**Speedup**

Speedup in parallel computing can be simply defined as , where is the time taken on 1 core, and is the time taken on cores.

**Strong scaling**

Strong scaling is concerned with how the solution time varies with the number of processors for a fixed *total* problem size. Amdahl’s law governs strong scaling. It states that speedup is limited by the fraction of the serial part of the software not amenable to parallelisation:

Where is the proportion of the execution time spent on the serial part and is the proportion spent on the parallelised part. This means that, for a fixed problem, the upper limit of speedup is determined by the serial fraction of the code.

**Weak scaling**

Weak scaling is concerned with how the solution time varies with the number of processors for a fixed problem size *per processor*. Weak scaling is governed by Gustafson’s law, which states:

It is based on two approximations:

* The parallel part scales linearly with the amount of resources.
* The serial part does not increase with respect to the size of the problem.

**Testing**

16 different processes were run. 8 were strong, with only the number of cores varying – 1, 2, 4, 8, 12, 16, 20, and 24. The other 8 were weak, with the number of particles varying – 500, 600, 700, 800, 900, 1000, 1100, and 1200 and the number of cores.

Amdahl, Gene M. (1967). AFIPS Conference Proceedings. (30): 483–485. doi: 10.1145/1465482.1465560

Gustafson, John L. (1988). Communications of the ACM. 31 (5): 532–533. doi: 10.1145/42411.42415