出國報告(出國類別：國際會議)

SICE Annual Conference 2014 儀表、控制、資訊技術及系統整合國際研討會

服務機關：國立虎尾科技大學

姓名職稱：鄭錦聰 教授

派赴國家：日本北海道

出國期間：103/9/8-13

報告日期：中華民國 103 年 10 月 6 日

摘要

本次由 SICE 所舉行的年度儀表、控制、資訊技術及系統整合國際會議於 103 年 9 月 9 日到 12 日在日本北海道盛大舉行，本次會議從理論與應用結合資訊軟硬體進而整合各種量測技術、控制理論與技術及智慧型系統分析與設計，本次會議除了專題演講之外，尚有一些相關論文發表，智慧型系統、模糊控制系統及機器人系統的展示，及一些實際系統與自動化成果的展示。此次本人很榮幸的獲得行政院國家科學委員會的補助，來參加由 SICE 所舉行的年度國際儀表、控制、資訊技術及系統整合國際會議。會中除了學習有關上列之智慧型控制與系統整合的新方向與在生物系統與嵌入式開發與應用，更幫助我在機器學習與智慧型系統實現之研究的提昇，更期望自己能藉由此次的學習可在下年度的行政院國家科學委員會的計畫中提出一個更新的研究計畫。

目次

一、 目的

本次出國的主要目的是發表一篇智慧型技術的論文，同時主持一個智慧型控制系統的議程。並學習有關智慧型控制與系統整合的新方向與在生物系統與嵌入式開發與應用，更幫助我在神經網路、模糊系統、機器學習與智慧型系統實現之研究的提昇。

二、 過程

1. 103 年 9 月 8-9 日前往日本北海道參加儀表、控制、資訊技術及系統整合國際研討會，並完成報到。
2. 103 年 9 月 10 日參加開幕及 Plenary Talks (I) (Title: Parametric Control Systems Design with Applications in Spacecraft Control)，主持 Intelligent Control Systems 並發表論文及聽取本會議各時段會議論文發表。
3. 103 年 9 月 11 日參加 Plenary Talks (II) (Title: Precision Mapping and Vehicle State Estimation for Autonomous Highway Vehicles) 及 Plenary Talks (III) (Title: Non-Contact Distance Metrology by Optical Comb for Industry and Society)， 參加 Intelligent Systems and State Estimation Session，晚上參加大會之 Banquet 進行相關學術交流。
4. 103 年 9 月 12 日參加 Plenary Talks (IV) (Title: Stable Manifold Method for Nonlinear Optimal Control)， 參加 Biological and Physiological Engineering, System Identification and Intelligent Control Systems Applications Session 進行相關學術交流。
5. 103 年 9 月 13 日搭機返國。

本次由 SICE 所舉行的年度儀表、控制、資訊技術及系統整合國際會議於 103 年 9 月 9 日到 12 日在日本北海道盛大舉行，本次會議從理論與應用結合資訊軟硬體、各種量測技術、控制理論與技術及智慧型系統分析與設計，本次會議除了專題演講之外，尚有一些相關儀表、控制、資訊技術及系統整合之論文發表，智慧型系統、模糊控制系統及機器人系統的展示，及一些實際系統與自動化成果的展示。

有關本次研討會在儀表、控制、資訊技術及系統整合的相關主題包括：

1、Intelligent Control Systems。
2、Intelligent Systems。
3、State Estimation。
4、Biological and Physiological Engineering。
5、System Identification。
6、Intelligent Control Systems Applications。

7、系統建模。
8、非線性控制。
9、嵌入式系統。
10、 機器人控制。
11、 適應控制。
12、 網路系統。
13、 學習控制系統。
14、 離散事件系統與控制。
15、 訊號與影像處理。
16、 生醫感測元件技術。
17、 網路技術。
18、 控制理論及系統應用。
19、 建模與估測理論。
20、 能源與電力控制。
21、 飛行控制技術。
22、 航太系統控制。
23、 計算智慧。
24、 光電量測。
25、 Robust Control。
26、 Intelligent Automobile and Field Robot Technology。
27、 Robotic and Automation Systems。
28、 Control and Optimization。
29、 Advance Pattern Measurement。
30、 智慧型移動機器人系統。
31、 人機介面系統設計。
32、 網路感測系統。

