

Module Role of Software in Complex Systems

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Abstract

This module addresses the role of software in complex systems

Distribution

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status: preliminary

draft

version: 1.0

The Role of Software in Systems

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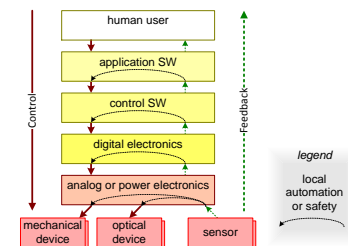
Abstract

Software is a dominating factor in the development of complex systems. It plays a crucial role in the performance of the final product at the one hand, while it contributes significant to the development cost and elapsed time of development. This paper will discuss the role of software in the broader system context. An improved understanding of the role of software enables the system architect, and the other stakeholders of the product creation process, to integrate the software development better. In this way hardware-software tradeoffs can be made, balancing performance, costs and risks.

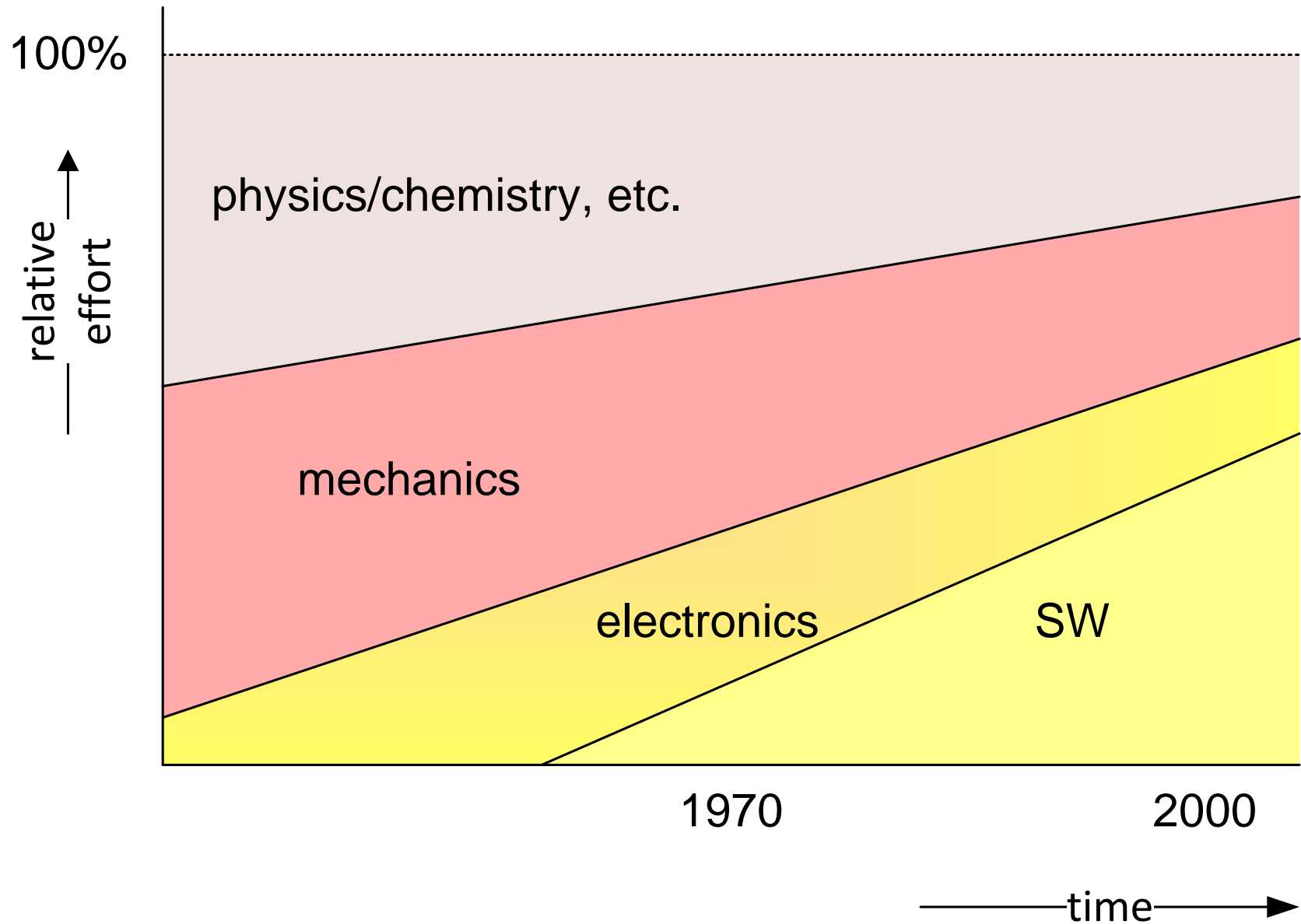
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status: concept
version: 1.3



