Consumers to benefit from advances in chip design

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Consumers will be able to fix their automobiles while the car gives step-by-step advice, attack their ailments by making computer models of various treatments to find the best one, and duck into virtual fitting rooms to try on a store's clothes without leaving home.

All that and much more will be possible -- in some cases within a few years -- because of a major shift in computer-chip design, according to Intel scientists and others. And as the technology evolves, these experts believe, the relationship people have with their computers and other devices will undergo a remarkable transformation.

"The machines we build will be capable of understanding the world around us much as we do as humans," said Justin Rattner, Intel's chief technology officer. "They will see and they will hear and they will probably speak and do a number of other things that resemble human-like capabilities."

For decades, semiconductor companies have steadily shrunk the size of their chips while cramming them with an ever-increasing number of transistors, the minuscule switches that manage the flow of electronic data that enables PCs and other consumer gadgets to perform their many functions.

But with more than 1 billion transistors currently crowded onto some microprocessors no bigger than a fingernail, companies are running into problems. Among them, the densely packed chips are becoming less

energy-efficient and more prone to producing potentially damaging heat.

To help get around that, chips are being built with multiple computing engines or so-called cores. These boost performance by processing steams of data simultaneously and tend to be more energy-efficient, in part because they can be programmed so that cores not in use at the moment don't drain energy.

Companies that make graphics-oriented processors have rushed into this technology. Some of the chips made by Nvidia of Santa Clara have 240 cores, and those from Sunnyvale-based Advanced Micro Devices have 1,600. These already are being used for everything from weather forecasting to processing medical images.

But Intel, whose general purpose microprocessors serve as the brains in most PCs, says that's just the beginning.

Even though the most advanced chips the Santa Clara giant sells boast just four cores, its cores have far greater capabilities than those in graphics processors, according to the company's researchers. And Intel, which recently showed off an experimental 48-core chip, believes such devices eventually will become so powerful they'll lead to an array of revolutionary consumer applications. Among them:

Virtual dressing rooms: Using a computer with a 3-D camera, Intel says a person could create a virtual model of their body, which then could try on clothes displayed on a store's Web site. "Twirl and turn and watch how the fabric drapes and how the color complements your skin tone," says an Intel publication that describes the idea. Sean Koehl, whose Intel job title is technology evangelist and who helped demonstrate the 48-core chip, said the dressing-room concept could become reality within five to 10 years.

Battling tumors: A similar computerized model could be made of a person's ailment, such as a tumor, Intel says. Using the patient's medical information along with data detailing what researchers know about that form of the disease, a multicore chip could simulate the likely effects of treating the tumor "using chemotherapy, radiation, surgery, a combination of approaches or no intervention at all."

Senior surveillance: Intel envisions homes being equipped with multicore-powered computers connected to wireless cameras that monitor and offer advice to old people. "For example," the company notes in one brochure, "the computer could help make sure the person self-medicates at appropriate intervals, gets a glass of water to drink after so much time has passed or doesn't leave the stove on and unattended for more than a few minutes."

Other multicore applications Intel envisions are brainy cars that instruct their owners how to make repairs, computers that let small-time investors manipulate financial databases like Wall Street pros and notebooks that can do complex video simulations to see, for example, "how a different pitcher might have changed the outcome of a pivotal baseball game."

Designing such chips is difficult, in part because of the complexity of writing software that can manage the flow of information through the various cores. Intel, which has been working for years on a multicore graphics processor recently disclosed in an e-mail to reporters that "we are disappointed that the product is not yet where we expected."

But despite such setbacks, the multicore trend will redefine how consumers relate to their computers and other devices, according to Tiburon chip analyst Jon Peddie. And as the number of gadgets equipped with such chips grows, he added, "these marvelous new processors will become embedded in our lives and we won't even know it."

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