此外本人也在這次會議中，發表一篇有關新的模糊分群演算法在智慧型手機的實現的研究論文。會中除了學習有關上列之智慧型控制與系統整合的新方向與在生物系統與嵌入式開發與應用，更幫助我在機器學習與智慧型系統實現之研究的提昇，更期望自己能藉由此次的學習可在下年度的行政院國家科學委員會的計畫中提出一個更新的研究計畫。

另有關之活動照片如圖一至圖五所示：圖一為大會開幕，圖二為大會開幕之專題演講，圖三為論文發表照片一，圖四為論文發表照片二及圖五為參加 Intelligent Control Systems 議程之台灣學者。

圖一、大會開幕

圖二、大會開幕之專題演講

圖三、論文發表照片一

圖四、論文發表照片二

圖五、參加 Intelligent Control Systems 議程之台灣學者

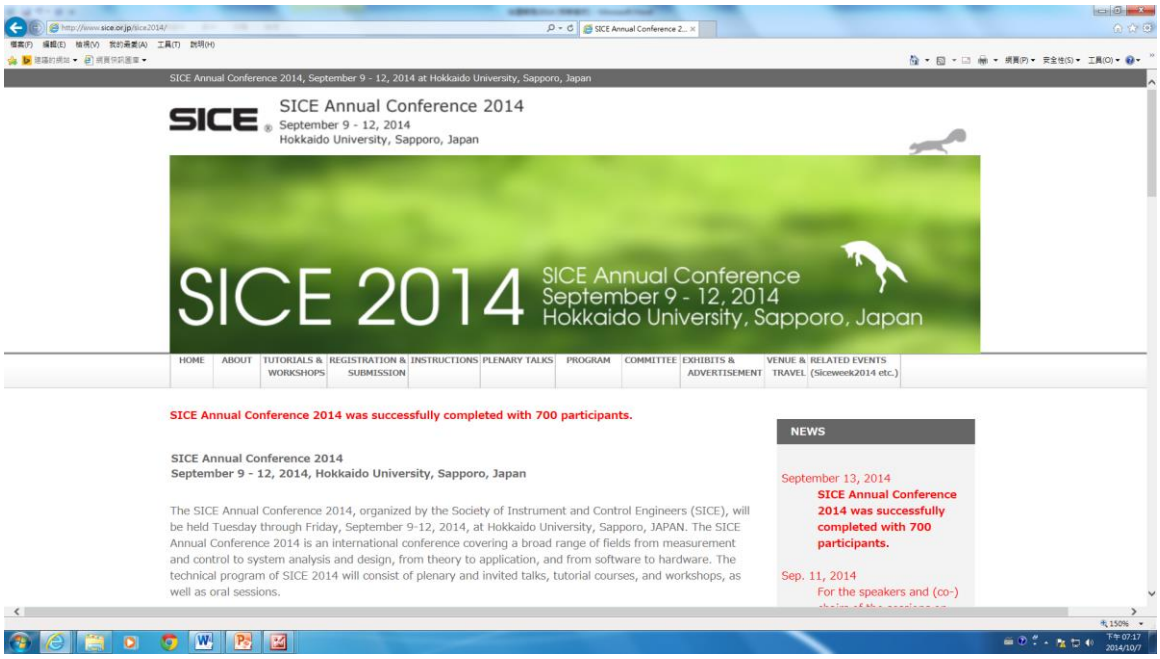
三、 心得與建議事項

本次參與會議獲益良多，除可增進專業學習外，同時亦可獲得許多新的研究方向與研究主題在智慧型系統、機器人系統及控制理論領域。新的研究方向與研究主題如下：Stable Manifold Method for Nonlinear Optimal Control、Parametric Control Systems Design、Intelligent System and Its Applications、Intelligent Mobile Robotic Systems、Optimization、Computational Intelligence。整體而言，可增進下期計畫提出之內容與創新性。建議事項：無。

四、 附件

攜回資料有 SICE 2014 研討會論文 CD 資料及 SICE Annual Conference 2014 Final Program and Abstract. 部分會議資料及專題演講者資料如下附件：

SICE Annual Conference 2014 Final Program and Abstract



會議首頁資料

Plenary talks Descriptions

Professor Guang-Ren Duan
Center for Control Theory and Guidance Technology, Harbin Institute of Technology

Title: Parametric Control Systems Design with Applications in Spacecraft Control

Abstract: A parametric approach for control systems design establishes a general parameterization of a set of controllers of certain type, which meet some dominant system design requirements, and meanwhile, provides all the design degrees of freedom which may be further utilized to modify some other closed-loop system performance. Due to these advantages, parametric control systems design approaches have played an important role in both theories and applications. In this talk, a general framework for a type of unified parametric approaches for control systems design is briefly introduced, which are based on general complete parametric solutions to a type of generalized Sylvester matrix equations. One of the key steps, i.e., finding the parameterization of the required type of controllers, is especially treated and emphasized.

