

The human computer Debriefing: Program counter

How realistic was this?

Not so bad.

One important concept that was illustrated here is that numbers, letters or instructions are stored exactly in the same way: binary numbers. So the program counter has no way to know which is which: it is the responsibility of the programmer to write the instructions so that they access what they should (e.g. a JMP should jump to the location of an executable instruction).

Another important aspect is that, if the program counter is unreliable, e.g. writes a wrong value when instructed to do something which was yet correct, the whole function of the computer can be hampered. More importantly, the error is nearly impossible to detect and recover from, since nothing resembles a binary value more than another binary value. If the JMP now links to a wrong cell, so be it.

Finally, important to remember the program counter is a register, and is not part of the computer's main memory. This means it is tightly integrated in the CPU (see below) and ensures very fast access from the control unit. For more details on main memory, look at the debrief page for that part of the computer.

Of course, in reality, the program counter is more complex.

Depending on the details of the particular machine, it holds either the address of the instruction being executed, or the address of the next instruction to be executed.

There are many other types of registers, depending on the type of processor. These can be classified according to their content or instructions that operate on them, for instance data registers (used to hold numeric values) and address registers (used to hold addresses and are used by instructions that indirectly access memory). In the program we role-played here, we used a "conditional register", which holds truth values used to determine whether branching (BLE) should or should not be executed. The program counter is often called a "control register".

Remember:

CPU (central processing unit) = control unity + 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.