

Fall 2011

# 控制技術專題 Special Topics on Control Technology

Lecture 01  
Introduction

Feng-Li Lian  
NTU-EE  
Sep11 – Jan12

## 討論題綱

9/17/11

- 控制
  - 理論：數學，物理
  - 技術：軟體，硬體
- 讀論文與資料整理
  - 文獻探討
  - 論文重點整理
  - 論文分類整理
- 做研究：
  - 理論推導
  - 軟體模擬
  - 硬體實作
  - 資料分析
- 寫論文
  - 科技論文寫作

Feng-Li Lian

2

## 本學期課程安排

9/17/11

- 口頭進度報告與討論
  - 每週或每兩週進行一次進度報告 (投影片, ppt), 可以包含:
    - 主題與問題分析
    - 文獻整理與歸納
    - 理論推導與分析
    - 軟體測試與分析
    - 硬體實作與分析
- 專題演講與國際會議
  - 參與專題演講(Invited Talk)
  - 參與國際會議(Conference or Symposium)
- 書面文字報告
  - 期中報告 (論文寫作, doc)
  - 期末報告 (論文寫作, doc)

Feng-Li Lian

3

## 文獻來源

9/17/11

- Books
  - Fundamental-level books (undergraduate, general)
  - Advanced-level books (graduate, specific)
  - Edited books (research topics)
  - Summary books or booklets
- Papers
  - Conferences, Symposium, Workshop
  - Journals, Transactions, Magazine
- Speeches
  - Invited talks
  - Conferences, Symposium, Workshop
- Websites
  - Research laboratory, technical company
  - definition, image, video

Feng-Li Lian

4

# Book on Control System Technology

- Introduction to Control System Technology (7th Edition)
- Robert N. Bateson, 2002

## A. INTRODUCTION

- Basic Concepts and Terminology
- Types of Control
- The Common Elements of System Components
- Laplace Transforms and Transfer Functions

## B. MEASUREMENT

- Measuring Instrument Characteristics
- Signal Conditioning
- Position, Motion, and Force Sensors
- Process Variable Sensors

## C. MANIPULATION

- Switches, Actuators, Valves, and Heaters
- Electric Motors

## D. CONTROL

- Control of Discrete Processes
- Programmable Logic Controllers
- Control of Continuous Processes

## E. ANALYSIS AND DESIGN

- Process Characteristics
- Methods of Analysis
- Controller Design

Feng-Li Lian

9/10/105

# 控制領域課程

大學部

數學基礎

微方、線代、  
複變、機率

控制基礎

控制系統、線性系統、  
信號與系統、感測器與致動器...

研究所

系統理論

(高等)線性系統、非線性系統、離散事件系統、混合系統...

控制理論

最佳控制  
適應控制  
強健控制  
隨機控制  
非線性控制...

最佳理論

線性規劃  
非線性規劃  
動態規劃  
離散最佳化...

學習理論

智慧型控制  
類神經控制  
人工智慧...

應用領域

智慧機器人  
影像,動畫,VR  
智慧型運輸系統  
精密運動控制  
衛星遙測&定位  
半導體製程  
生產自動化...

時間基礎

數位控制  
電腦控制  
即時控制...

Feng-Li Lian

6

## 研究工作分配比例

Jun 14, 06 by Feng-Li Lian

	Initial Stage	Intermediate Stage	Final Stage
Survey <small>Others' work</small>	50	30	20
Design <small>Idea, Concept</small>	30	50	20
Analysis <small>Proof, Demo</small>	20	20	60

■ Eigenvalues: 20, 40, 100

■ Eigenvectors:

1	1	1
-1	1	1
0	-2	1

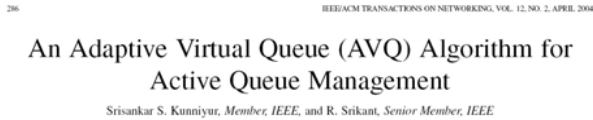
7

4/10/02

超級星光大道3	超級星光大道4	3/20/09
Chapter 1 起飛: 百人初選(上)	築夢: 個人拿手歌: 30強資格賽	
Chapter 2 起飛 續章: 百人初選(下)	砥礪: 個人拿手歌: 一對一PK賽	
Chapter 3 生存法則: 男女PK賽(上)	競爭: 個人拿手歌: 20強資格賽	
Chapter 4 全力應戰: 男女PK賽(下)	自信: 大改造! 我的主打歌	
Chapter 5 成長: 電視劇主題曲指定賽	分享: 我的第一張專輯	
Chapter 6 壓力: 海外選手資格賽1	齊心: 組曲合作賽 三人輪流唱一首歌	
Chapter 7 沉著: 海外選手資格賽2	心弦: 我的音樂故事	
Chapter 8 堅持: 海外選手資格賽3	火花: 雙人合作賽	
Chapter 9 溫故知新: 我的出生年代歌曲	自我: 給網友的歌	
Chapter 10 破繭而出: 我的主打歌	饗宴: 學長姐合唱賽(上)	
Chapter 11 試煉: 評審指定曲	饗宴: 學長姐合唱賽(下)	
Chapter 12 傾聽: 合唱指定賽	鬥志: 快歌指定賽	
Chapter 13 純淨: Unplugged指定賽	超越: 評審指定曲	
Chapter 14 態度: 肢體考驗賽	開戰: 歌手、藝人踢館賽(上)	
Chapter 15 經驗: 學長姐合唱賽	開戰: 歌手、藝人踢館賽(下)	
Chapter 16 領航: 藝人合唱賽	求勝: 一對一踢館賽 I	
Chapter 17 榮耀: 觀眾點播歌曲	拼勁: 一對一踢館賽 II	
Chapter 18 相信: 突破自我挑戰賽 Try it	請益: 連續PK抗壓賽(上)	
Chapter 19 應戰: 非歌手藝人踢館賽	請益: 連續PK抗壓賽(下)	
Chapter 20 應戰: 一對一踢館賽 PART1	機會: 敗部復活賽	
Chapter 21 實力: 一對一踢館賽 PART2	潛能: 突破自我挑戰賽	
Chapter 22 關卡: 一對一踢館賽 PART3	迷宮: 電視電影主題曲	
Chapter 23 奮戰: 資格決定賽 (敗部復活)	顛覆: 老歌新唱挑戰賽	
Chapter 24 觸動: TOUCH人心挑戰賽	助力: 默契合唱考驗賽	
Chapter 25 同心: 拿手歌曲&默契合唱	體悟: 天堂High歌vs.地獄悲歌	
Chapter 26 抗壓: 偶像合唱抗壓賽	推手: 歌手合唱賽, 積分賽(一)	
Chapter 27 毅力: 第七名決定賽	累積: 拿手歌曲&2008新曲, 積分賽(二)	
Chapter 28 信念: 第六名決定賽	無間: 藝文團體合作賽, 積分賽(三)	
Chapter 29 總決賽	關鍵: 第六名決定賽, 積分賽(四)	
	決戰: 總決賽(Live)	

8

- **Filename**
  - ◆ Last Name of First Author
  - ◆ Number of Authors
  - ◆ Year (2 digits)
  - ◆ First three words of the title
    - \* Capital the first letter of these words
- **Example**



→ **Filename:** Kunniyur2\_04\_AdaptiveVirtualQueue.pdf

*REM: Active Queue Management*

Sanjeeva Athuraliya and Steven H. Low, California Institute of Technology  
Victor H. Li and Qinghe Yin, CUBIN, University of Melbourne

IEEE Network • May/June 2001

→ **Filename:** Athuraliya4\_01\_REMActiveQueue.pdf

- **文中citation的用法:**
  - ★ One author  
[2: Lian 2004]
  - ★ Two authors  
[3: Lian & Chang 2004]
  - ★ More than three authors  
[4: Lian et al. 2004]

Ex: 2.2 TCP-Reno [10: xxx 1988] (將citation放在內文中)  
xxx.....

請不要，多加或少掉，任何“標點符號”或者是“空格”。

在投影片或書面報告中，  
引用的任何資料，  
都要清楚註明出處

- **References 的命名與編排方式如下：**

[1: Stankovic 2002]

S. S. Stankovic, "Decentralized overlapping control of a platoon of vehicles," IEEE Transactions on Control Systems Technology, Vol. 8, No. 5, pp. 816-832, Sep. 2002

[2: Bello & Mirabella 2000]

L. L. Bello and O. Mirabella, "Analysis and comparison of different interconnection solutions for switched Ethernet networks," Proceedings of IEEE International Workshop on Factory Communication Systems, pp. 221-230, Sep. 2000

[3: Aweya et al. 2002]

J. Aweya, M. Ouellette, J.M. Korsakas, and D. Y. Montuno, "Interworking of switched Ethernet and ATM flow control mechanisms," International Journal of Network Management, Vol. 12, No. 6, pp. 357-366, May 2002

\*Note: 就是紅色以下 要內縮至數字以後的位置

- **References 的 期刊與會議論文的資料：**

- ◆ **Journal Paper**

S. S. Stankovic,  
"Decentralized overlapping control of a platoon of vehicles,"  
IEEE Transactions on Control Systems Technology, Vol. 8, No. 5,  
pp. 816-832, Sep. 2002.