Relative Contribution of SW



Mismatch between Role and Discipline

role of software

integration technology
captures *application* functionality
defines lot of *system* behavior
determines how much of potential *system* performance is achieved
acts as director

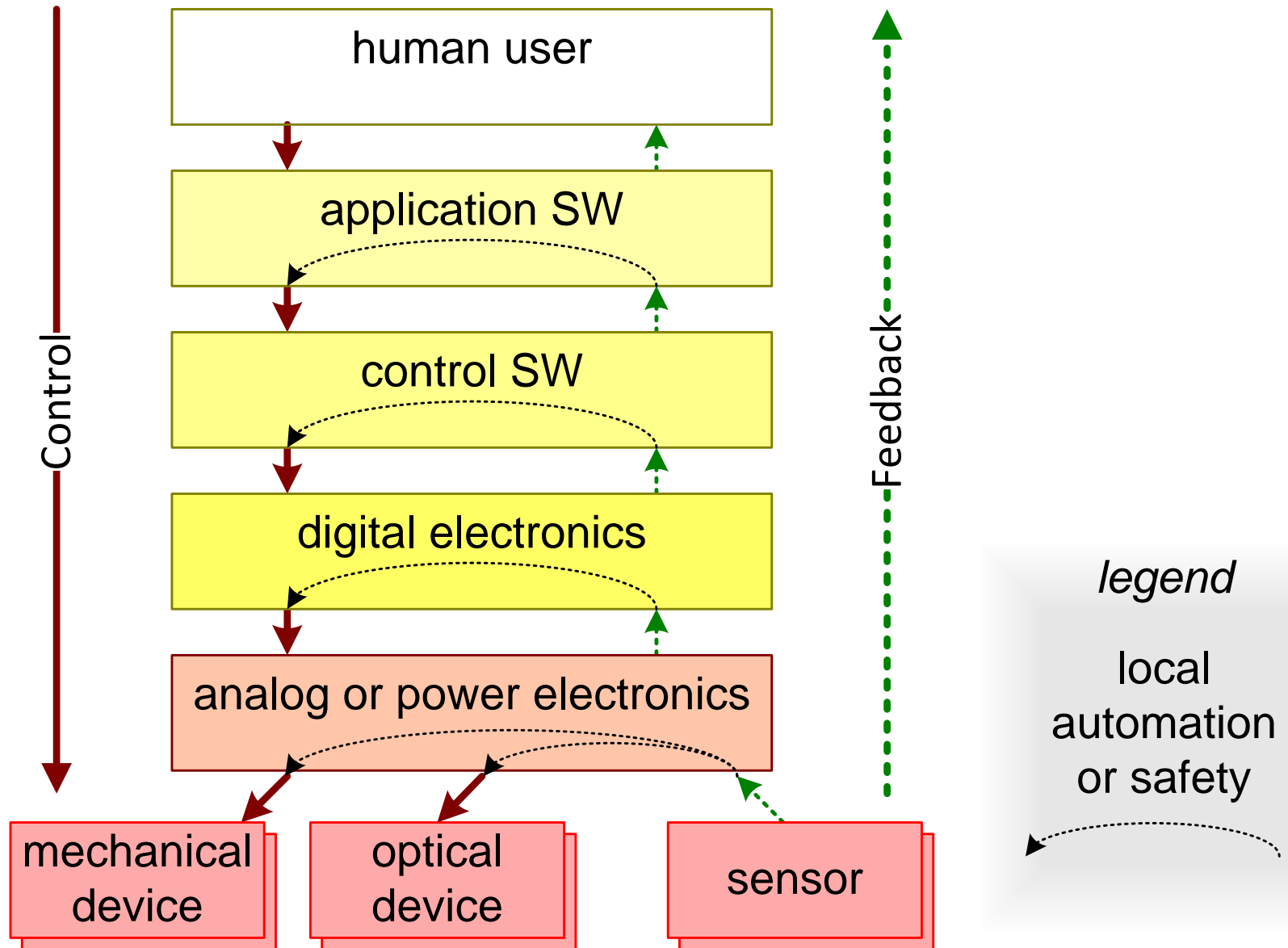


mismatch!

