Microchip at 25: More power to it

BY MARY GODDARD

I t seemed beyond the realm of fantasy and physics: a single slice of silicon capable of operating the most complicated electronic device quickly and cheaply. But since the microprocessor was invented 25 years ago, the wonder is no longer a surprise. It has gone on to become the center of the information-technology revolution, the brain of the personal computer and a wide assortment of other electronics used in homes and office. In the 1970s, the brain was already making cars and appliances smarter. Today, it reigns over a host of electronic subsystems and is the engine behind the automobile’s electronic systems.

The early microprocessors were small and limited in their ability to learn on their own. They required a human to program them to solve a problem. But as the technology advanced, so did the capabilities of the microprocessors. By the late 1980s, microprocessors had become ubiquitous in almost every electronic device, from home appliances to automobiles.

IN THE BEGINNING

Since the first Intel microprocessor, the Intel 4004, was introduced in 1971, Intel has released a new generation of chips every year or two, making it a predictable evolution in technology. Intel’s 4004, for example, had 2,300 transistors and could perform 24,000 instructions per second. Today, Intel’s chips can perform billions of instructions per second.

The first Intel microprocessor, the 4004 on the left, could handle 60,000 instructions a second; its latest, the Pentium Pro, can handle 300 million instructions a second.

From toasters to cars, chips part of daily life

The first computer most people use each day is the one they fire up when they get to work. But chances are that when you wake up in the morning to a clock-radio alarm, make toast or expresso for breakfast, look at your watch, adjust the thermostat, set the VCR to tape a show, turn on the lights, or drive to work in a car past a few traffic lights, you have already used devices containing chips.

The device at the heart of each of these specialized computers is a microprocessor. A tiny integrated circuit, it is the part of the computer that does the actual computational work. A microprocessor can be as simple as a single transistor or as complex as an entire computer system.

The microprocessor’s greatest strengths are its low price, small size and flexibility. It remembers and adjusts to incoming information, turning on the furnace when a room becomes cold, just as easily as it reads the telephone.

Therefore, just as a PC is a computer with a keyboard for entering data and a screen for displaying the results, a microwave oven is a computer with a push-button input and heat-output device, and a car’s anti-lock brakes are run by a computer with a foot-pedal input and accelerated velocity as its output. Many products contain or are made with the help of microprocessors. It is estimated that there are more than 10 billion microprocessors in use worldwide, about two for every living person.

And product designers are finding new places to put them: in toys, in appliances, and even in automobiles. They run automatically when it gets dark, running shoes and ski bindings react to the weather or the conditions beneath them, dog collars that provide information about the canine they hang on and devices connected directly to nerves to help people hear and see. -Staff

Calvin Golsthe, professor emeritus of computer science at the University of Toronto, got his first taste of computing in 1951 by setting up a little computer, which used vacuum tubes, cost $750,000 and filled a large room. Computer chip designers are 10,000 times as powerful as a conservative estimate, he says.