

Development of Remotely Monitoring and Control System for Siemens 840D sl NC Machine Tool Using Snap 7 Codes

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Abstract—Based on the understanding of the communication methods and the structure and architecture of databases/data blocks of numeric control (NC) system, an open source communication suite designed specifically for Siemens NC system, Snap 7, is used to realize data acquisition from Siemens 8400 sl NC system of which the communication interfaces are industrial Ethernet. Furthermore, monitoring system for display and analyses of the production processing state is developed and its reliability is evaluated.

Keywords—monitoring; remote control; snap 7; 840D sl; NC system

1. INTRODUCTION

To meet the competitive priorities like low cost, good quality, short delivery times, high flexibility, and good service [1], modern manufacturing needs rich information on various factors/parameters related to production like those for product design, materials, and particularly production processing. Modern technologies like NC system and information and communication technology (ICT) make it possible to generate/store/transfer data (information) relevant to the situation and conditions during the manufacturing, e.g., the manufacturing parameters, the state of the machine tools and measurement probes and so on [1-4]. Data (information) can be further analyzed to optimize the manufacturing processes, provide basic information for manufacturing execution system (MES), and set the basis for product life management [1,5]. Clearly, realization of the real time monitoring and control system for manufacturing processes becomes very important today. Mainstream NC systems like those of Siemens and Fanuc are not open systems and data acquisition can be made through their own specifically defined interfaces among the system modulus or by the exchange between the machine data blocks (MDb) [6]. This situation not only limits the advanced system development based on current mainstream NC systems, but also hinders the interoperability since usually more than one NC systems may be used in manufacturing plants. Therefore, the methods for data acquisition other than those provided by the specific NC system itself are preferable for the development of distributed NC system (DNC) which nowadays constitutes the base for smart manufacturing. In this study, aiming at the realization of monitoring system, we choose a

widely adopted NC system in manufacturing industry, SINUMERIK 840D sl, to explore the methods to extract useful data like those concerning the state of manufacturing, the motor and so on.

II. SINUMERIK 840D SL NC SYSTEM AND THE MODULUS

SINUMERIK 840D sl NC system is capable of high-performance milling and turning and opens up a nearly inexhaustible technology range: from grinding to modern manufacturing technology like the laser machining [6-7]. This system boasts of high flexibility in terms of new manufacturing technology fields. In addition, the SINUMERIK 840D sl also provides excellent modularity of the operator components and has such unique open system architecture that the CNC with this NC system can be optimally adjusted to the machine technology [7]. And the SINUMERIK 840D sl supports various communication protocols and is commutative at all levels. 840D sl mainly consists of human machine interface (HMI), PC unit (PCU), numeric control unit (NCU), drive and motors [7]. The communication architecture is shown as Figure 1.

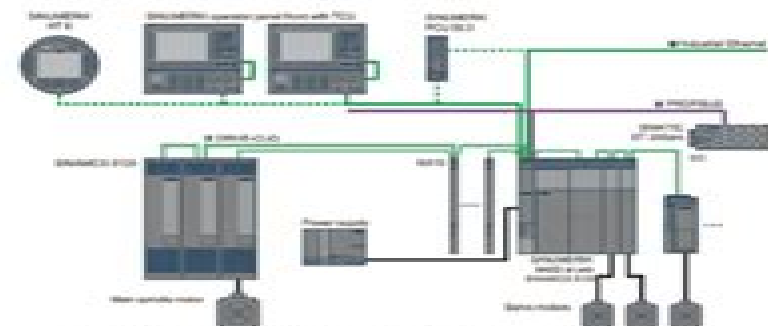


FIGURE 1. COMMUNICATION ARCHITECTURE OF RADS SE

Siemens 840d Nc Program G Codes

Marco Cascella

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the author's name.

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Modern Mechanical Engineering J. Paulo Davim, 2014-01-07 This book covers modern subjects of mechanical engineering such as nanomechanics and nanotechnology mechatronics and robotics computational mechanics biomechanics alternative energies sustainability as well as all aspects related with mechanical engineering education The chapters help enhance the understanding of both the fundamentals of mechanical engineering and its application to the solution of problems in modern industry This book is suitable for students both in final undergraduate mechanical engineering courses or at the graduate level It also serves as a useful reference for academics mechanical engineering researchers mechanical materials and manufacturing engineers professionals in related with mechanical engineering

