DS MINDMAPS

2º PARTE

25TH

10 ALGOS

Movement on graph

5 th

1 Algo

Istance

Goals

Measures

Number of pebble moved

Overall Movement

Maximum movement

IND-MAX hardness

IS

max Is

3-SAT -> IND-MAX

Claim

INd-MAX approximability

Theorem hall's matching

Lemma

Lemma

Theorem

ALGO

Distributed Vertex coloring

2 Th
1 Algo

Vertex coloring
Valid vertex coloring
k-coloring
chromatic number

Delta+1 coloring ALGO

palette(v)

Claim

OGNI Ci ALMENO Δ+1 COLORI, CIOÉ
$\chi(G) \leq \Delta+1 \quad \forall G$

Mis Coloring ALGO

Complexity O(Delta log Delta log n)

Coloring and IS

Lemma MASSIMO Δ+1 ITERAZIONI

ALGO
C=1
WHILE ∃v∈V non colorato
TROVA MIS I DEL SOTTOGRAFO INDOTTO dai v∈V non colorati
ASSEGNA C AD OGNI v∈I
C++

2 -Delta Coloring ALGO

Complexity O(log n) high prob)
palette(v) = 2 sigma(v)
candidates colors

Analysis
A(v), u(v), A'(v)

Prob(v accetta)
prob(v rigetta in log n fasi)
Prob(almeno un v rigetta in log n fasi)
prob(tutti accettano in log n fasi)'

Mutex

2 Th
3 algo

Mutex problem
- Liveness condition
  - Mutual Exlusion
  - No deadlock
  - No lockout
  - Bounded waiting

Bakery ALGO
ticket
Complexity 2n R/W

Mutual ex
- **Lemma 1** $SE\ P_i\ in\ CS \Rightarrow NUM_i > 0$
- **Lemma 2** $SE\ P_i\ in\ CS,\ NUM_k \neq 0,\ k \neq i \Rightarrow NUM_k > NUM_i$

Bounded waiting

no lock

ALGO

```
CHOOSING[i] := TRUE
NUM[i] := max{NUM_0, ..., NUM_n-1} + 1
CHOOSING[i] := FALSE
FOR j:=0 _ n-1 Tq j≠i
    WAIT UNTIL CHOOSING[j] = FALSE
    WAIT UNTIL NUM[j] = 0 OR NUM[i] < NUM[j]
NUM[i] := 0
```

ENTRY. EXIT

Bounded space 2-processors mutex ALGO
Complexity 2 boolean R/W vars: w[0], w[1]

Mutual ex

no deadlock

no lock

P_0's code

```
1 w[0] := 1
2 WAIT UNTIL(w[1]=0
3
4 w[0] := 0
```

P_1's code

```
1 w[1] := 0
2 WAIT UNTIL (w[0]=0)
3 w[1]=1
4
5 IF w[0]=1 GOTO 1
6
7 w[1] := 1
```

