

1) Why study DSA.

SaaS Algo/Prog

Linear Algebra, Probability, Diff Eq, DSA

PaaS Platform

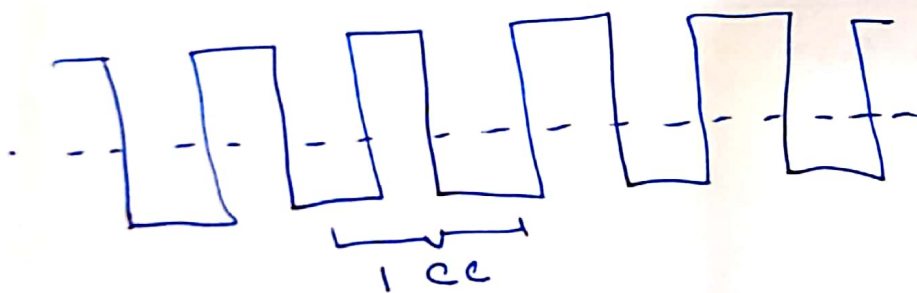
Op Systems.

IaaS H.W

Signal & Systems, CoA, MBSO...

Bringing efficiency by squeezing at all levels.

2) Processor Speed.



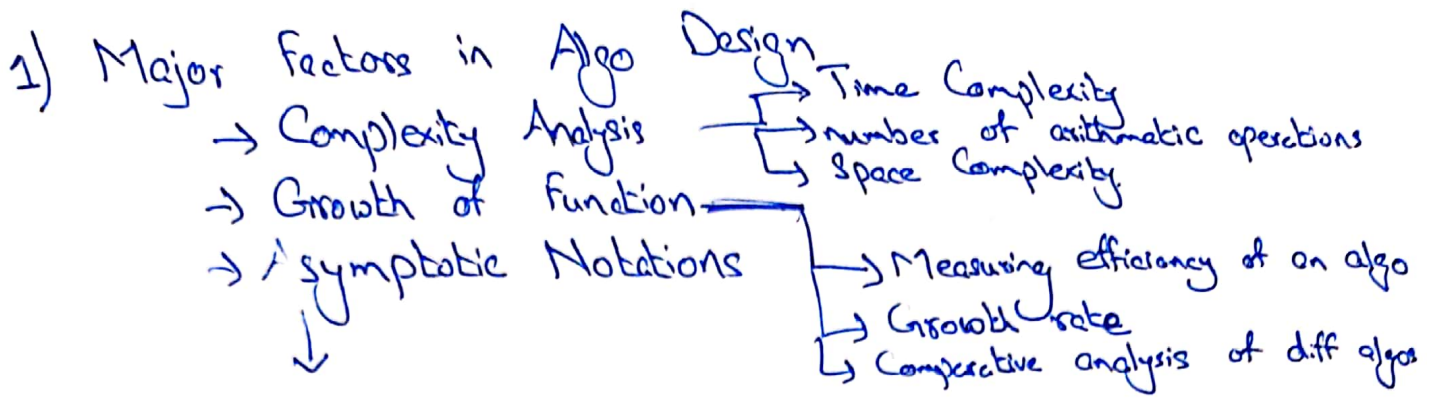
Processor
1 GHz
1.5 GHz

1 GHz MHz kHz
000 000 000
└─ clock cycle

→ ~~Objective~~ ~~being~~ to
General Rule

add/Sub	4cc
mul/Div	6cc
Memory Ops	10-16cc

Hence the objective is to reduce memory & Computational operations.



Five Asymptotic Notation

- O means "order at most"
- o means "tight upper bound"
- Ω means "order at least"
- ω means "tight lower bound"
- Θ means "order exactly"

2) Algo Complexity

→ Complexity in terms of 'n'

$$O(1) < O(\lg n) < O(n) < O(n \lg n) < O(n^2) < O(2^n) < O(n!)$$

Example

```
int main()
```

```
{
    cout << "Hello buddy"; c.1
    cout << "Hello buddy"; c.1
    cout << "Hello buddy"; c.1
}
```

```
int main() {
```

```
{
    int i, n = 38; c.1
    for (i = 1; i <= n; i++) c.n
    {
        cout << "Hello buddy"; c.n
    }
    cout << "Hello buddy"; c.1
}
```

$$\begin{aligned}
 T(n) &= c.1 + c.n + c.n + c.1 \\
 &= 2c.1 + 2c.n \\
 &= O(n)
 \end{aligned}$$

Examples

1. Selection Sort ($O(n^2)$)
2. Bubble Sort ($O(n^2)$)
3. Merge Sort ($n \lg n$)

On the other spectrum

