# A Perspective on the Embodiment of Computing

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# A brief consideration of history

- The computer has had about 60 years of history
  - Simulation – 1960's
  - Communication – 1980's
  - Embodiment – 2010's

- Some durable insights worth remembering
  - Computing progress is made at the pace of hardware advances --hardware is the raw material of computing, software gives it shape.
  - Managing *complexity* through interfaces, abstraction, modularity, and separation of concerns --but we never really got a grip on complexity.

- CPS was right on schedule
  - A system science of computing meeting the physical world
  - How does the physical change computing -> How does AI change CPS?

# Lessons and achievements of CPS

**Lessons (around managing complexity)**:

- Embodiment is more than just interactions --(embodied computing) system is greater than the sum of its parts
- New complexities introduced because the physical world cannot be abstracted away
- Shared complexities across cyber and physical are hard to reconcile.

**Achievement**: Language, notions, and tools (not yet frameworks) for multidisciplinary, multi-domains consideration of cyber-physical systems.

# Wants for ~~20~~ ~~10~~ ~~5~~ 2 years from now

- **Speculation (not really)**: *Complexity will explode*
- **Opportunity**: *The interface is our chance*
- **Proposition**: A *gatekeeper to manage complexity (risks) at the interface*
- **Objective**: *Imagine an independent, secure, trustworthy, and capable gatekeeper managing decisions and actions at the interface of cyber and physical.*
- **Key questions:**
  - *What core characteristics and principles do we need?*
  - *What tools do we have? What do we need to invent?*
  - *Are we the right people to do it?*
- Remember that brakes are the innovation that allows cars to go faster!

# Sources


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