Information Society Technologies

ARTIST2 – Year 1 Review

Grenoble, October 3rd-4th, 2005

Activity *JPRA - Cluster Integration*

Real-time Techniques in Control System Implementations

Activity leader : Alfons Crespo (UPVLC)

Goals

Year1:

- **Roadmap** describing the **current state-of-the-art** and the important research issues

Year2:

- Definition of a **common framework** of the **control parameter**s that can be influenced by an embedded control system implementation and the **real time operating systems** criteria that can be adjusted to **increase the robustness of the control system**.

Year4:

- **Development** of a common framework model in order to facilitate the **control and computing co-design**

Industrial State of Practice

- Control system implementation issues are important in a wide range of industrial sectors
  - automotive, avionics, automation, manufacturing, …..
- Tremendous variations among sectors and within the same sector
  - time-triggered or event-triggered
  - model-based control / model-driven engineering or non-model-based
  - the use of automatic code generation tools
  - temporal determinism an issue or a non-issue
- The more safety-critical applications the higher the focus on temporal determinism
- Event-based approaches common also for applications with hard timing constraints
- Generally, low use of schedulability theory

Year 1 activities

Achievements & Ongoing Work

09/04 → Definition of the contents of the Roadmap

→ Definition of the contents of the Graduate Course on Embedded Control Systems

12/04

→ Preliminar contents of the Roadmap

03/05 → Graduate Course on Embedded Control Systems

→ Workshop on Control for Embedded Systems, Lund. June

06/05 → Proposal of a special session in CDC Sevilla December 2005

→ IFAC World Congress: Special Session on ECS. Prague. July

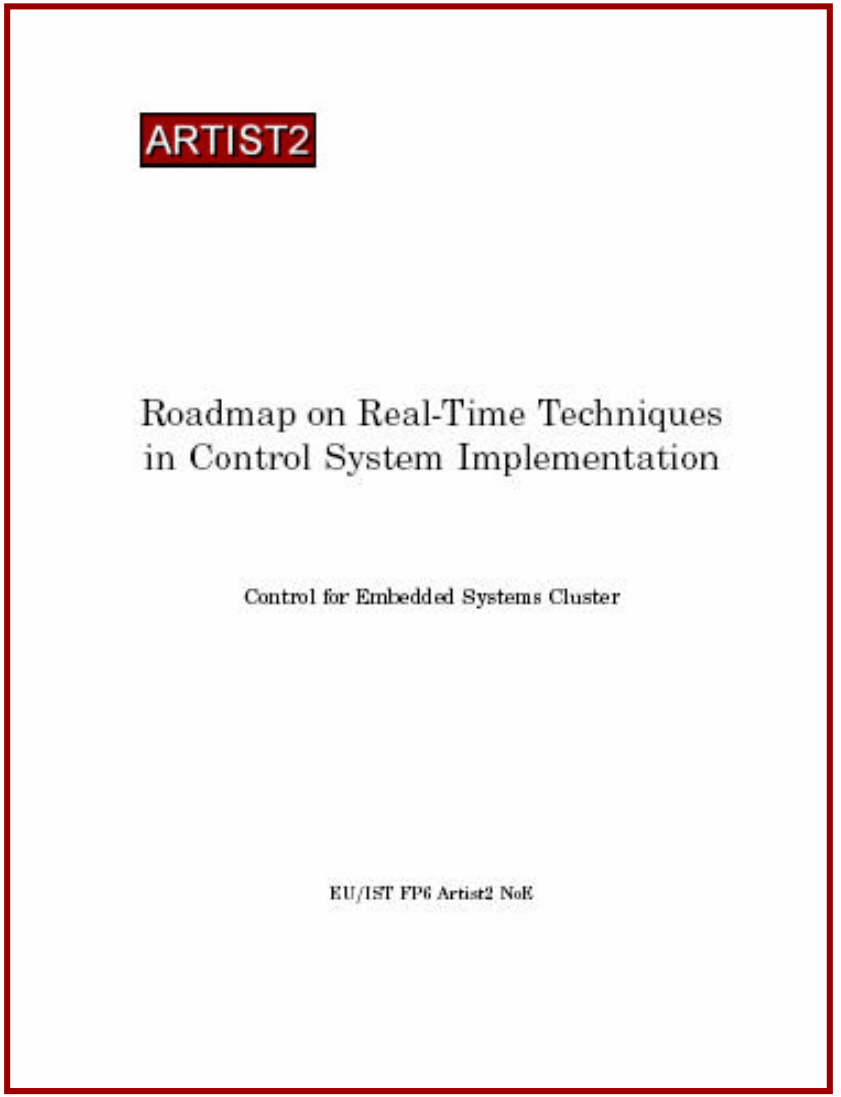
→ 1st International Workshop on Real-Time and Control. Palma Mallorca. July