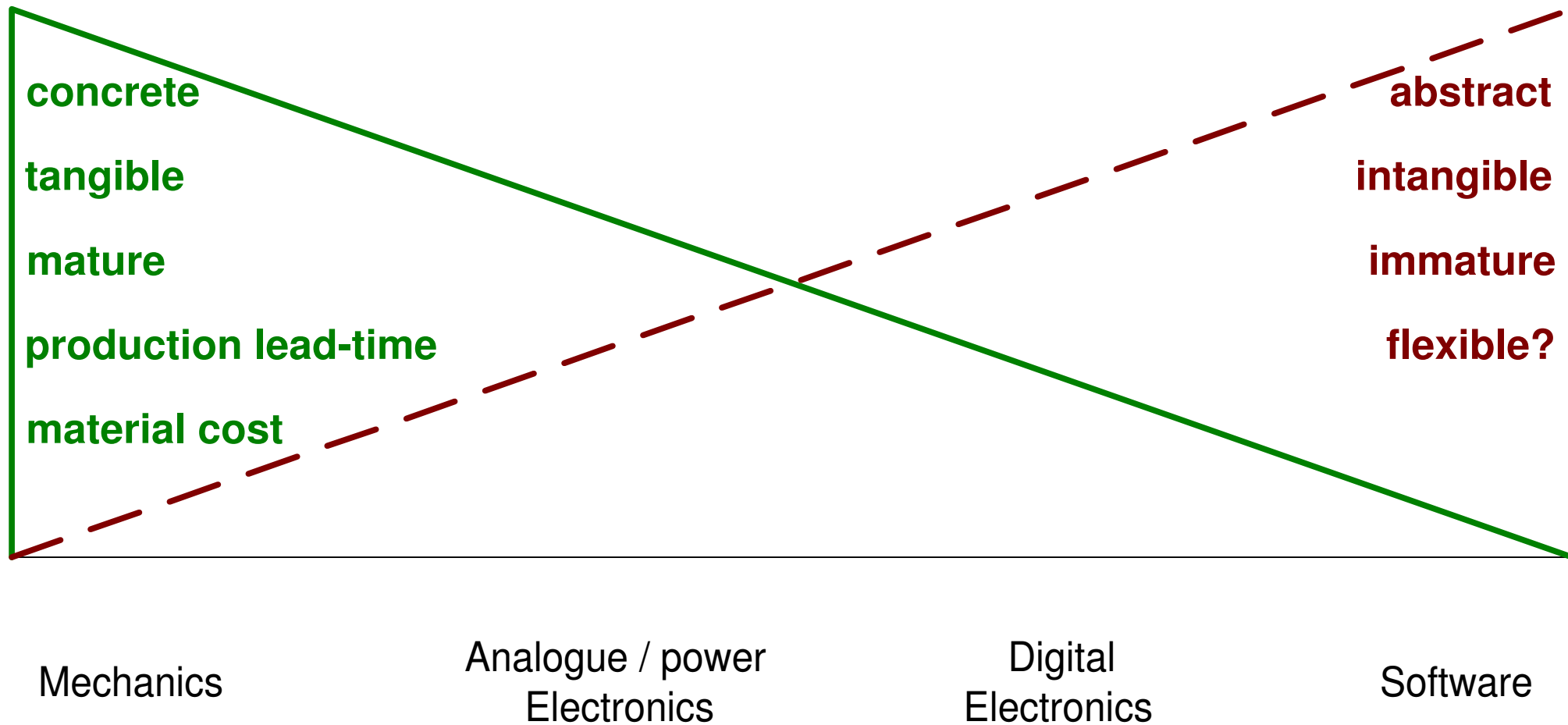
focus of software discipline

software technologies, such as:
programming languages
data bases
operating systems
component technologies
engineering practices