Modular Programming of Adaptive CAX Manufacturing Process Chains (E-Book) Gunter Spöcker, 2016-11-07 The manufacturing industry is undergoing major changes due to current trends like mass customization and Industrie 4.0 However today's CAX systems and approaches are not suitable to handle adaptive CAX process chains To overcome this situation and to close the gaps between the existing CAX environment and the requirements for the manufacturing of the future a modular approach based on extended function blocks is presented The proposed approach is verified based on the use case of a worn out BLIR segment by using repair features

Digital Conversion on the Way to Industry 4.0 Numan M. Durakbasa, M. Güneş Gençyılmaz, 2020-10-25 This book presents the proceedings from the International Symposium for Production Research 2020 The cross disciplinary papers presented draw on research from academics and practitioners from industrial engineering management engineering operational research and production operational management It explores topics including computer aided manufacturing Industry 4.0 applications simulation and modeling big data and analytics flexible manufacturing systems decision analysis quality management industrial robotics in production systems information technologies in production management and optimization techniques Presenting real life applications case studies and mathematical models this book is of interest to researchers academics and practitioners in the field of production and operation engineering

Intelligent Robotics and Applications YongAn Huang, Hao Wu, Honghai Liu, Zhouping Yin, 2017-08-04 The three volume set LNAI 10462 LNAI 10463 and LNAI 10464 constitutes the refereed proceedings of the 10th International Conference on Intelligent Robotics and Applications ICIRA 2017 held in Wuhan China in August 2017 The 235 papers presented in the three volumes were carefully reviewed and selected from 310 submissions The papers in this second volume of the set are organized in topical sections on industrial robot and robot manufacturing mechanism and parallel robotics machine and robot vision robot grasping and control

Designing Small Weapons Jose Herrera-Ramirez, Luis Zuñiga-Aviles, 2022-06-09 This book focuses on developing small weapons following the lifecycle of a firearm from design to manufacture It demonstrates how modern technologies can be used at every stage of the process such as design methodologies CAD CAE CAM software rapid prototyping test benches materials heat and surface treatments and manufacturing processes Several case studies are presented to provide detailed

considerations on developing specific topics Small weapons are designed to be carried by one person examples are pistols revolvers rifles carbines shotguns and submachine guns Beginning with a review of the history of weapons from ancient to modern times this book builds on this by mapping out recent innovations and state of the art technologies that have advanced small weapon design Presenting a comprehensive guide to computer design tools used by weapon engineers this book demonstrates the capabilities of modern software at all stages of the process looking at the computer aided design engineering and manufacturing It also details the materials used to create small weapons notably steels engineering polymers composites and emerging materials Manufacturing processes both conventional and unconventional are discussed for example casting powder metallurgy additive manufacturing and heat and surface treatments This book is essential reading to those in the field of weapons such as designers workers in research and development engineering and design students students at military colleges sportsmen hunters and those interested in firearms Dr Jose Martin Herrera Ramirez is a military engineer with experience in the field of weapon and ammunition development After receiving his PhD in Materials Science and Engineering from the Paris School of Mines in France he was the head of the Applied Research Center and Technology Development for the Mexican Military Industry CIADTIM He now researches the development of metallic alloys and composites at the Research Center for Advanced Materials CIMAV in Chihuahua Mexico Dr Luis Adrian Zuñiga Aviles is a military engineer with wide experience in the field of weapon and ammunition development He was head of the prototypes and simulation departments at the Applied Research Center and Technology Development for the Mexican Military Industry CIADTIM and head of engineering of the Production directorate He received his PhD in Science and Technology on Mechatronics from the Center for Engineering and Industrial Development CIDESI in Queretaro Mexico He now researches the new product design and development for military application machinery robotics and medical devices in the Faculty of Medicine at the Autonomous University of Mexico State UAEMex and the Faculty of Engineering at UAEMex as part of the Researchers for Mexico program CONACYT

Designing Exoskeletons Luis Adrian Zuñiga-Aviles, Giorgio Mackenzie Cruz-Martinez, 2024-03-27 *Designing Exoskeletons* focuses on developing exoskeletons following the lifecycle of an exoskeleton from design to manufacture It demonstrates how modern technologies can be used at every stage of the process such as design methodologies CAD CAE CAM software rapid prototyping test benches materials heat and surface treatments and manufacturing processes Several case studies are presented to provide detailed considerations on developing specific topics Exoskeletons are designed to provide work power rehabilitation and assistive training to sports and military applications Beginning with a review of the history of exoskeletons from ancient to modern times the book builds on this by mapping out recent innovations and state of the art technologies that utilize advanced exoskeleton design Presenting a comprehensive guide to computer design tools used by bioengineers the book demonstrates the capabilities of modern software at all stages of the process looking at computer aided design manufacturing and engineering It also details the

