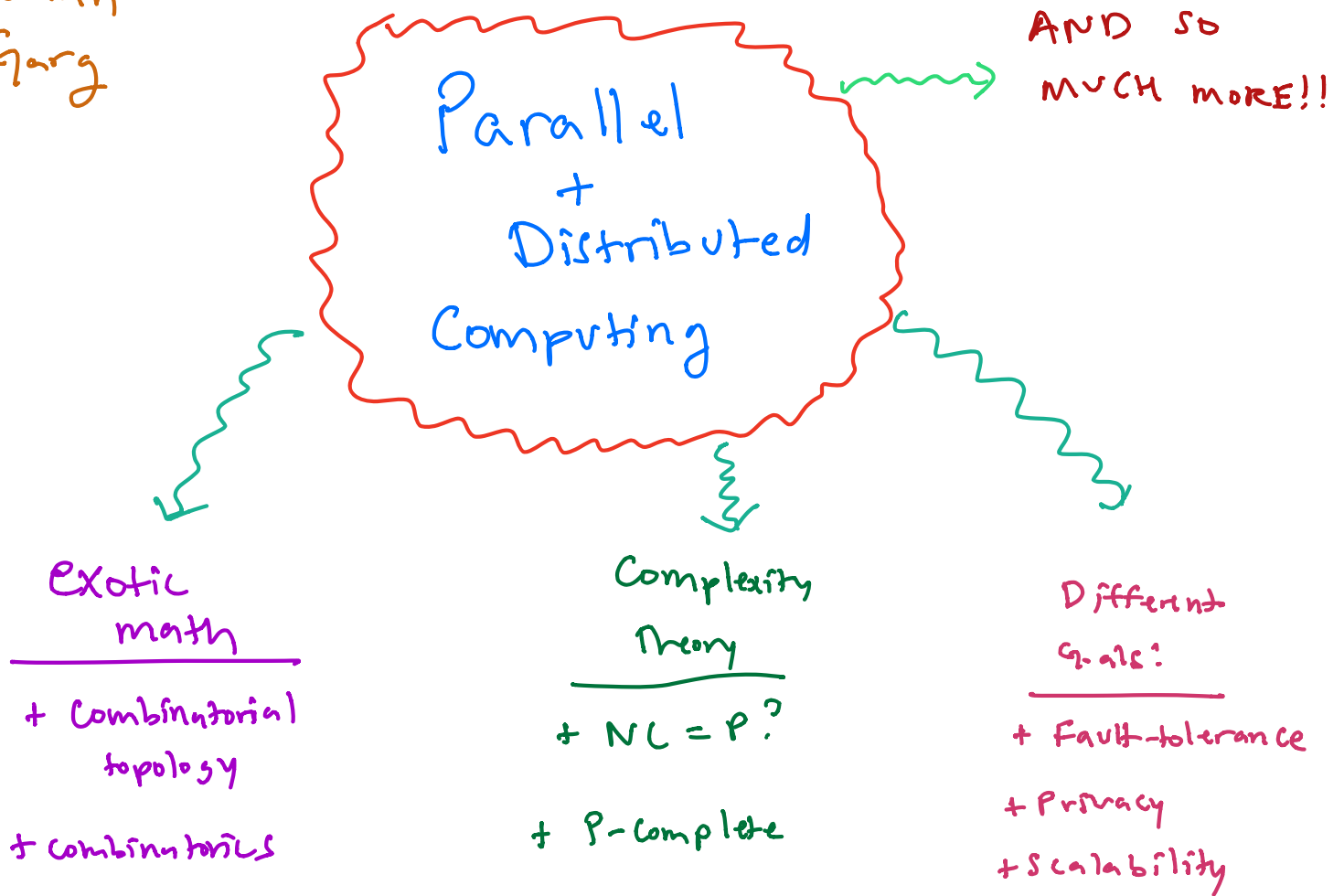


Rohan
Garg



"Distributed System: You know you have one when the crash of a computer you've never heard of stops you from getting any work done" - Leslie Lamport

Leader election: "To lead the people, walk behind them."
- Lao-Tzu

Parallel Computation: Shared memory

PRAM $\begin{cases} \text{CRCW} \\ \text{CREW} \end{cases}$

BSP - ? Look into

MPC - Massively Parallel Computation

NC - Nick's class

RNC = NC + Randomness

Solve some problem in $\text{polylog}(n)$ time

with polynomial number of processors.

MST,

Stable Marriage \in NC ??

