Intro to Digital Control Systems

Digital Control Systems

Computer Science Engineering

Prof. Federica Pascucci

March 1, 2023

▶ **Course info**

▶ Teaching staff

▶ Resources

▶ Exam

▶ Course outline

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Course name:	Controllo Digitale
SSD:	Ing–Inf/04
Instructor:	Prof. Federica Pascucci
Lectures:	Mon-Wed-Thu
Timetable:	10:00-12:00
Room:	N8
Textbook:	Bonivento, Melchiorri, Zanasi
	Sistemi di controllo digitale
	Progetto Leonardo
Resources:	Moodle, Teams

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Federica Pascucci

Associate Professor in Automatic Control

Robotics and Automation Group (GRA)

Chair for Technical Activities - I-RIM
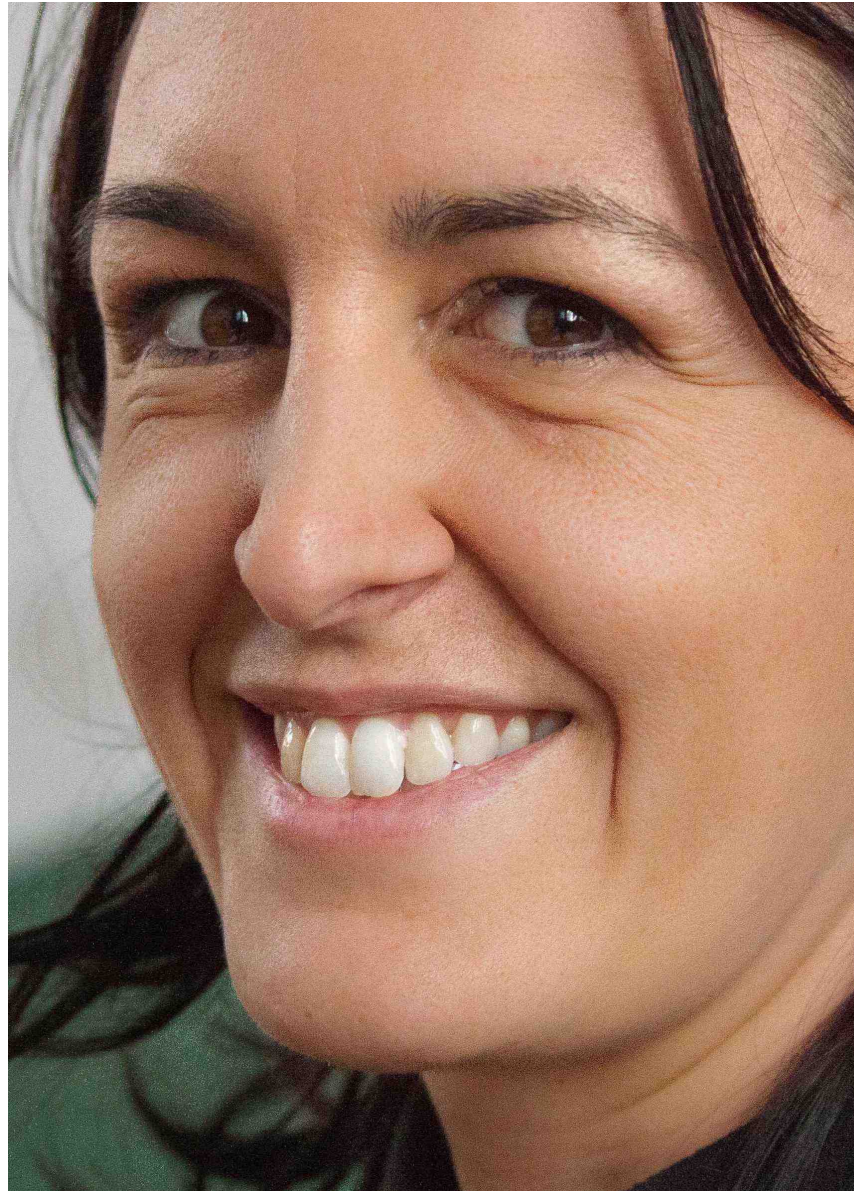
My research interests

- Cybersecurity for Industry 4.0
- Wearable Robotics
- Autonomous Navigation
- Localization

How to contact me

2 Teaching staff

- Online meeting (Teams)
- In presence meeting (DIA 2.35)
- Email: federica.pascucci@uniroma3.it
- Phone: 06 5733 3227

- Valeria Bonagura

  Email: valeria.bonagura@uniroma3.it

- Laura Filardo

  Email: laura.filardo@uniroma3.it

- Jacopo Pisani

  Email: jacopo.pisani@uniroma3.it

- Subject: [**CD**]

