Differences between brain and CPU

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1 Question

What are the differences between a brain and a CPU?

2 Answer

- The brain is extremely parallel (each neuron processing many signals), while CPUs are currently limited to a few cores.
- The brain appears to be able to only do a single thing at once (single process, single thread).
- CPUs can explicitly control their memory access while the brain memory organization and access is unclear.
- The brain is a lot slower in terms of sequential operations, processing at a maximum of 250-1000 Hz while current generation (2020) desktop CPUs are in the 3-5 GHz range.
- The brain does not have a clear instruction set.
- The brain consumes glucose for energy, while a CPU consumes electricity.
- The human brain is much larger (average 1273 cm3 for men, 1131 cm3 for women) than a CPU chip (Intel Core i7-10710U is 46mm by 24mm (height unknown but definitely less than 10 mm) which is less than 11 cm3).
- Heat dissipation is done through cerebral circulation in the brain and through a heatsink attached to a CPU.
- The brain is biodegradable, the CPU is not.
- Signal is transmitted between neurons using neurotransmitters (chemically) while CPUs transmit signals between transistors electrically.
- The organization of the brain evolves over time (in a single person), while a CPU chip will remain the same its whole life.
- We currently cannot transplant a brain from one person to another, but we can transfer a CPU from one computer to another (as long as the motherboard is compatible).
- The brain contains a large amount of memory, while the CPU has a small amount of memory and relies on larger memory stores (RAM, disks).
- It is possible to reverse engineer a CPU by trying a different combination of inputs and recording the output (immutable). Doing the same with a part of the brain may result in different results as the brain is mutable.

2.1 To be determined

- The brain may not have different levels of memory cache (we do however talk about short and long term memory).

3 References

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