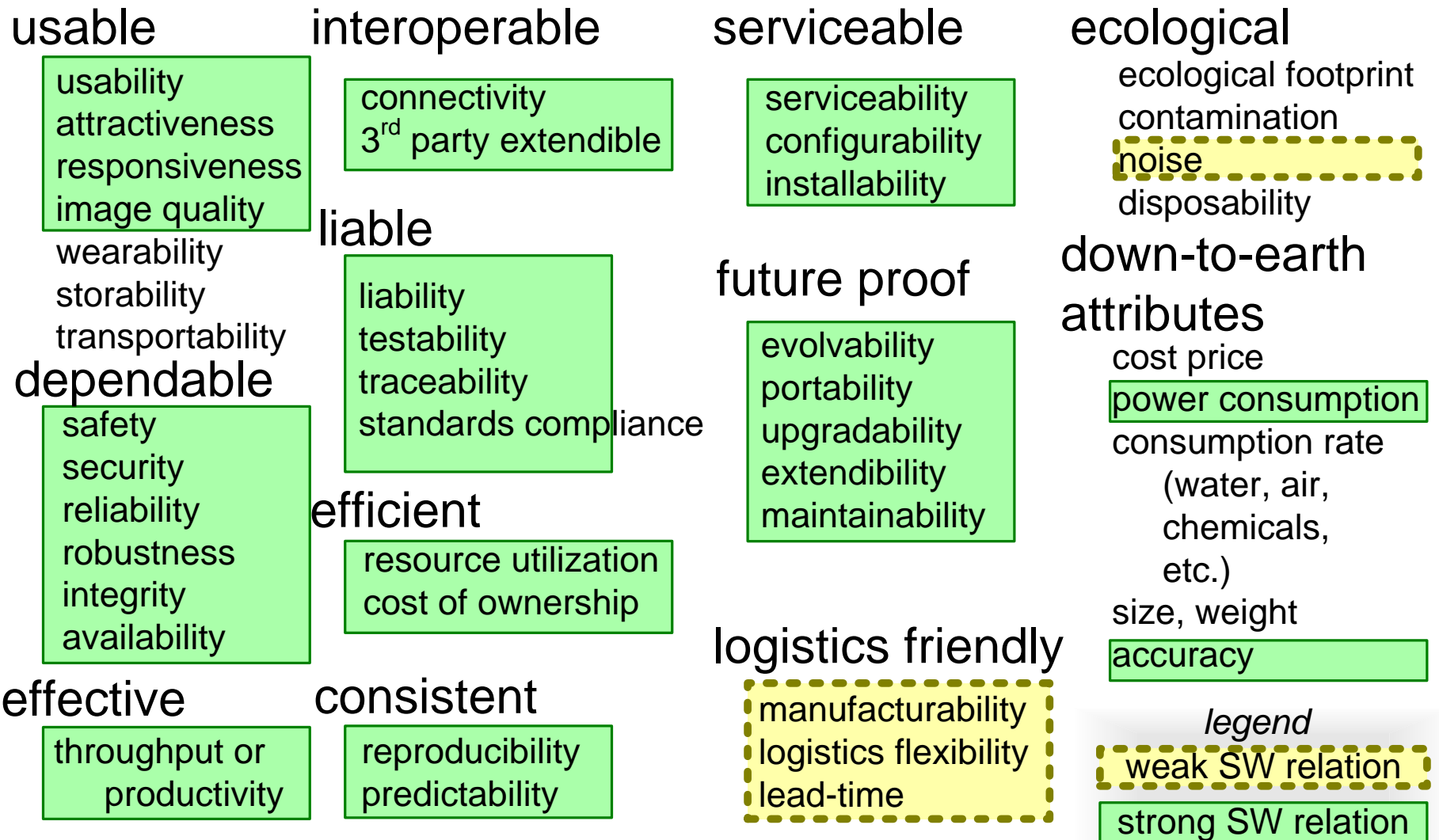
Control Hierarchy along Technology axis



Characterization of disciplines



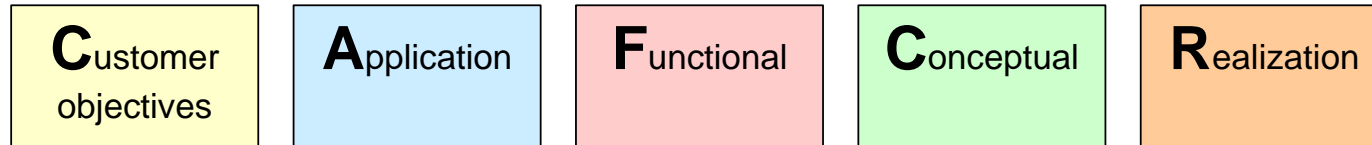
Quality Attributes annotated with SW relation



