TDT4200 - PS1

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Problem a:

Briefly explain why multi-core processors have become so popular over the past decade, despite being harder to program.

Single-core processors was long the only common thing, especially for personal computers. Every second year their clock speed increased significantly, which made them increasingly faster and faster. If it were possible to keep increasing this clock speed forever, they would be great to keep using. Unfortunately, we have reached a limit where clock speed cannot be increased further, without temperatures getting too high for the CPU to function.

Therefore, the only way to allow processors to keep getting faster, is by adding more cores, with all the complexity that introduces.

Problem b:

Briefly describe the four kinds of parallel systems in Flynn's taxonomy, as well as SPMD

SISD:
An architecture where a single processor executes instructions one-by-one with data from a single memory.

MISD:
Multiple processor cores perform different instructions, operating on the same data.

SIMD:
There are multiple processing units working on their own pieces of data in parallell, but all of them executes the same instruction.

MIMD:
Many independent processing units executing their own instructions on separate pieces of data.

SPMD:
A specialized variant of MIMD where a single program is split up and run simultaneously on different cores.

Problem c:

Is MPI usually used for shared memory, or distributed memory systems? Why?

MPI is usually used for distributed memory systems. MPI is based upon sending messages between processes. In an environment where processes share memory, this becomes an unnecessary overhead. Thus MPI is best suited in cases where processes have no other way of communicating.