09/05 → Roadmap

Year 1 activities

Achievements & Ongoing Work

Roadmap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Roadmap on Real-Time Techniques in Control System Implementation

Control for Embedded Systems Cluster

EU/IST FP6 Artist2 NoE

Control Cluster: Real-time techniques in control system implementations

Year 1 activities

Achievements & Ongoing Work

Roadmap contents

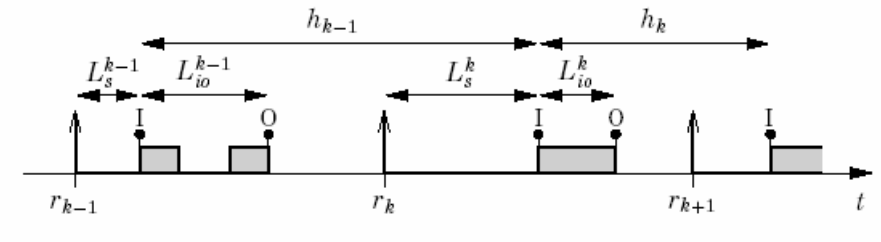
Year 1 activities

Achievements & Ongoing Work

Roadmap contents

3 Real-time and control systems: Design aspects

Timing Parameters

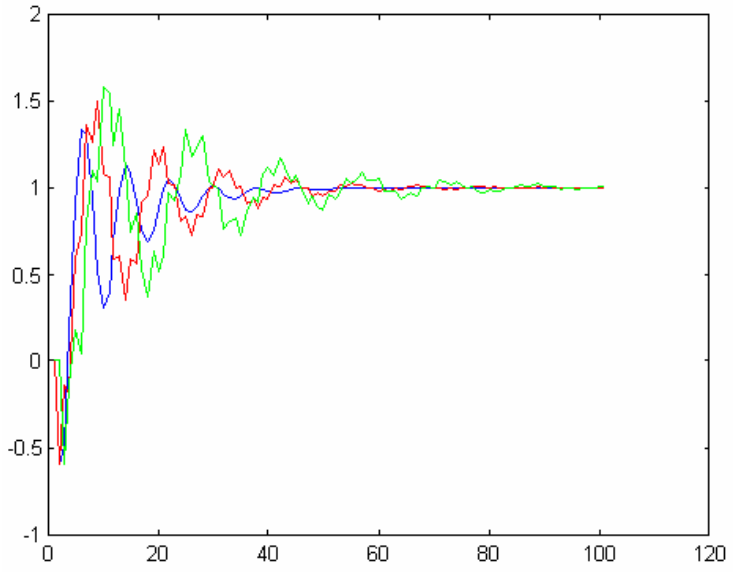


Control Performance

Effects of Temporal Nondeterminism

Real-Time Task Models

RT & Control Issues



Year 1 activities

Achievements & Ongoing Work

Roadmap contents

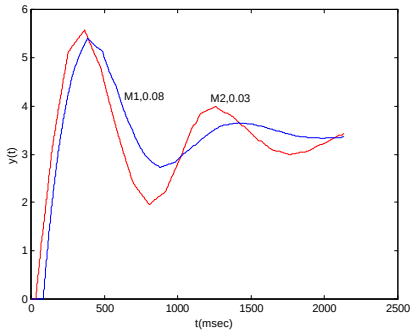
4 Integrated real-time and control design: Techniques

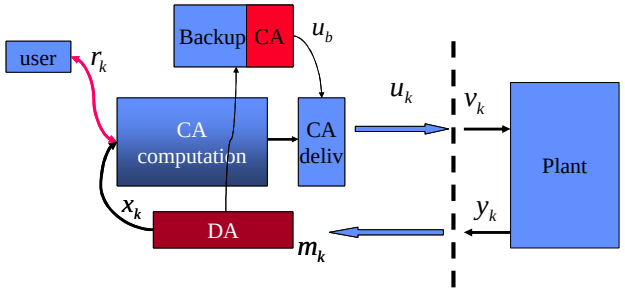
Design Process for Control System Implementation

