

Butler Lampson, "What Computers Do: Model, Connect, and Engage"

Every 30 years there is a new wave of things that computers do. Around 1950 they began to model events in the world (simulation), and around 1980 to connect people (communication). Since 2010 they have begun to engage with the physical world in a non-trivial way (embodiment—giving them bodies). Today there are sensor networks like the Inrix traffic information system, robots like the Roomba vacuum cleaner, and cameras that can pick out faces and even smiles. But these are just the beginning. In a few years we will have cars that drive themselves, glasses that overlay the person you are looking at with their name and contact information, telepresence systems that make most business travel unnecessary, and other applications as yet unimagined. All computer systems are built on the physical foundation of hardware (steadily improving, according to Moore's law) and the intellectual foundations of algorithms, abstraction and probability. Their performance is determined by basic issues of latency, bandwidth, availability and complexity. In the future they will deal with uncertainty much better than today, and many of them will be safety-critical and hence much more dependable.