

New Predictive Control Scheme for Networked Control Systems

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Abstract This paper is concerned with the design of networked control systems with random network-induced delay and data dropout. It presents a new control scheme, which is termed networked predictive control with optimal estimation. Based on Multirate Kalman Filtering, the measured data which are out of sequence or delayed can be used to improve the precision of estimation. The control prediction generator provides a set of future control predictions to make the closed-loop system achieve the desired control performance and the compensator removes the effects of the network transmission with time delay and data dropout. Simulation results are presented to illustrate the effectiveness of the control strategy via comparing with control schemes without any compensation for the network.

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New Predictive Control Scheme For Networked Control Systems

Garry Zhu



New Predictive Control Scheme For Networked Control Systems:

Analysis and Synthesis of Networked Control Systems Yuanqing Xia, Mengyin Fu, Guo-Ping Liu, 2011-03-14 Analysis and Synthesis of Networked Control Systems focuses on essential aspects of this field including quantization over networks data fusion over networks predictive control over networks and fault detection over networks The networked control systems have led to a complete new range of real world applications In recent years the techniques of Internet of Things are developed rapidly the research of networked control systems plays a key role in Internet of Things The book is self contained providing sufficient mathematical foundations for understanding the contents of each chapter It will be of significant interest to scientists and engineers engaged in the field of Networked Control Systems Dr Yuanqing Xia a professor at Beijing Institute of Technology has been working on control theory and its applications for over ten years

Networked Predictive Control Systems Hua Ouyang, 2010-05 Networked predictive control is a new research method for networked control systems which can handle network induced problems such as time delays data dropouts packets disorders etc and stabilise the networked control systems This work has extensively studied the following problems robust control of networked predictive linear control systems control scheme for networked nonlinear control systems and robust control of networked nonlinear control systems This work provides a theoretical framework for stability analysis and robust controller synthesis for networked predictive control systems In this work both time driven and event driven predictive controllers are used to stabilise the networked predictive control systems

Networked Control Systems Fei-Yue Wang, Derong Liu, 2008-06-17 Networked control systems NCS confer advantages of cost reduction system diagnosis and flexibility minimizing wiring and simplifying the addition and replacement of individual elements efficient data sharing makes taking globally intelligent control decisions easier with NCS The applications of NCS range from the large scale of factory automation and plant monitoring to the smaller networks of computers in modern cars places and autonomous robots Networked Control Systems presents recent results in stability and robustness analysis and new developments related to networked fuzzy and optimal control Many chapters contain case studies experimental simulation or other application related work showing how the theories put forward can be implemented The state of the art research reported in this volume by an international team of contributors makes it an essential reference for researchers and postgraduate students in control electrical computer and mechanical engineering and computer science

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Proceedings of the ... IEEE International Conference on Control Applications, 2005

Control Applications and Ergonomics in Agriculture 1998 N. Sigrimis, P.P. Groumpos, 1999 In this workshop

an attempt was made to fuse the disciplines involved in the requirements specification design and implementation of control systems for the automation of agricultural systems The need to meet the demanding specifications for increasingly complex agricultural systems is being addressed by using increasingly sophisticated models and control algorithms In parallel the ever decreasing profit margins in the agricultural sector no longer permit agriculture to operate in the traditional manner but are forcing it to transform into a contemporary business with all the complexities that this implies The work environment is changing rapidly and humans are moving to positions of supervision and management while automation and robotics are taking over many of the menial and tedious tasks Modern technological developments in industrial management and control are entering agriculture and transforming it rapidly into an industry Smaller agricultural systems are being linked to produce hierarchical large scale agricultural systems whose management and control demands high level intelligent decision support mechanisms Local and wide area networks provide the relevant agricultural and economic data and facts to central production management systems where decisions are made and subsequently transferred to remote locations for execution Agriculture which is a highly distributed operation is taking advantage of modern communications networks unifying remote locations into a virtual world Agriculture has been making significant steps in producing food and fibers of improved quality in a highly constrained economic environment Robust control of such a largely uncertain system demands that application domain experts work closely with systems analysts and control engineers to produce systems of higher autonomy and efficiency to meet todays global challenge

International Aerospace Abstracts ,1998 **Chemical Abstracts** ,2002
Mathematical Reviews ,2008 *Strategies for Wireless Networked Control Systems* Mercedes Chacón Vásquez,2017

Networked Control Systems NCS and Wireless Networked Control Systems WNCS are control systems where controllers sensors and final elements of control are connected to a mutual communication network The inclusion of the network introduces delays and dropouts which greatly influence the stability and robustness of the controller While there is wealth in theoretical contributions to NCS it is still imperative to study more applications and investigate the effects of networks in a real time operation There are also open problems that require further study of the impact of disturbances constraints and strong interactions in complex NCS This thesis is concerned with the design of control strategies for WNCS mainly focused on Model Based Predictive Control MBPC Proportional Integral Derivative PID and decentralised schemes with the aim of creating control laws suitable for compensating time varying delays and dropouts These strategies rely on optimisation problems which incorporate robustness and performance restrictions to compute the optimum controller The performance and robustness of the controllers are evaluated through extensive experiments in a network simulator A new adaptive Internal Model Control IMC controller has been developed to adapt to the network requirements and compute the IMC model parameters online A new robust PID for NCS under random delays has been created by solving a new constrained optimisation problem that included constraints of maximum sensitivity to guarantee robustness A novel optimal immune PID

is developed to improve the performance of NCS under time varying delays and dropouts Simulation results show that the controller offers greater flexibility and improves the performance and robustness with respect to the other methods studied Four more controllers have been tested and extensive tests have indicated stability for a limited percentage of process model variations and dropouts Predictive PID controllers with similar properties to MBPC are developed to compensate dropouts in WNCS A quadratic programming problem optimises a new MBPC cost function to find the optimal PID gains The approach successfully maximises the performance by changing the controller gains at every sampling time and allowing maximum variations of system parameters and dropouts Also a new constrained predictive PID controller is presented to deal with input saturation Simulation results show the superiority of the design in comparison with the control schemes studied earlier Furthermore a decentralised wireless networked model predictive control design for complex industrial systems has been developed Also the method has been applied to wind farm control The proposed decentralised control offers an effective and innovative solution to improve the performance of large industrial applications

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First International Conference on Intelligent Systems in Process Engineering James F. Davis, George Stephanopoulos, Venkat Venkatasubramanian, 1996

Journal of Dynamic Systems, Measurement, and Control, 1994

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KES'2000: Fourth International Conference on Knowledge-Based Intelligent Information Engineering Systems & Allied Technologies R. J. Howlett, 2000

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much since hedgehogs are solitary creatures who usually come together only

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