Short Biography: Guang-Ren Duan received his BSc. degree in Applied Mathematics, and both his MSc and PhD degrees in Control Systems Theory. From 1989 to 1991, he was a post-doctoral researcher at Harbin Institute of Technology, where he became full professor of control systems theory in 1991. He visited the University of Hull, the University of Sheffield, and also the Queen's University of Belfast, UK, from December 1996 to October 2002. He was selected by the Cheung Kong Scholars Program of the Chinese government in August 2000, and elected in 2005 leader of a Cheung Kong Scholar Innovative Team sponsored by the Chinese Ministry of Education, and elected in 2009 leader of an Innovative Research Group

sponsored by NSFC. He is the founder and currently the Director of the Center for Control Theory and Guidance Technology at Harbin Institute of Technology, and also Member of the Science and Technology committee of the Chinese Ministry of Education, Vice President of the Control Theory and Applications Committee, Chinese Association of Automation, and Associate Editors of a few international journals. Prof. Duan is the winner of the 4th Chinese National Youth Award of Science and Technology, and the Chinese National Award of Natural Sciences. He is also winner of the Over- century Talents Program of the Chinese Ministry of Education, and that of the Distinguished Young Scholars Program of NSFC (Natural Science Foundation of China). His main research interests include parametric robust control systems design, LMI-based control systems, descriptor systems, spacecraft control and magnetic bearing systems. He is the author and co-author of 5 books and over 200 SCI indexed publications, with more than 30 appeared in IEEE Transactions.

Professor Jay A. Farrell
Department of Electrical Engineering (EE), the University of California, Riverside.

Title: Precision Mapping and Vehicle State Estimation for Autonomous Highway Vehicles

Abstract: Given recently publicized demonstrations of autonomous vehicles operating on public streets, various countries are considering technical, legal, and ethical issues related to their legalization. Even without fully autonomy, intelligent transportation systems have high potential for improvement of highway safety and throughput, especially after "where-in-lane" accuracy can be reliably achieved. This presentation will discuss the role of control and systems theoretic methods related to practical autonomous vehicle applications, particularly as they relate to automated construction of precise feature maps and reliable real-time navigation with position accuracy at the decimeter level. Both applications require reliable and automated data fusion from various sensor modalities: LIDAR, camera, global navigation satellite systems, inertial measurements, etc. The presentation will survey and present modern methods for roadway feature mapping and vehicle state estimation. Results from a demonstration at the US Department of Transportation Turner Fairbanks Research Center will be included.

Short Biography: Jay A. Farrell earned B.S. degrees in physics and EE from Iowa State U., and M.S. and Ph.D. degrees in EE from the U. of Notre Dame. At Charles Stark Draper Lab (1989-1994), he received the Engineering Vice President's Best Technical Publication Award in 1990, and Recognition Awards for Outstanding Performance and Achievement in 1991 and 1993. He is a Professor and two time Chair of the Department of Electrical Engineering (EE) at the University of California, Riverside. He has served the IEEE Control Systems Society (CSS) as Finance Chair for three IEEE CDC's (`95, `01, and `03), on the Board of Governors for two terms (`03-`06, `12-`14), as Vice President Finance and Vice President of Technical Activities, as General Chair of IEEE CDC 2012, and as President in 2014. He was named a GNSS Leader to Watch for 2009-2010 by GPS World Magazine in May 2009 and a winner of the Connected Vehicle Technology Challenge by the U.S. Department of Transportation's (DOT's) Research and Innovative Technology

Administration in July 2011. He is a Fellow of the IEEE, a Fellow of AAAS, a Distinguished Member of IEEE CSS, and author of over 200 technical publications. He is author of the book "Aided Navigation: GPS with High Rate Sensors" (McGraw-Hill 2008). He is also co-author of the books "The Global Positioning System and Inertial Navigation" (McGraw-Hill, 1998) and "Adaptive Approximation Based Control: Unifying Neural, Fuzzy and Traditional Adaptive Approximation Approaches" (John Wiley 2006).

