorithms can solve the DNR problem with high speed. In the study by Harsh and Das (2023), a two-stage heuristic algorithm based on the power flow analysis is used for DNR. Zhan et al. (2020) proposed the switch opening and exchange method for DNR. Recently, efficient mathematical programming algorithms, such as convex programming, have been

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Dynamic Reconfiguration:

Dynamic Reconfiguration Ramachandran Vaidyanathan,Jerry Trahan,2004-01-31 Dynamic Reconfiguration Architectures and Algorithms offers a comprehensive treatment of dynamically reconfigurable computer architectures and algorithms for them The coverage is broad starting from fundamental algorithmic techniques ranging across algorithms for a wide array of problems and applications to simulations between models The presentation employs a single reconfigurable model the reconfigurable mesh for most algorithms to enable the reader to distill key ideas without the cumbersome details of a myriad of models In addition to algorithms the book discusses topics that provide a better understanding of dynamic reconfiguration such as scalability and computational power and more recent advances such as optical models run time reconfiguration on FPGA and related platforms and implementing dynamic reconfiguration The book featuring many examples and a large set of exercises is an excellent textbook or reference for a graduate course It is also a useful reference to researchers and system developers in the area   Dynamic Reconfiguration in a Modular Computer System Roger R. Schell,1971   **Dynamic Reconfiguration in Real-Time Systems** ,2012-08-31   **Component Deployment** Judith Bishop,2002-06-14 Deployment is the act of taking components and readying them for productive use There may be steps following deployment such as installation or m agement related functions but all decisions about how to con gure and c pose assemble a component are made at the deployment stage This is therefore the one opportunity in the software lifecycle to bridge the gap between what the component developer couldn t know about the deployment environment and what the environment s developer couldn t know about the open set of depl able components It is not surprising that deployment as a dedicated step gains importance when addressing issues of system wide qualities such as coping with constrained resources or preparing for component adaptation and system evolution Yet component deployment is still a discipline in its infancy it became mainstream practice only in the mid 1990s Much of the best practice impulse originated in products like Microsoft s Transaction Server and its approach to attribute based programming and later products like Enterprise JavaBeans and now the Corba Component Model All these address the speci c needs of enterprise appli tion servers However the potential of the deployment concept goes far beyond this Deployment can and should touch e ectively all truly component based solutions The proceedings of Component Deployment 2002 represent a good cro section of the gamut of deployment issues From customization to address source constraints to recon guration of deployed systems and from architecture to design to languages the avid reader will nd some contribution   **Risk, Reliability and Safety: Innovating Theory and Practice** Lesley Walls,Matthew Revie,Tim Bedford,2016-11-25 Risk Reliability and Safety contains papers describing innovations in theory and practice contributed to the scientific programme of the European Safety and Reliability conference ESREL 2016 held at the University of Strathclyde in Glasgow Scotland 25 29 September 2016 Authors include scientists academics practitioners regulators and other key individuals with expertise and experience relevant to specific areas Papers include

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improving the use and utilization of radio frequency spectrum This includes the creation of radio networks that can reconfigure their operation based on application requirements policy updates environmental conditions and the ability to adapt to a wide range of protocols One of the key benefits of having a C SDR is its ability to change communication parameters in response to changes in application needs and or changes in the radio frequency landscape Such reconfiguration requires an understanding of how these communication parameters interact within the network protocol stack Analysis of these parametric cross layer interactions is a critical precursor in the development of a predictive model and algorithm for dynamic reconfiguration of a C SDR This work investigates how parameters at the physical data link network and application layers interact how desirable configurations of these parameters can be determined and how these parameters affect the performance of file transfer and Voice over IP applications An analysis of varying communication parameters across networking layers is used to inform the design implementation and evaluation of a predictive model and algorithm for dynamic reconfiguration of a cognitive radio This model and algorithm allow a C SDR to dynamically modify its configuration in order to improve system performance A systematic method for development of a cognitive platform is presented This method uses statistical analysis of variance and design of experiments techniques to inform the design and implementation of a dynamic reconfiguration algorithm **1997 International Conference on Parallel and Distributed Systems** IEEE Computer Society. TC on Distributed Processing,1997 Aimed at researchers professors practitioners students and other computing professionals this work looks at architectures parallel and distributed computation networks mobile computing and communication parallel language and compiler and cache memory 22nd International Conference on Distributed Computing Systems Luis E. T. Rodrigues,Wen-Shyen Eric Chen,2002 This year s program covers areas such as distributed agents and intelligent networks internet and web computing network protocols distributed operating systems distributed databases middleware and distributed platforms mobile computing distributed algorithms fault tolerant systems distributed systems security IEEE Symposium on FPGAs for Custom Computing Machines Kenneth L. Pocek,Jeffrey M. Arnold,1996 Contains papers from the April 1996 symposium reporting on research in device architectures applications compilers and related software support Topics include using MORRPH in an industrial machine vision system a software development system for FPGA based data acquisition systems a reconfigura IEEE International Symposium on Industrial Electronics Proceedings ,2002 **Optical Engineering** ,2005 Publishes papers reporting on research and development in optical science and engineering and the practical applications of known optical science engineering and technology **Design Patterns for Developing Dynamically Adaptive Systems** Andres J. Ramirez,2008 *Proceedings* ,1994 **GLOBECOM Tokyo '87** ,1987

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