Authors, "Title of the Paper," Journal Title, Volume, Number,  
Pages, Month Year.

- ◆ **Conference Paper**

L. L. Bello and O. Mirabella, "Analysis and comparison of different interconnection solutions for switched Ethernet networks," in Proceedings of IEEE International Workshop on Factory Communication Systems, Porto, Portugal, pp. 221-230, Sep. 6-8, 2000.

Authors, "Title of the Paper," in Proceeding of Conference Title,  
Location, (Volume), Pages, Month Day, Year.

## References

### ■ References 的資料：

#### ◆ Books

Gary O. Young, "Synthetic structure of industrial plastics," in *Plastics*, 2nd ed., vol. 3, Editor: J. Peters, New York: McGraw-Hill, 1964, pp. 15–64.

Won-Kung Chen, *Linear Networks and Systems*. Belmont, CA: Wadsworth, 1993, pp. 123–135.

基本事項：Authors, "Title of the Book," Edition, (Volume), (Editors), Publisher Location, Publisher, Year, (Pages).

#### ◆ Technical Reports:

Eric E. Reber, Robert L. Mitchell, and Clark J. Carter, "Oxygen absorption in the Earth's atmosphere," Aerospace Corp., Los Angeles, CA, Tech. Rep. TR-0200 (4230-46)-3, Nov. 1968.

基本事項：Authors, "Title of the Book," Publisher, Location, Year, Number, (Pages), Month Year.

#### ◆ Standards/Patents:

Greg Brandli and Michael Dick, "Alternating current fed power supply," U.S. Patent 4 084 217, Nov. 4, 1978.

13

## References

### ■ References 的On-Line資料：

◆ **Books:** Author. (year, month day). Title. (edition) [Type of medium]. volume (issue). Available: site/path/file

\* J. Jones. (1991, May 10). *Networks*. (2nd ed.) [Online]. Available: <http://www.atm.com>

◆ **Journals:** Author. (year, month). Title. Journal. [Type of medium]. volume (issue), pages. Available: site/path/file

\* R. J. Vidmar. (1992, Aug.). On the use of atmospheric plasmas as electromagnetic reflectors. *IEEE Trans. Plasma Sci.* [Online]. 21(3), pp. 876–880. Available: <http://www.halcyon.com/pub/journals/21ps03-vidmar>

◆ **Papers Presented at Conferences:** Author. (year, month). Title. Presented at Conference title. [Type of Medium]. Available: site/path/file

\* PROCESS Corp., MA. Intranets: Internet technologies deployed behind the firewall for corporate productivity. Presented at INET96 Annu. Meeting. [Online]. Available: <http://home.process.com/Intranets/wp2.htm>

◆ **Reports and Handbooks:** Author. (year, month). Title. Company. City, State or Country. [Type of Medium]. Available: site/path/file

\* S. L. Talleen. (1996, Apr.). The Intranet Architecture: Managing information in the new paradigm. Amdahl Corp., CA. [Online]. Available: <http://www.amdahl.com/doc/products/bsg/intra/intra/html>

◆ **Computer Programs and Electronic Documents:** ISO recommends that capitalization follow the accepted practice for the language or script in which the information is given.

\* A. Harriman. (1993, June). Compendium of genealogical software. *Humanist*. [Online]. Available e-mail: HUMANIST@NYVM Message: get GENEALOGY REPORT

14

## Writing

By Feng-Li Lian, 9/17/11

### ■ Procedure of doing research：

◆ Problem → Math Model → Analysis → Design

### ■ Controller Design

◆ **PID control:** Basic control

◆ **Optimal control:** Control with respect to one specific cost function

◆ **Adaptive control:** Parameter A is unknown and constant

◆ **Robust control:** Parameter A is unknown and varying (bounded)

◆ **Intelligent control:** Fuzzy, Neural, ... with respect to human thinking

### ■ Problem Description

◆ Clearly describe the problem or identify the model in a mathematical way

◆ Provide proper references in corresponding location, sentence, paragraph, figure, equation

◆ What to do next?

15