Professor Hirokazu Matsumoto
Director, TOKYO SEIMITSU Co., LTD.

Title: Non-Contact Distance Metrology by Optical Comb for Industry and Society

Abstract: Recently, high accuracy and non-contact measurements are required for improving the products quality in industry and guarantee the safety in society. In this present, temporal coherence interferometry is developed using the optical comb which of repetition frequency is in general 100 MHz and is phase-locked to a rubidium clock standard of 10-11. Therefore, the interference fringe pattern is not fairy affected by the air turbulence and mechanical vibration. At first, fast optical comb whose repetition frequency is 15 GHz is developed using fiber Fabry-Perot etalon and so the repetition distance in space is exactly 10 mm. Then, the comb is applied to absolute distance measurement with an accuracy of 0.05 μm. This technology has a possibility of measuring the distances up to hundreds meter. Next, it is applied for non-contact measurement of a coordinate measuring machine with 0.2 μm. This technology is also applied to the remote non-contact measurements of the huge-size objects such as airplane with a rough surface of Ra=1.6 μm.

Short Biography: 1976 PhD Graduate School of Engineering, The University of Tokyo, 1976 Research of precision measurement technology by laser interferometer, and Research on measurement technology of large size by infrared interferometer at National Research Laboratory of Metrology (NRLM). 1983 Research on measurement technology of long-distance by laser high-frequency modulation at U.S. National Bureau of Standards (Visiting Fellow) and Research of phase conjugate technology by non-linear crystal at the NRLM. 1991 Temporal lecturer at Faculty of Engineering, Kobe University. 1995 Research of advanced measurement technology by femtosecond pulse laser and Research Planning Officer at NRLM. 1997 Research of dimensional measurement technology by the low-coherence interference, and Research on standard quantum metrology. Research on advanced ultra-precision measurement and analysis technology using optical frequency comb at NRLM (Department Director). 1999 Tokyo University of Science Joint Graduate School Visiting Professor. 2001 Length metrology research, Development of broadband light synthesizer, Development of remote measurement technology using optical fiber, National Institute of Advanced Industrial Science and Technology (Vice Director), 2008 Traceability measurement engineering (optical comb metrology) at The University of Tokyo (Project Professor). 2013 Optical comb technology at Tokyoseimitsu, Co. Ltd. (Director).

Professor Noboru Sakamoto
Associate Professor with the Department of Aerospace Engineering, Nagoya University, Japan.

Title: Stable Manifold Method for Nonlinear Optimal Control

Abstract: Hamilton-Jacobi equations have been one of the serious impediments for the application of nonlinear control theory. Recently, a novel approach based on stable manifold theory for numerically solving Hamilton-Jacobi equations is developed. This approach is unique in that it obtains the derivative of the solution of Hamilton-Jacobi equations and is efficient in that it consists of successive computations which are suitable for computer implementation. We have developed a Matlab package that carries out the manifold computation and creates optimal feedback controllers. This computational package for optimal control has been applied for a number of real-world systems with experimental verifications. Those applications include pendulum swing up, aircraft control and control of mechatronic systems such as electric motors (AC and DC) and control moment gyros. In this talk, the general notion of invariant manifold of dynamical systems and its significance in nonlinear control design will be also discussed.

Short Biography: Noboru Sakamoto received the B.Sc. degree in mathematics from Hokkaido University and M.Sc. and Ph.D. degrees in aerospace engineering from Nagoya University, in 1991, 1993, and 1996, respectively. Currently, he is an Associate Professor with the Department of Aerospace Engineering, Nagoya University, Japan. He has held a visiting research position at University of Groningen, The Netherlands, in 2005 and 2006 via Scientists Exchange Program Fellowship by JSPS. He won the SICE Best Paper Prizes in 1997, 2006, 2008 and 2011. He is also a member of IFAC Technical Committee on Optimal Control. His research interests include nonlinear control theory, control of chaotic systems, dynamical system theory and control applications for aerospace and automobile industries.