- Insert your **name** e **surname** in the email text

→ Please notice that email without [CD] in the subject will not be read

- Outcomes
- Textbooks
- Syllabus
- Slides and notes
- Links
- Exams

- Old recordings
- Slides and notes
- Forms

$\rightarrow$ The course will be in presence only

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- 2 Mid term tests or written exam (Aula Campus)
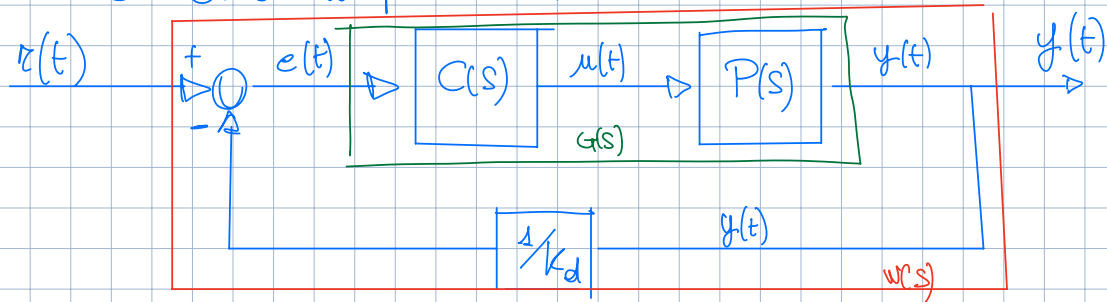
- Oral exam

- Homeworks

- Digital Control Systems (65%)
  - Analysis of digital control systems
  - Design of digital control systems

- Microcontroller (15%)
  - Arduino platform
  - Arduino programming

- Training: Matlab (20%)

- Continuous time linear systems

- Computer architectures

- Signal sampling and reconstruction

ANELLO DI CTRL DIGITALE

Anello di ctrl tempo continuo

$e(t) = r(t) - y(t)/k_d$ errore

$y(t)$ = uscita

$r(t)$ = riferimento

$u(t)$ = ingresso al processo/forzamento

$C(s)$: controllore

$P(s)$: processo da controllare

$1/k_d$: controreazione
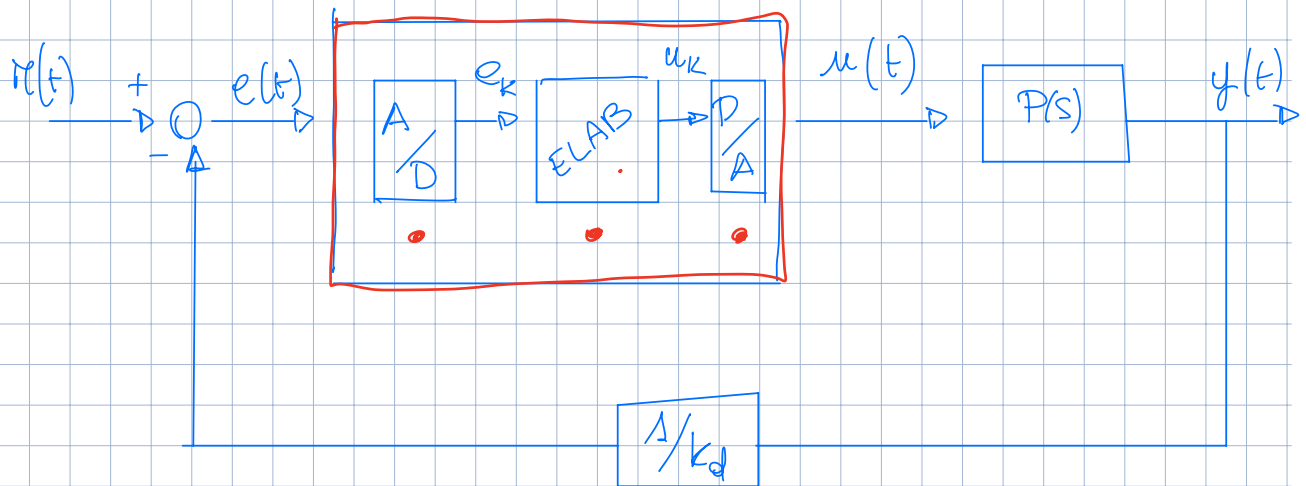$\hookrightarrow$ guadagno di anello

$G(s)$: catena diretta
$C(s) \cdot P(s)$

$F(s)$: funzione ad anello aperto
$$\frac{G(s)}{k_d}$$

$W(s)$: funzione a ciclo chiuso
$$\frac{G(s)}{1 + F(s)}$$

ANELLO DI CTRL DIGITALE

1. Segnali analogici ($r(t), y(t), e(t)$)
2. Segnali tempo continuo quantizzati ($\mu(t)$)
3. Segnali digitali – campionati e quantizzati (e_k, u_m)

segnali a dati campionati

segnale analogico

→ segnale tempo continuo quantizzato

→ segnale digitale

$t \in \mathbb{R}$
$k \in \mathbb{Z}_+^+$

ASSUNZIONE e_k, u_k segnali a dati campionati

$u(t)$ segnale analogico

ELABORATORE $\Rightarrow$ codice $\Rightarrow$ algoritmo di ctrl

PRO	CONS
Modificare in base alle esigenze	Alimentazione
Più potenza computazionale	Guasti
Storico dell'impianto	Difficoltà di progettazione
Portare in remoto l'unità di ctrl	

Intro to Digital Control Systems

Thanks for sharing your thoughts

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