materials used to create exoskeletons notably steels engineering polymers composites and emerging materials Manufacturing processes both conventional and unconventional are discussed for example casting powder metallurgy additive manufacturing and heat and surface treatments This book is essential reading for those in the field of exoskeletons such as designers workers in research and development engineering and design students and those interested in robotics applied to medical devices *Theory and Design of CNC Systems* Suk-Hwan Suh,Seong Kyoong Kang,Dae-Hyuk Chung,Ian Stroud,2008-08-22 Computer Numerical Control CNC controllers are high value added products counting for over 30% of the price of machine tools The development of CNC technology depends on the integration of technologies from many different industries and requires strategic long term support Theory and Design of CNC Systems covers the elements of control the design of control systems and modern open architecture control systems Topics covered include Numerical Control Kernel NCK design of CNC Programmable Logic Control PLC and the Man Machine Interface MMI as well as the major modules for the development of conversational programming methods The concepts and primary elements of STEP NC are also introduced A collaboration of several authors with considerable experience in CNC development education and research this highly focused textbook on the principles and development technologies of CNC controllers can also be used as a guide for those working on CNC development in industry January 2022 - Surplus Record Machinery & Equipment Directory Surplus Record,2022-01-01 SURPLUS RECORD is the leading independent business directory of new and used capital equipment machine tools machinery and industrial equipment listing over 95 000 industrial assets including metalworking and fabricating machine tools chemical and process equipment cranes air compressors pumps motors circuit breakers generators transformers turbines and more Over 1 100 businesses list with the SURPLUS RECORD January 2022 issue Vol 99 No 1 **Proceedings of the 14th International Conference on Flexible Automation and Intelligent Manufacturing** Lihui Wang,National Research Council Canada,International Conference on Flexible Automation and Intelligent Manufacturing (14th : 2004 : Ryerson University),2004 Industrial Applications of Machine Learning Pedro Larrañaga,David Atienza,Javier Diaz-Rozo,Alberto Ogbechie,Carlos Esteban Puerto-Santana,Concha Bielza,2018-12-12 Industrial Applications of Machine Learning shows how machine learning can be applied to address real world problems in the fourth industrial revolution and provides the required knowledge and tools to empower readers to build their own solutions based on theory and practice The book introduces the fourth industrial revolution and its current impact on organizations and society It explores machine learning fundamentals and includes four case studies that address a real world problem in the manufacturing or logistics domains and approaches machine learning solutions from an application oriented point of view The book should be of special interest to researchers interested in real world industrial problems Features Describes the opportunities challenges issues and trends offered by the fourth industrial revolution Provides a user friendly introduction to machine learning with examples of cutting edge applications in different industrial sectors Includes four case

studies addressing real world industrial problems solved with machine learning techniques A dedicated website for the book contains the datasets of the case studies for the reader s reproduction enabling the groundwork for future problem solving Uses of three of the most widespread software and programming languages within the engineering and data science communities namely R Python and Weka Machinery and Production Engineering ,2002 Proceedings of the ... ASME Design Engineering Technical Conferences ,2003 **Machinery** ,2004 *June 2022 - Surplus Record Machinery & Equipment Directory* Surplus Record,2022-06-01 SURPLUS RECORD is the leading independent business directory of new and used capital equipment machine tools machinery and industrial equipment listing over 95 000 industrial assets including metalworking and fabricating machine tools chemical and process equipment cranes air compressors pumps motors circuit breakers generators transformers turbines and more Over 1 100 businesses list with the SURPLUS RECORD June 2022 issue Vol 99 No 6 **October 2022 - Surplus Record Machinery & Equipment Directory** Surplus Record,2022-10-01 SURPLUS RECORD is the leading independent business directory of new and used capital equipment machine tools machinery and industrial equipment listing over 100 000 industrial assets including metalworking and fabricating machine tools chemical and process equipment cranes air compressors pumps motors circuit breakers generators transformers turbines and more Over 1 100 businesses list with the SURPLUS RECORD October 2022 issue Vol 99 No 10 January 2023 - Surplus Record Machinery & Equipment Directory Thomas C. Scanlan,2023-01-01 SURPLUS RECORD is the leading independent business directory of new and used capital equipment machine tools machinery and industrial equipment listing over 110 000 industrial assets including metalworking and fabricating machine tools chemical and process equipment cranes air compressors pumps motors circuit breakers generators transformers turbines and more Over 1 100 businesses list with the SURPLUS RECORD March 2022 issue Vol 100 No 1

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