**冯诺依曼计算核心特点**

**一.冯·诺依曼计算机主要由运算器、控制器、存储器和输入输出设备组成**

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*At any rate a central arithmetical part of the device will probably have to exist, and this constitutes the first specific part: CA.*

*By the central control we mean this latter function only, and the organs which*

*perform it form the second specific part: CC.*

*At any rate the total memory constitutes the third specific part of the device: M*

*That medium will be called the outside recording medium of the device: R.*

*These organs form its output, the fifth specific part: O.*

无论如何，设备的中央算术部分可能必须存在，这构成了第一个特定的部分：CA。 我们所说的中央控制是指后一种功能，以及 从第二个特定部分执行它：CC。 无论如何，总内存构成了设备的第三个特定部分：M 该介质将称为设备的外部记录介质：R。 这些器官形成了它的输出，第五个特定的部分：O。

**二.计算机运行过程中，把要执行的程序和处理的数据首先存入主存储器，计算机执行程序时，将自动地并按顺序从主存储器中取出指令一条一条地执行，这一概念称作顺序执行程序。**

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*Indeed, all existing (fully or partially automatic) computing devices use R—as a stack of punchcards or a length of teletype tape—for all these purposes (excepting (a), as pointed out above).*

*Nevertheless it will appear that a really high speed device would be very limited in its usefulness unless it can rely on M, rather than on R, for all the purposes enumerated in 2.4, (a)–(h), with*

*certain limitations in the case of (e), (g), (h), (cf. {12.3})*

事实上，所有现有的（完全或部分自动）计算设备都使用R（作为一堆打孔卡或一段电传打字磁带）用于所有这些目的（如上所述，（a除外）。 然而，一个真正高速的设备似乎在其实用性方面将非常有限。

**三.一个非常高速的计算设备理想应该有真空管元件**

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*It is clear that a very high speed computing device should ideally have vacuum tube elements.*

*Vacuum tube aggregates like counters and scalers have been used and found reliable at reaction*

*times (synaptic delays) as short as a microsecond (= 10−6*

*seconds), this is a performance which no*

*other device can approximate. Indeed: Purely mechanical devices may be entirely disregarded and*

*practical telegraph relay reaction times are of the order of 10 milliseconds (= 10−2seconds) or more. It is interesting to note that the synaptic time of a human neuron is of the order of a millisecond(= 10−3seconds).*

很明显，一个非常高速的计算设备理想应该有真空管元件。像计数器和比例器这样的真空管聚集物已经被使用，并发现在反应时间（突触延迟）短至一微秒（=10−6秒）时可靠，这是其他设备无法接近的性能。事实上：纯粹的机械设备可能会被完全忽略，而实际的电报继电器的反应时间是10毫秒（=10−2秒）或更多。值得注意的是，人类神经元的突触时间约为一毫秒（=10−3秒）

**四.计算机处理的数据和指令一律用二进制数表示**

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*Thus, whether the tubes are used as gates or as triggers, the all-or-none, two equilibrium, arrangements are the simplest ones. Since these tube arrangements are to handle numbers by means of their digits, it is natural to use a system of arithmetic in which the digits are also two values .This suggests the use of the binary system.*

*The analogs of human neurons, discussed in 4.2–4.3 are equally all-or-none elements. It will appear that they are quite useful for all preliminary, orienting, considerations of vacuum tube systems (cf. {6.1, 6.2}). It is therefore satisfactory that here too the natural arithmetical system to handles the binary one.*

由于这些管排列是通过其数字来处理数字，因此使用算术系统是很自然的，其中数字也是两个值。这表明使用二进制系统。

**第二问：情况B出现时的现实例子**

1. 优化代码编写。减少冗余代码并提高可读性，用更少的代码做相同的事情。
2. 优化代码算法。例如将冒泡排序改为快排，简单插入排许改为希尔排序，减少相同功能下代码所需要的运行次数。
3. 优化代码逻辑。尽可能减少代码，尽量减少需要运行的代码行数，提高效率。
4. 优化数据库和需要网络的对外操作。