Techniques to reduce performance degradation

- Scheduling influence over performance degradation
- The control effort
- Controllers and period changes

Control kernel





Year 1 activities

Achievements & Ongoing Work

Roadmap contents

5 Real time networks for control systems

The access to the shared communication medium

Fieldbus systems

General purpose networks Wireless networks

Year 1 activities

Interaction & Building Excellence

- Interaction Between Partners
  - Mobility: 3/5 PhD Students exchanges

    5/11 Staff exchanges
- Building Excellence
  - Graduate Course on Embedded Real-Time Systems. Valencia. May 2005
  - Workshop on Control for Embedded Systems, Lund. June. 2005
  - IFAC World Congress: Special Session on ECS. Prague. July 2005
  - 1st International Workshop on Real-Time and Control. Palma Mallorca. July 2005 (Euromicro Conference on Real-Time Systems)

Year 1 activities

Interaction & Building Excellence

ARTIST2

Graduate Course on Embedded Control Systems

Introduction | Goals | Program | Location | Slides | Dates & Info

News

Course location

Links

Lund University
Univ. Pol. Valencia
Royal Institute of Technology
Czech Technical University Prague
Univ. Pol. Madrid

The strategic objective of the ARTIST2 Network of Excellence is to stre
Embedded Systems Design, and promote the emergence of this new multi

One of the main activities in the Network is the Joint Programme of Activi
Excellence.These are activities for disseminating excellence across all avai
students, and other European and international research teams.

The **Control for Embedded Systems Cluster** organises a **Graduate C**
Systems to be held in Valencia (Spain) April 5-8, 2005. With the particip

- Lund University (Control Department)
- Universidad Politécnica de Valencia(Computer Engineering and Sy
- Royal Institute of Technology (KTH) Stockholm (Control Dept, M
  Systems Dept)
- Czech Technical University Prague (Control Dept)
- Universidad Politécnica de Madrid (Real-Time Systems Group)

Course Cooordinator : Pedro Albertos

T1	**Motivation and examples** **Bengt Eriksson (KTH)**	slides
T2	**RT issues (RT perspective)** **Juan A. De la Puente (UPM)**	slides
T3	RT practical issues (laboratory) **Alfons Crespo & Miguel Masmano (UPVLC)**	slides
W1	**Control issues (Control perspective)** **Pedro Albertos (UPVLC)**	slides
W2	**Integrated control design and implementation (Joint perspective)** **Karl-Erik Arzen and Anton Cervin (LTH)**	slides
W3	**Control design practical issues (lab) (W3)** **Bengt Eriksson (KTH)**	slides
Th1	**Kernels and safe (back-up) operation** **Pedro Albertos and Alfons Crespo (UPVLC)**	slides
Th2	**Control of Computing Systems** **Karl-Erik Arzen and Anton Cervin (LTH)**	slides
Th3	**Jitterbug and Truetime (lab)** **Karl-Erik Arzen and Anton Cervin (LTH)**	slides
F1	**Off-line schedulingOff-line scheduling (F1)** **Zdenek Hanzalek (CTU)**	slides
F2	**ECS Deployment ECS Deployment (F2)** **Bengt Eriksson (KTH)**	slides
F3	**ECS Deployment and validation (lab) (F3)** **Michal Sojka (CTU)**	slides

Control Cluster: Real-time techniques in control system implementations

18 Month Perspective

Work Planned for the next 18 months

09/05

03/06

09/06

03/07

09/07

03/08

09/08

- Define the topic priorities to be consider in the definition of the framework. Extracting milestone from roadmap and synchronising the interactions with other clusters
- Define the functionalities and criteria to develop the **common framework for control development**
- Specify the interactions between partners and the roles in the development of the framework
- **Develop the framework**

18 Month Perspective

Significant Events or Achievements Expected

- 1 day Course at the next CDC
- Next edition of the Graduate Course (Prague)
- Joint Summer School in conjunction with ART Cluster

Notes : Graduate Course on Embedded Control System