

The human computer Debriefing ALU

How realistic was this?

Not so bad.

One important concept that was illustrated here is that the ALU is the only part of the main computer that knows what a number means. For all the other parts, control unit and memory notably, numbers are handled in the same way as text or instructions: just a bunch of zero and ones. The ALU is able to take these zero-and-ones and to add them together, compare them and so on.

Another important thing to remember is that the ALU can only do operations for which it is built. As we role-played it here, this was only addition and comparison. Note that any ALU that is capable of performing just the simplest operations can be used in a program that breaks down the more complex operations into simple steps that it can perform (e.g. $5*4 = 4+4+4+4+4$). Therefore, any computer can be programmed to perform any arithmetic operation—although it will take more time to do so if its ALU does not directly support the operation.

Finally, it is also important to realize that the ALU and the control unit have no “master clock”. At this scale of the computer, these are simply independent electronic components, with nothing to ensure that they run in synchrony. An operation in the ALU may take a certain time, which is unknown by the control unit. The output port “s” is a way for both devices to synchronize. Not until $S=true$ can the control unit assume the ALU has finished computing what it requested of it.

Of course, in reality, ALUs are more complex.

Certain computers contain multiple ALUs so that they can process several instructions at the same time, and thus run much faster.

Certain parts of modern computers outside of the motherboard (what we role-played here) may also contain ALUs. For instance, graphic cards which are used to compute very quickly what should be traced on screen for the user often provide special, dedicated ALUs that can perform arithmetic on vectors and matrices (i.e. input A and input B are not single numbers, but series of numbers all at once).

Remember:

CPU (*central processing unit*) = control unit + arithmetic and logic unit (ALU)
+ registers + basic input and output devices

Most basic computer= CPU + memory

A CPU is usually constructed on a single integrated circuit called a *micro processor* (e.g. Intel Pentium III). CPU and memory are usually incorporated with other devices on an electronic circuit called the *motherboard*.

For more information, you can have a look at the role-sheets and debriefing information of the parts played by other people in the class.