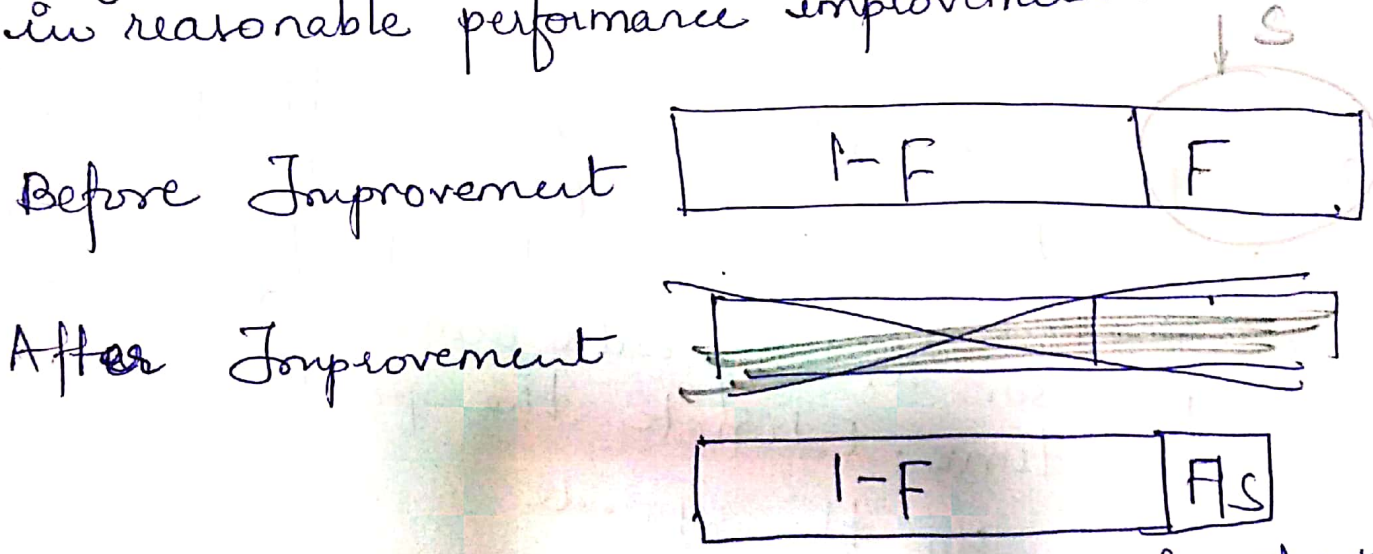
* Amadahl's law

→ It is used to find the maximum expected improvement of an overall system when only part of the system is improved.

— very useful to check whether any proposed improvement can provide expected return.

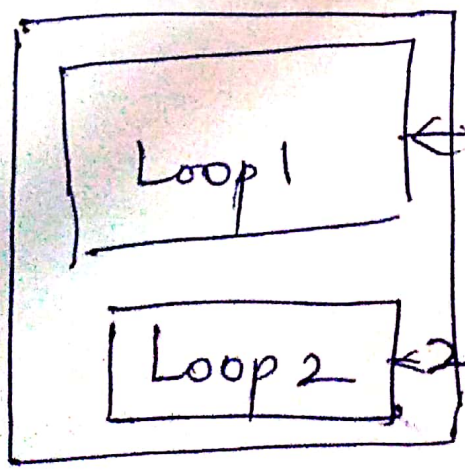
— Used by computer designers to enhance only those architectural features that result in reasonable performance improvement.



Execution time before Improvement = (1-F) + F =

Execution time after Improvement = (1-F) + F/S

$$\text{Speedup} = \frac{1}{(1-F) + F/S}$$



← 500 lines 10% of execution time

← 20 lines 90% of execution time

⇒ 10% of a program 50 times faster

F = 0.1

$$\text{Speedup} = \frac{1}{0.9 + 0.1/50} \qquad S = 50$$

$$= 1.108$$

⇒ 90% of a program 50 times faster

F = 0.9

$$\text{Speedup} = \frac{1}{0.1 + 0.9/50} \qquad S = 50$$

$$= 8.474$$

Q. Suppose we plan to upgrade the processor of a web server. The CPU is 30 times faster on search queries than the old processor. The old processor is busy with search queries 80% of the time. Estimate the speedup obtained by the upgrade

Q. The execution time of a program on a m/c is found to be 50 seconds out of which 42 seconds is consumed by multiply operations It is required to make the program run 5 times faster. By how much the speed of the multiplier be improved?