1. Record Nr. UNINA9910495247903321 Nuclear power plants: innovative technologies for instrumentation and **Titolo** control systems, the fifth International Symposium on Software Reliability, Industrial Safety, Cyber Security and Physical Protection of Nuclear Power Plant (ISNPP) / / edited by Yang Xu [and five others] Pubbl/distr/stampa Singapore:,: Springer,, [2021] ©2021 **ISBN** 981-16-3456-4 Descrizione fisica 1 online resource (779 pages) Collana Lecture Notes in Electrical Engineering;; v.779 818.602 Disciplina Soggetti Nuclear power plants - Instruments Nuclear power plants - Computer programs Lingua di pubblicazione Inglese **Formato** Materiale a stampa Livello bibliografico Monografia

Nota di contenuto

Intro -- Contents -- Research on Converged Wireless Communication Network Scheme in Nuclear Power Plants -- 1 Introduction -- 2 Converged WCN Scheme for Case 1 -- 3 Converged WCN Scheme for Case 2 -- 4 Converged WCN Scheme for Case 3 -- 5 Conclusion --References -- Research About Computer Based System Reliability Demonstration Methods in Nuclear Power Plant -- 1 Background -- 2 Life Cycle of I& -- C System in Nuclear Power Plant -- 3 Hardware and Software Reliability Guarantee Methods -- 3.1 Hardware Reliability Guarantee -- 3.2 Software Reliability Guarantee -- 4 Computer Based System Reliability Demonstration Test -- 4.1 Testing Methods Discussion -- 4.2 Statistical Testing in Nuclear Power Plant -- 4.3 Test Cases -- 4.4 Test Method Deviation -- 5 Conclusion -- References --Multi-ray Intelligent Monitoring System for Mixed Radiation Field Measurements -- 1 Introduction -- 2 Measurement System Design --2.1 -ray Measurement Unit -- 2.2 Neutron Measuring Unit -- 2.3 Aerosol Measurement Unit -- 2.4 Tritium Monitoring Unit -- 2.5 Radon Concentration Monitoring Unit -- 2.6 The Integrated Monitoring System -- 3 Experiments and Discussion -- 3.1 -ray Measurement Unit Test -- 3.2 Neutron Measurement Unit Test -- 3.3 Aerosol Measurement Unit Test -- 3.4 Tritium Monitoring Unit Test -- 3.5 Radon

Concentration Monitoring Unit Test -- 4 Conclusion -- References -- Basic Model Design of Online Monitoring System for Mixed Radiation Field -- 1 Preface -- 2 Establishment of the Basic Model of On-Line Radiation Monitoring System -- 2.1 Functional Requirements -- 2.2 Index System -- 2.3 Establishment Principles -- 2.4 Instrument Selection and Development Principle -- 3 Key Technologies and Solutions -- 3.1 Various Types of Data Acquisition and Processing Technology -- 3.2 Multi-system Integrated Technology -- 4 Experimental Verification Design.

4.1 Radiation Performance Test -- 4.2 Environmental Experiment --4.3 Reliability Experiment -- 4.4 Maintainability Experiment -- 5 Application Demonstration Design -- 5.1 Representative Application of Demonstration -- 5.2 Evaluability of Demonstration Application -- 6 Conclusion -- Duty Ratio Restriction Strategies of Space Vector PWM for Power Amplifiers of AMBs -- 1 Introduction -- 2 Power Amplifier for AMBs -- 3 The Principle of SVPWM of Three-Phase Bridge Circuit --4 Two Duty Ratio Restriction Strategies -- 4.1 Proportional Reduction Strategy -- 4.2 Period Bisection Strategy -- 4.3 Comparison of Two Duty Ratio Restrictions -- 5 Digital Implementation of Power Amplifier Control Algorithm -- 6 Experiments of Two Duty Ratio Restriction Strategies -- 6.1 Normal Tracking Experiment -- 6.2 Compare of Two Duty Ratio Restriction Strategies When Command Signals Exceed the Tracking Range -- 7 Conclusions -- References -- Research and Application of 3D Real-Time Simulation Technology for Thermal and Hydraulic Mechanism in Nuclear Power Plant -- 1 Introduction -- 2 Virtual Reality Technology and Application -- 3 System Implementation -- 3.1 Design Idea -- 3.2 Technical Framework -- 3.3 Thermal Hydraulic Modeling -- 3.4 Real-Time Analog Data Processing -- 3.5 Data Driven Model -- 3.6 Dynamic Visualization Interaction -- 4 Application Status -- 5 Conclusion -- References -- Research on Software Quality Evaluation Model of Instrument and Control System in Nuclear Power Plant -- 1 Introduction -- 2 Software Quality Evaluation Index -- 3 Software Quality Evaluation Model Based on Analytic Hierarchy Process -- 3.1 Establishing Hierarchical Model --3.2 Constructing Judgment Matrix -- 3.3 Computing Weight Vector --3.4 Checking consistency -- 3.5 Computing Comprehensive Score -- 4 Concluding remarks -- References.

