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## *The System Memory*

The performance of a microprocessor system may be thought of as being influenced by four factors: the instruction set of the microprocessor, the speed of the microprocessor, the addressing techniques employed by the microprocessor, and the memory.

The instruction set determines the way in which a program is executed. A microprocessor with a primitive instruction set requires more instructions to carry out a given task than a microprocessor with a sophisticated instruction set. For example, multiplication can be performed by a single instruction (TMS9900, 6809), or by means of a series of instructions using a shifting and adding algorithm. Of course, what constitutes a good instruction set depends very much on the type of application for which the microprocessor is to be used. The microprocessor systems designer should beware of manufacturers who quote a large number of instructions for their microprocessor. It is not the total number of instructions that gives a microprocessor its power, but their usefulness.

The speed of a microprocessor determines the rate at which instructions are executed. There is little point in having a microprocessor with a very powerful instruction set if it takes longer to execute a given task than an alternative microprocessor which has a simpler instruction set, requiring more instructions per task, but which operates at a speed more than compensating for any deficiencies in its instruction set.

The addressing techniques used by a microprocessor determine the way in which it accesses data from the memory. Widely used addressing techniques are absolute addressing, indexed addressing, page-based addressing, indirect addressing, relative addressing, stack addressing and literal (or immediate) addressing. Often the power of a particular microprocessor lies in its range of addressing techniques rather than in its instruction set. For example, the Z80 is an upgraded version of the 8080, just as the 6809 is an upgraded version of the 6800. However, the Z80 has been upgraded by the addition of a very large number of new instructions but only a small improvement in the number of addressing techniques, while the 6809 has been upgraded by the addition of several new addressing modes and just a few new instructions. It is expected that the improvement in performance