ALGO with Priority.
Complexity 3 boolean R/W: w[01], w[1], priority

Mutual ex

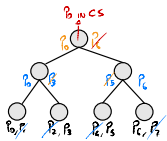
no deadlock

no lock

Bounded waiting

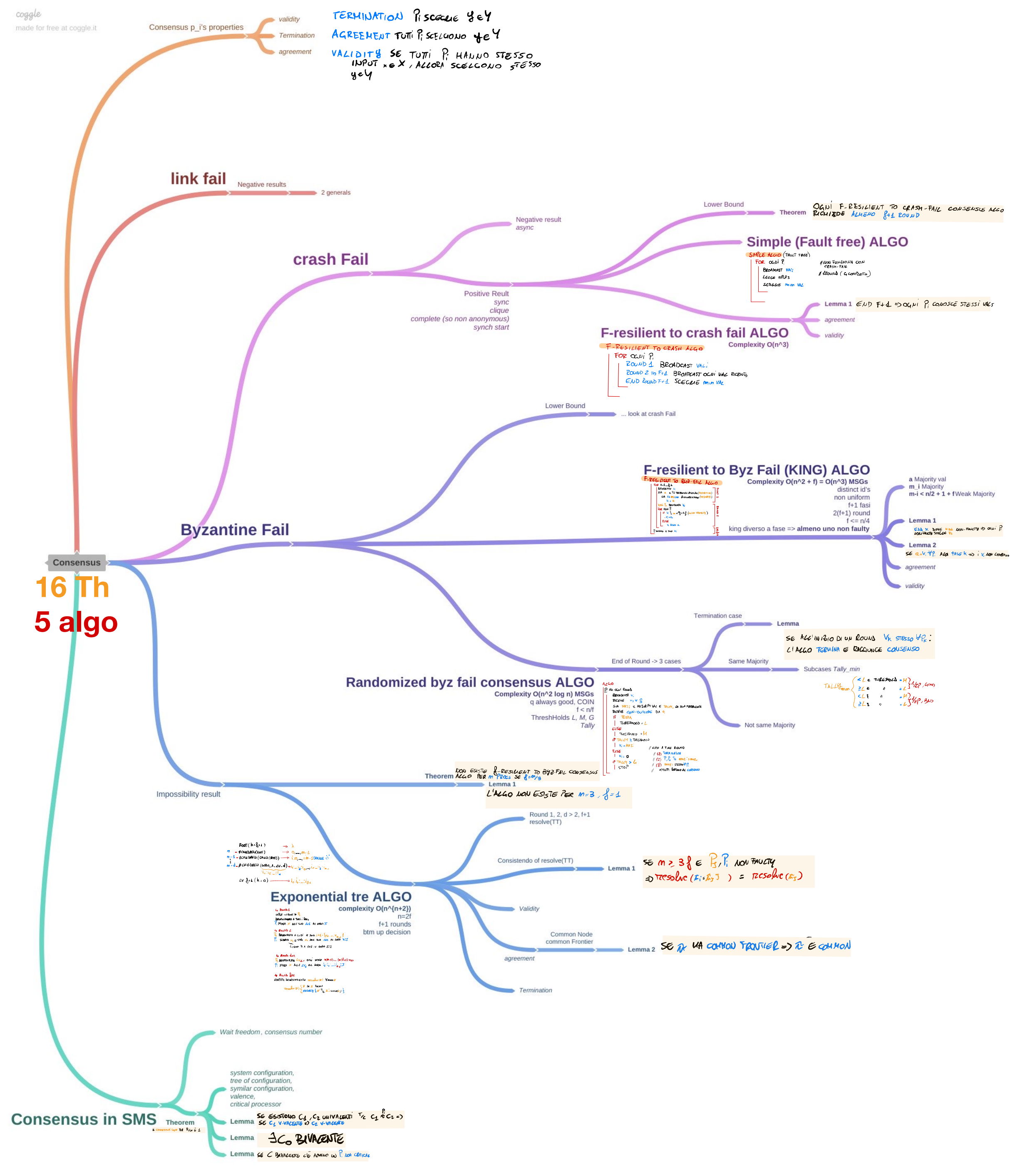
P_i's code

```
1 w[i]:=0
2 w[1-i]:=1
3 WAIT UNTIL (w[1-i]=1 OR Priority=i)
4 IF(Priority=1-i)
5    IF(w[1-i]=1) GOTO 1
6 ELSE
7    WAIT UNTIL(w[1-i]=0)
8 Priority:=1-i
9 w[i]:=0
```



Tournament tree
n=2^k

Bounded space n-processor mutex ALGO
Complexity 3(n-1) boolean R/W


coggle
made for free at coggle.it
Consensus
16 Th
5 algo
Consensus p_i's properties
validity
Termination
agreement
TERMINATION Pi SCEGLIE y∈Y
AGREEMENT TUTTI Pi SCELGONO y∈Y
VALIDITY SE TUTTI Pi HANNO STESSO INPUT x∈X, ALLORA SCELGONO STESSO y∈Y
link fail
Negative results
2 generals
crash Fail
Negative result
async
Positive Reult
sync
clique
complete (so non anonymous)
synch start
Lower Bound
Theorem
OGNI F-RESILIENT TO CRASH-FAIL CONSENSUS ALGO RICHIEDE ALMENO f+1 ROUND
Simple (Fault free) ALGO
Lemma 1
agreement
validity
F-resilient to crash fail ALGO
Complexity O(n^3)
F-RESILIENT TO CRASH ALGO
FOR OGNI Pi
ROUND 1 BROADCAST VAL
END ROUND f+1 SCEGLIE min VAL
Byzantine Fail
Lower Bound
... look at crash Fail
F-resilient to Byz Fail (KING) ALGO
Complexity O(n^2 + f) = O(n^3) MSGs
distinct id's
non uniform
f+1 fasi
2(f+1) round
f <= n/4
king diverso a fase => almeno uno non faulty
a Majority val
m_i Majority
m-i < n/2 + 1 + f Weak Majority
Lemma 1
Lemma 2
agreement
validity
Randomized byz fail consensus ALGO
Complexity O(n^2 log n) MSGs
q always good, COIN
f < n/f
ThreshHolds L, M, G
Tally
Termination case
Lemma
SE ALL'INIZIO DI UN ROUND Vk STESSO ∀Pk: L'ALGO TERMINA E RAGGIUNGE CONSENSO
End of Round -> 3 cases
Same Majority
Subcases Tally_min
Not same Majority
Impossibility result
Theorem
NON ESISTE f-RESILIENT TO BYZ FAIL CONSENSUS ALGO PER n PROCS SE f≥n/3
Lemma 1
L'ALGO NON ESISTE PER n=3, f=1
Exponential tre ALGO
complexity O(n^(n+2))
n=2f
f+1 rounds
btm up decision
Round 1, 2, d > 2, f+1
resolve(TT)
Consistendo of resolve(TT)
Lemma 1
Validity
Common Node
common Frontier
Lemma 2
agreement
Termination
Consensus in SMS
Wait freedom, consensus number
system configuration,
tree of configuration,
symilar configuration,
valence,
critical processor
Theorem
Lemma
Lemma
∃C0 BIVALENTE
Lemma