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Intel CTO Says Gap Between Humans, Machines Will Close by 2050

SAN FRANCISCO--(BUSINESS WIRE)--

NOTE TO EDITORS: photos, videos and more facts available at www.intel.com/pressroom/idf

Intel Corporation's chief technology officer took a fascinating look at how technology will bring man and machine much closer together by 2050.

Justin Rattner, during his keynote today at the Intel Developer Forum in San Francisco, predicted big changes are ahead in social interactions, robotics and improvements in computer's ability to sense the real world. He said Intel's research labs are already looking at human-machine interfaces and examining future implications to computing with some promising changes coming much sooner than expected.

"The industry has taken much greater strides than anyone ever imagined 40 years ago," Rattner said. "There is speculation that we may be approaching an inflection point where the rate of technology advancements is accelerating at an exponential rate, and machines could even overtake humans in their ability to reason, in the not so distant future."

Cutting the Last Cord, Wireless Power

Imagine being able to walk into an airport or room with your laptop and instead of consuming battery, it is recharged. Based on principles proposed by MIT physicists, Intel researchers have been working on a Wireless Resonant Energy Link (WREL). Rattner demonstrated powering a 60-watt light bulb without the use of a plug or wire of any kind, which is more than is needed for a typical laptop.

The magic of WREL is that it promises to deliver wireless power safely and efficiently. The technology relies on strongly coupled resonators, a principle similar to the way a trained singer can shatter a glass using her voice. At the receiving resonator's natural frequency, energy is absorbed efficiently, just as a glass absorbs acoustic energy at its natural frequency. With this technology enabled in a laptop, for example, batteries could be recharged when the laptop gets within several feet of the transmit resonator. Many engineering challenges remain, but the company's researchers hope to find a way to cut the last cord in mobile devices and someday enable wireless power in Intel-based platforms.

Programmable Matter: Computers that Change Shape

Intel researchers are also investigating how millions of tiny micro-robots, called catoms, could build shape-shifting materials. If used to replace the case, display and keyboard of a computing device, this technology could make it possible for a device to change physical

form in order to suit the specific way you are using it. A mobile computer, for example, could be tiny when in a pocket, change to the shape of an earpiece when used as a mobile phone, and be large and flat with a keyboard for browsing the Internet or watching a movie.

Rattner described this as a difficult exploratory research agenda, but steady progress is being made. He demonstrated for the first time the results of a novel technique for fabricating tiny silicon hemispheres using photolithography, a process used today to make silicon chips. This capability is one of the basic structural building blocks needed to realize functional catoms, and will make it easier to bring the necessary computational and mechanical components together in one tiny package less than a millimeter across. The technique is compatible with existing high-volume manufacturing and enables the possibility to produce such catoms in quantity at some point in the future.

Dr. Michael Garner, program manager of Emerging Materials Roadmap, joined Rattner onstage to discuss the importance of research of novel silicon technology, keeping Moore's Law alive and well through the next decade and beyond. Among other things, Intel is researching how to go beyond planar transistors to 3D transistors and is looking at using compound semiconductors to replace silicon in the transistor channel. Looking further out, Intel is exploring into a variety of non-charge-based technologies that could one day replace CMOS altogether.

Robots: From the Factory Floor to Your Kitchen

Robots today are primarily used in the factory environment, designed to perform a single task repeatedly and bolted down. To make robotics personal, robots need to move and manipulate objects in cluttered and dynamic human environments, according to Rattner. They need to be cognizant of their surroundings by sensing and recognizing movement in a dynamic physical world, and learn to adapt to new scenarios. Rattner demonstrated two working personal robot prototypes developed at Intel's research labs. One of the demonstrations showed electric field pre-touch that has been built into a robot hand. The technique is a novel sensing modality used by fish but not humans, so they can "feel" objects before they even touch them. The other demonstration was a complete autonomous mobile manipulation robot that can recognize faces and interpret and execute commands as generic as "please clean this mess" using state-of-the-art motion planning, manipulation, perception and artificial intelligence.

In addition to robots becoming more human-like, Rattner said he believes more innovation will emerge to make human and machine interaction more robust. Randy Breen, chief product officer of Emotiv Systems, joined Rattner onstage to demonstrate the company's EPOC(1) headset. The Emotiv EPOC identifies brainwave patterns, processes them in real time and tells a game what conscious or non-conscious thoughts the user has had, like facial expressions, conscious actions or emotions. A user with the headset could think about smiling or lifting an object, and an avatar in a game would execute it. EPOC can currently identify more than 30 different "detections" through the 16 sensors on the headset.

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