"matching" \in Quasi-NC ~~why~~
↖

Distributed Systems; Message-passing

Synchronous: upper bound on receiving a message

Asynchronous: no upper bound

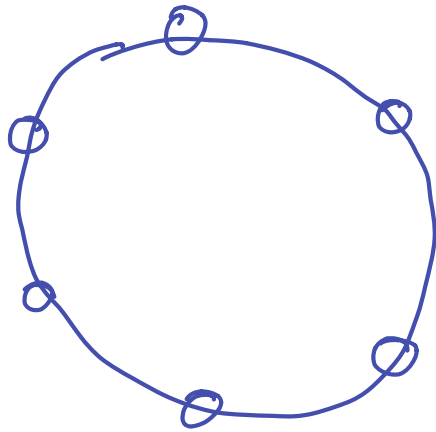
LOCAL: Messages are unbounded in size

CONGEST: Local but messages have to be $\log(n)$ in size.

Leader Election?

Network topology: Ring:

Anonymous:
Ring:

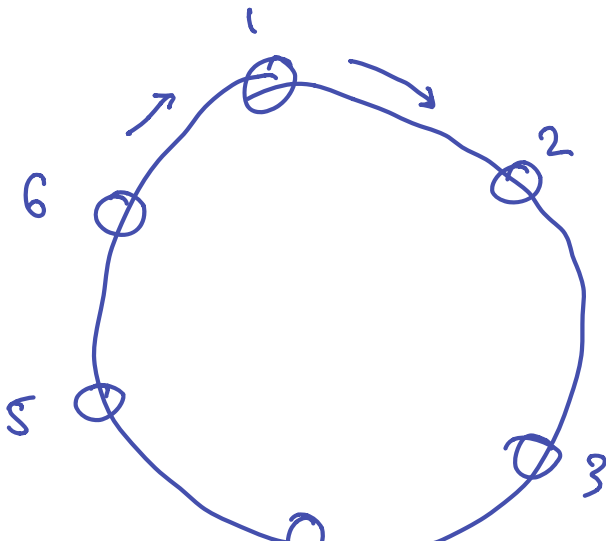


Program {

}

No deterministic alg!

Unique ID's:



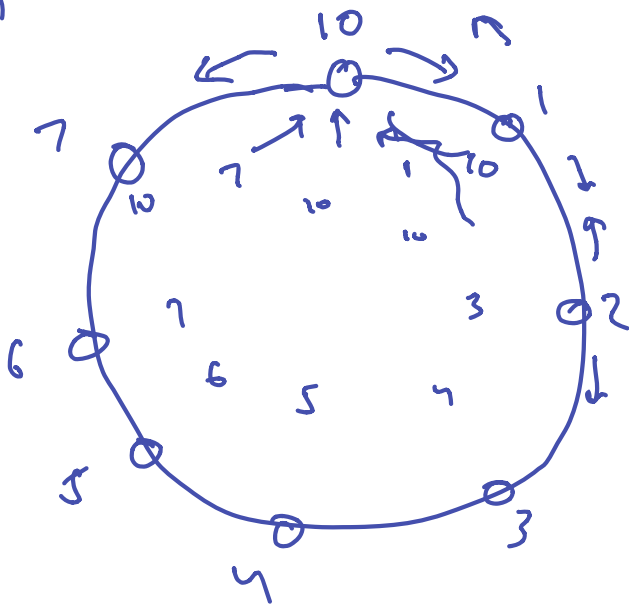
Chang-
Roberts
Alg.

~~Chang-
Roberts~~

$O(N^2)$ messages

4

Bidirectional ring:



rounds:

In round r ,

Each node knows the leader

I'll know the leader up to 2^{r-1} nodes away from me.

Hirschberg-Sinclair

Algorithm:

Left as exercise to reader.

$O(D)$
↑
time

$O(N \log N)$ messages total

Randomization:

Coin being flipped by every computer

(fair) coin \rightarrow every round we half # nodes

$\frac{1}{n}$ heads
 $\frac{n-1}{n}$ tails
 } \rightarrow Constant

\rightarrow Consensus: {Agreement}

crashes → behaving maliciously
Byzantine

→ Blockchain

⋮

Nancy Lynch - Dist. Algorithms

Joseph JaJa - Intro to Parallel Alg.

Mohsen Ghaffari → Distributed Alg
for graph problems
ETH-Z

PODC, DISC, SPAA, FUCS/STOC/SODA



Thanks!