Design Aspects related to SW



SW Mechanisms



error handling, exception handling, logging
processes, tasks, threads
configuration management; packages, components, files, objects, modules, interfaces
automated testing: special methods, harness, suites
signaling, messaging, callback scheduling, notification, active data, watchdogs, timeouts
locking, semaphores, transactions, checkpoints, deadlock detection, rollback
identification, naming, data model, registry, configuration database, inheritance, scoping
resource management, allocation, fragmentation prevention, garbage collection
persistence, caching, versioning, prefetching, lazy evaluation
licensing, SW-keys
bootstrap, discovery, negotiation, introspection
call graphs, message tracing, object tracing, etc.
distribution, allocation, transparency; component, client/server, multitier model

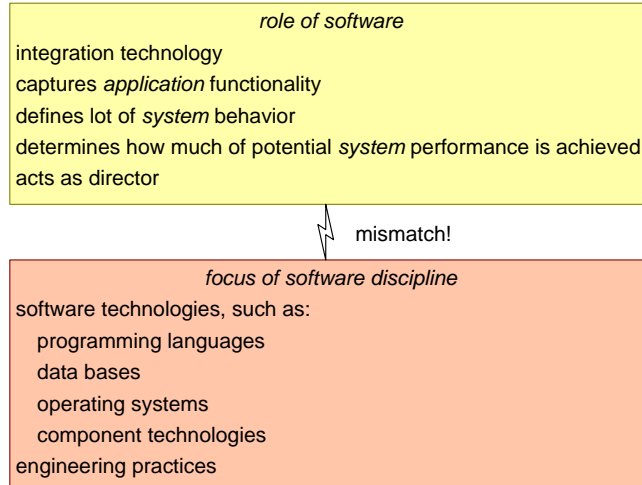
Exercise Role of Software in a complex product

Describe the SW in a complex product, from different viewpoints for instance:

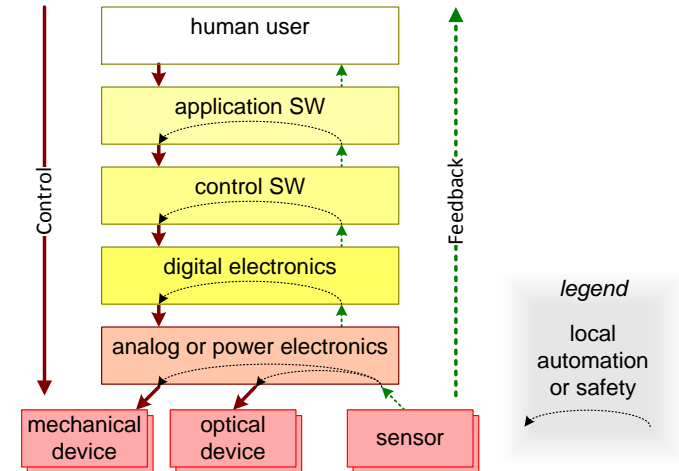
- Give an indication of the size/complexity
- Outline the SW architecture
- Identify the top 3 critical characteristics
- Identify potential improvements
- Process
- Development environment

Software

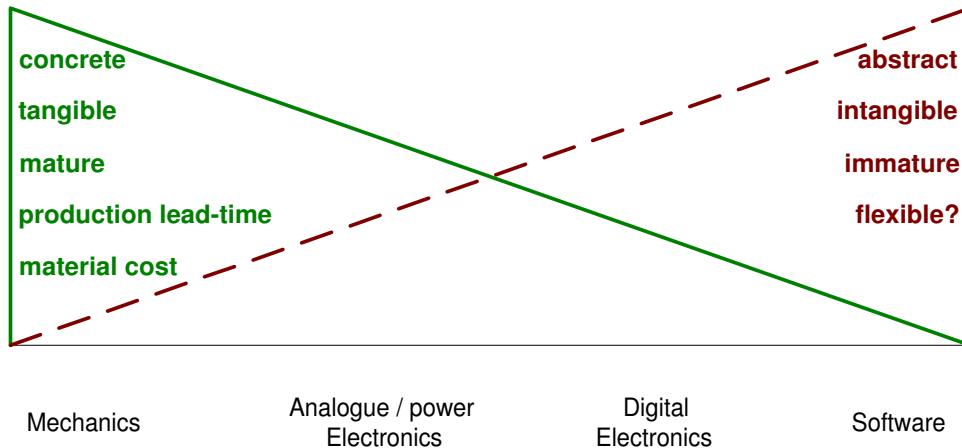
Role of Software



Control Hierarchy



Discipline Characteristics



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