

General explanation on the lecture, Fundamental knowledge on control

FUJIMOTO, Hiroshi
The University of Tokyo
Control and System Theory
Friday 14:55–16:40



Schedule and contents

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12-13 lectures by 6 professors from System Control Group in EE

4/6 Fujimoto: 1) Syllabus , 2) General explanation on the lecture , 3) fundamental knowledge on control

4/26 Hori: Future vehicles will run by motor, capacitor and wireless (1) (2)

4/26 Fujimoto: Basic Theory and Application of Multirate Sampling Control

5/10 Hashimoto: Spacecraft control (1): Control system overview

(5/17 No class. Please visit Open Labs in Hongo)

5/24 Hashimoto: Spacecraft control (2) : Lessons learned from real operation

5/29 Ohnishi: Basics of two degrees of freedom control (1)

5/31 Ohnishi: Basics of two degrees of freedom control (2)

6/7 Sakai: Spacecraft control (3): Estimation 1, Kalman filter 1

6/14 Sakai: Spacecraft control (4): Estimation 2, Kalman filter 2

6/21 Koseki: A practical approach to design a feedback controller and its application to Maglev (1)

6/28 Koseki: A practical approach to design a feedback controller and its application to Maglev (2)

7/5 Fujimoto and Takeda: Modeling and Control of Electric Circuit for Wireless Power Transfer

7/12 Reserved

Prof. Y. HORI

Future vehicles will run by motor, capacitor and wireless.



電気自動車の最大の特徴 → モータの高い制御性

- 高速トルク応答 → 車輪の空転防止制御
- 4輪独立駆動 → 2次元車体運動制御
- 正確なトルク値把握 → 路面状態推定



キャパシタだけで動くC-COMS



インホイールモータ4基搭載の東大三月号II



トルク垂下特性で高粘着を目指すカドワエル号

- (1) 電子制御によるABS (トラクション制御)
- (2) 逆起電力オブザーバによるスリップ抑制制御
- (3) 油圧と電圧によるハイブリッドABSやESC
- (4) 熱伝導率モータの落下特性をまねる粘着制御
- (5) 車体すべり角の推定と制御
- (6) ヨーモーメントオブザーバを用いたESC制御
- (7) 非線形領域での勾配の推定 (ブラシモータと駆動オブザーバによるピーク推定)
- (8) ドライバの意図を積みスムーズな加速を実現する速度パターンのリアルタイム生成
- (9) 電力の推定を用いた制動割合最適配分制御
- (10) キャパシタモータでライフスタイルを変えよう!

現在進行中の研究テーマ

Prof. T. KOSEKI

Feedback gain tuning of linear controllers based on polynomial methods
 Stabilizing control in electromagnetic levitation and application of state-observer

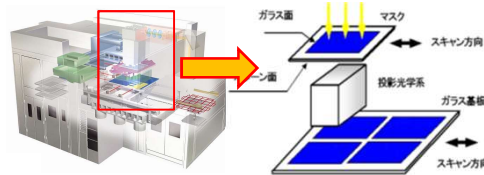


Prof. H. FUJIMOTO

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General explanation on the lecture, fundamental knowledge on control

Basic Theory and Application of Multirate Sampling Control

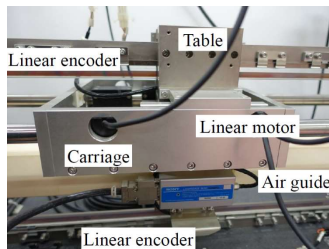


Prof. W. Ohnishi

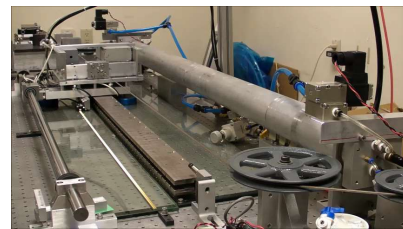
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Basics of two degrees of freedom control (1):
System modeling and identification for two degrees of freedom control

Basics of two degrees of freedom control (2):
Importance of feedback control and its fundamental limitations



Two degrees of freedom control for non-minimum phase systems

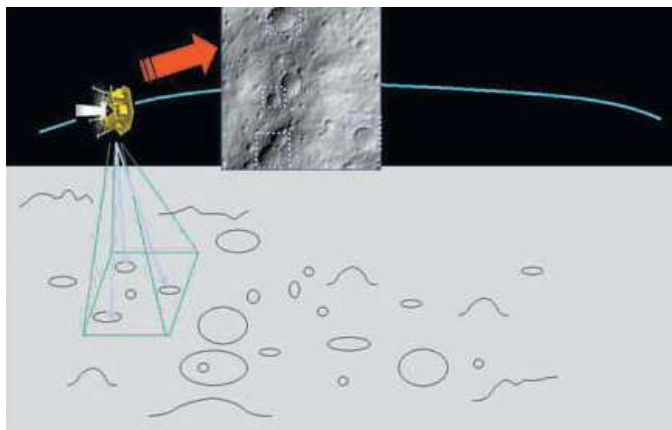


Precision tracking control by pneumatic actuators

Prof. T. HASHIMOTO *ISAS*

Spacecraft control: Control system overview

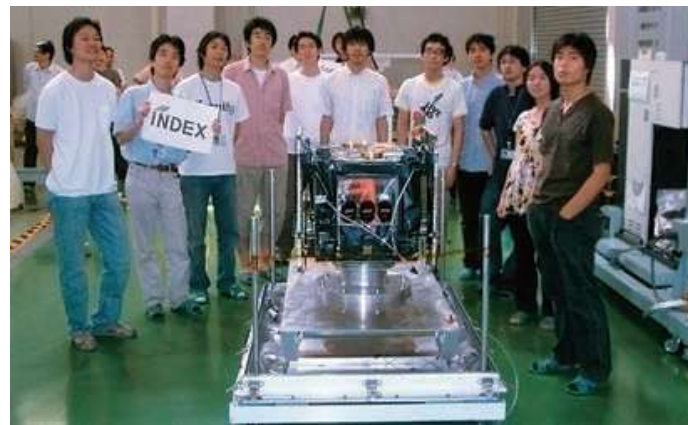
Spacecraft control: Lessons learned from real control



Prof. S. SAKAI *ISAS*

Spacecraft control: Estimation

Spacecraft control: Controller design, implementation & test



Mr. K. Takeda

Modeling and Control of Electric Circuit for
Wireless Power Transfer



Final exam (1)

Semester report

Upload your report and the original papers you read in (1) by
Google form <https://sites.google.com/edu.k.u-tokyo.ac.jp/cst/>

ABOUT:

- (1) Read three original papers on control theory which were published in recent 3 years, summarize them, and give your own comment on their relation and significance. **Do not select papers from your laboratory.**
- (2) Make a problem on control theory and give its solution. The problem should be as mathematical as possible.
- (3) Choose one professor and give your impression on his lecture and suggestion for future improvement. More general impressions and suggestions will be also welcome.

● 解答は日本語でも結構です。

Final exam (2)

Semester report

Deadline: July 17th, 2019

- The google form will be appear on <https://sites.google.com/edu.k.u-tokyo.ac.jp/cst/>
The form will be checked on July 17th.
- We will upload the list of acceptance with student ID in the web by July 21st. Please confirm it.
- If your name is missing, please send it again by July 24th.
- Contact: csreport@koseki.t.u-tokyo.ac.jp