The Security Based on Wireless Network in Nuclear Power Plant -- 1 Application Background of Wireless Network in Nuclear Power Plant --2 The Security Risks of Wireless Network in Nuclear Power Plants -- 3 Analyses of Wireless Network Security Regulations and Standards -- 4 Nuclear Power Plant Wireless Network Security Protection Strategy --4.1 Application Range of Wireless Network -- 4.2 Wireless Network Security Protection Measures -- 5 Summaries -- References --Information Fusion Analysis of Cyberattack Identification Based on D-S Evidence Theory -- 1 Introduction -- 2 Theoretical Foundations -- 2.1 Basic Concepts -- 2.2 Dempster's Rule of Combination -- 2.3 Triangular Fuzzy Number -- 2.4 BPA Generation Method Based on Triangular Fuzzy Number -- 3 Testbed and Cyberattack Types Description -- 4 Experimental Results and Analysis -- 4.1 Training and Test Data Generation -- 4.2 Triangular Fuzzy Number Model Construction -- 4.3 Test Samples Matching and BPA Generation -- 4.4 BPA Fusion Using Dempster's Rule of Combination -- 5 Conclusions --References -- Power Control System of Small Modular PB-Bi Fast Reactor (SMPBR) -- 1 Introduction -- 2 Model and Methods -- 2.1 Point Reactor Kinetis Equations -- 2.2 Thermal Dynamic Model -- 2.3 Hot and Cold Pool -- 2.4 Reactivity -- 3 Results and Discussion -- 3.1 Adjust Power by the Coolant Flow Rate -- 3.2 Influence of Core Inlet

Temperature on the Primary Circuit -- 4 Conclusion -- References --Research on Integrated Management Technology for Physical Protection System of Nuclear Facilities -- 1 Physical Protection System -- 1.1 Definition of Physical Protection System -- 1.2 Composition of Physical Protection System -- 1.3 Function Realization of Physical Protection System -- 2 Integrated Management System -- 2.1 Development Status of Integrated Management System. 2.2 Development Trend of Integrated Management System -- 3 Construction Scheme of Integrated Management System -- 3.1 Functional Requirements of Integrated Management System -- 3.2 Composition of Integrated Management System -- 3.3 Software Architecture of Integrated Management System -- 4 Summary --References -- Calculation and Selection of Cross-Sectional Area of Instrumentation and Control Cable Core -- 1 Introduction -- 2 Principle Analysis -- 3 Calculation of Maximum Laying Length of Cable -- 3.1 Digital Input Signal -- 3.2 Digital Output Signal -- 3.3 Analog Input Signal -- 3.4 Analog Output Signal -- 3.5 Temperature Measuring Loop System -- 4 Conclusion -- References -- The Formulation of BOP Auxiliary System Centralized Control Network in Nuclear Power Plant -- 1 Introduction -- 1.1 A Subsection Sample --2 BOP Auxiliary System Control Network Analysis -- 2.1 Status of Auxiliary System Control -- 2.2 Solution of BOP Auxiliary Control Network -- 3 Network Architecture and System Composition -- 4 Analysis on the Implementation of BOP Auxiliary Control Network --4.1 Impact Analysis of New Construction Progress -- 4.2 Impact Analysis of New Works Design -- 4.3 Impact Analysis of New Construction Procurement -- 4.4 Impact of Transformation on In-Service Power Plant Operation -- 5 Conclusion -- References --An AHP-Fuzzy Complex Evaluation Method for MCR Human Factors Engineering Verification and Validation -- 1 Introduction -- 2 Human Factors V& -- V Overview -- 3 AHP-Fuzzy Complex Evaluation Model -- 3.1 Establishment of Evaluation Index System -- 3.2 Multilevel Fuzzy Complex Evaluation Model -- 4 Case Study -- 4.1 Weight Determination Based on AHP -- 4.2 Complex Evaluation -- 5 Conclusion -- References -- Research on Control Strategy of Nuclear Island Ventilation Systems in Nuclear Power Plant -- 1 Introduction. 2 Analyses of Industry Development and Challenges -- 2.1 Safety Classification Requirements Changes and Challenges -- 2.2 Automatic and Control Level Requirement Change and Challenge -- 3 Control Strategy and Development Ideas of Nuclear Island Ventilation Systems -- 3.1 Control Strategy Face to the Challenge of Safety Classification --3.2 Ideas for Improving the Automation Level -- 4 Implementation Results -- 5 Conclusion -- References -- The Safety Function Design Improvement of Circulation Water Filter System in CPR1000 Unit -- 1 Introduction -- 1.1 The Flow Diagram of CFI System in CPR1000 -- 1.2 The Main Equipment of CFI System in CPR1000 -- 1.3 The Operation Process of CFI System in CPR1000 -- 1.4 The Function Analysis of CFI System in CPR1000 -- 1.5 The Safety Classification of CFI in CPR1000 -- 2 The CFI Safety Function Design Defect in CPR1000 -- 2.1 Design Concept Defect -- 2.2 Function Classification Defect -- 2.3 Logic Function Design Defect -- 2.4 Logic Design Defect -- 3 The Design Improvement of CFI in the Third Generation Unit -- 3.1 The Design Concept Improvement -- 3.2 Function Classification Improvement --3.3 Manual Logic Design Improvement -- 4 Results -- 5 Conclusion --References -- A Study About Unit Testing for Embedded Software of Control System in Nuclear Power Plant -- 1 Introduction -- 2 Related Works -- 2.1 Embedded Software Testing Features -- 2.2 Unit Test of Embedded Software -- 3 Embedded Software Unit Test Method

Based on Program Piling -- 3.1 Software Structure Analysis -- 3.2 Program Piling -- 3.3 Syntax Modification -- 3.4 Hardware Simulation -- 4 Engineering Practice -- 4.1 Software Analysis -- 4.2 Software Separation -- 4.3 Unit Test -- 5 Conclusions -- References -- Design of Defence in Depth for I& -- C System in Pressurized Water Reactor Nuclear Power Plant -- 1 Introduction -- 2 Requirements of IAEA.

2.1 Requirements of IAEA SSR2/1.