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# Fundamental Research Needs for Embedded Networked Systems

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# Unified View of Communication, Control and Computation

- Based on a theory of Interconnections of Sensors, Coders, Decoders, Communication Channels, Controllers (Heterogeneity)
  - Seen at different levels of Abstractions
  - Embedding in Family of Components (Dynamic Programming View)
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# Requirements

- Components as part of *open systems*; support interface-based composition and refinement
- Functional and non-functional aspects *jointly handled*, at both component- and system-level
- Design space involves both functions and execution infrastructure
- With *heterogeneous and flexible* **Models of Computation and Communication** (MoCC)

Requirements – they contain but do not coincide with the focus of the control engineer

➤ Functional aspects

stability, robustness, performance, what it does

and non-functional aspects

timeliness, fault tolerance, power use, how it performs

*jointly handled*, at both component- and system-level

➤ Design space involves both functions and execution infrastructure

➤ With *heterogeneous and flexible* **Models of Computation and Communication** (MoCC)

# Requirements → Research Challenges

- Components as part of *open systems*; support interface-based composition and refinement
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