

Beyond traditional sampling strategies for enhanced performance and cost-effectiveness

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Beyond Traditional Sampling Strategies for Enhanced Performance and Cost-Effectiveness

Jurgen van Zundert^a

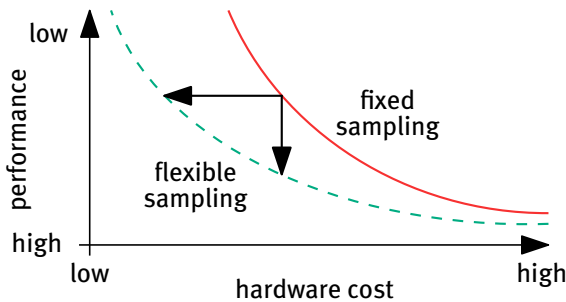


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Motivation

- Present: mainly fixed sampling (single-rate, equidistant) → well-developed control design framework
- Problem: limited by performance/cost trade-off:

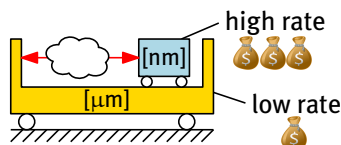


- Aim: break trade-off through flexible sampling
- Challenge: control design for systems with flexible sampling

Applications in motion control

- Examples of flexible sampling:

- multi-rate control [1]

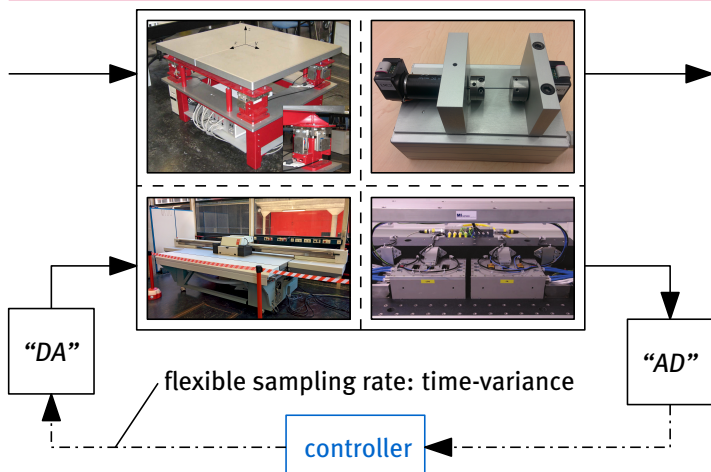


- non-equidistant sampling [2]



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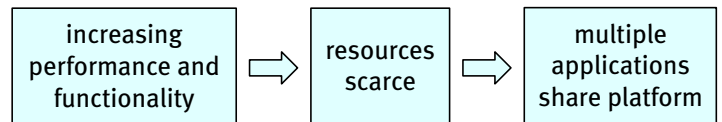
Unified framework for flexible sampling



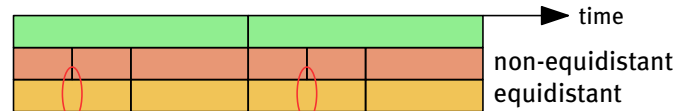
Key contribution: various control algorithms for flexible sampling

Case study: FF for non-equidistant sampling

Motivation:

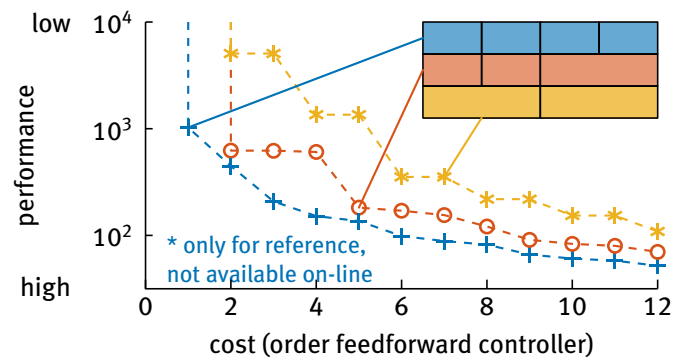


Tasks executed on same processor → requires scheduling → non-equidistant sampling of motion system



Two approaches for (feedforward) control design:

- I) settle with equidistant sampling rate ⇒ conservative
- II) design for non-equidistant rate → exploit additional design freedom to break the performance/cost trade-off:



Concluding remarks

General framework for

- modeling,
- identification, and
- control

of motion systems with flexible sampling

References

- [1] J.C.D. van Zundert, J.L.C. Verhaegh, W.H.T.M. Aangenent, T. Oomen, D. Antunes and W.P.M.H. Heemels. "Feedforward for Multi-Rate Motion Control: Enhanced Performance and Cost-Effectiveness", *Proceedings of the 2015 American Control Conference*, 2831-2836, Chicago, IL, 2015.
- [2] Jurgen van Zundert, Tom Oomen, Dip Goswami, and W.P.M.H. Heemels. "On the Potential of Lifted Domain Feedforward Controllers with a Periodic Sampling Sequence", *Proceedings of the 2016 American Control Conference*, Boston, MA, 2016.