Algorithmique Répartie

Jeremy Krebs - Guillaume Soulié

Université Paris Saclay

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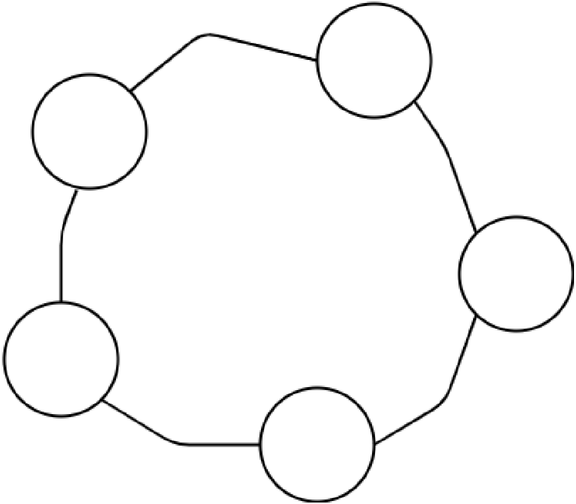
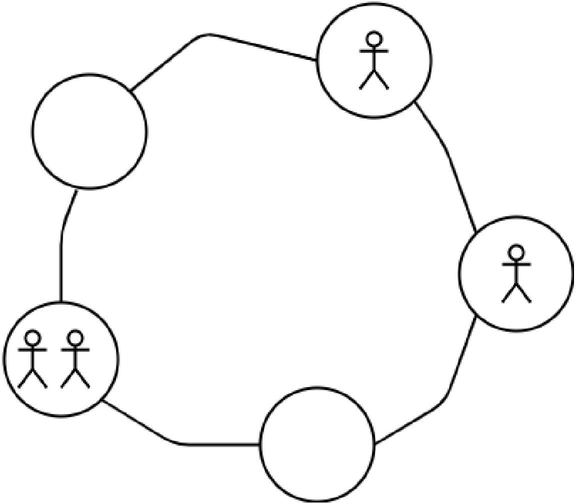
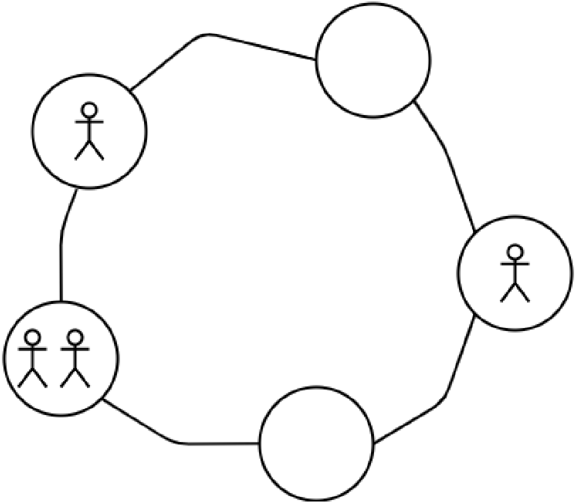
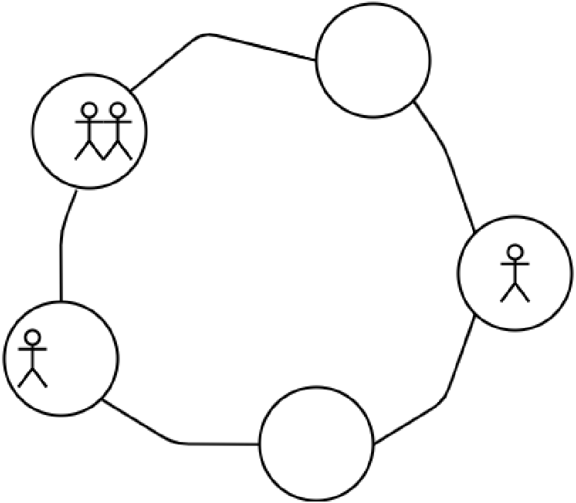
- **Pioneering work** Suzuki, I., & Yamashita, M. (1999). Distributed anonymous mobile robots : Formation of geometric patterns.
- it studies **self-stabilizing** algorithms for anonymous and oblivious robots in uniform ring network.









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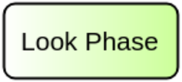

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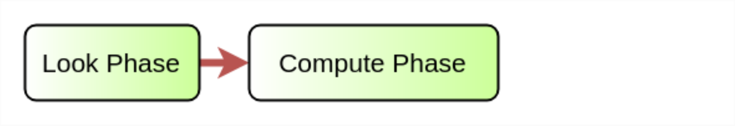

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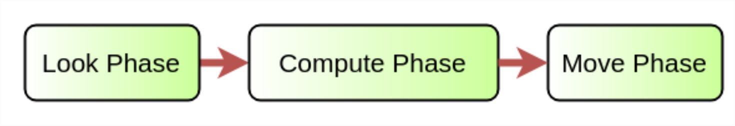

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- we propose three algorithms :
  self-stabilizing gathering algorithm
  self-stabilizing orientation algorithm
  self-stabilizing formation algorithm

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  - none of them are self stabilizing

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- Global-Strong Multiplicity Detection

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- Global-Strong Multiplicity Detection
- Local-Strong and Global-Weak Multiplicity Detection

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ASYNC Asynchronous - The robots are activated/executed asynchronously

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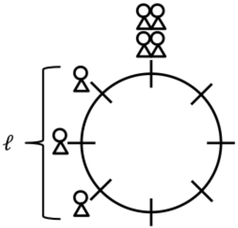

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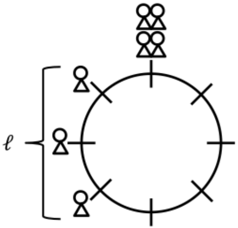

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- SSYNC Model - global-weak & local-strong multiplicity

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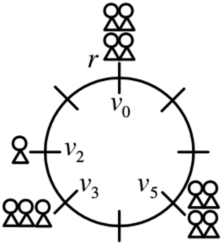

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- If there are multiple candidates, find a way to make, in expectation, exactly one of them move
- **Take care !** The scheduler is an enemy and will activate the robots in the worst way.

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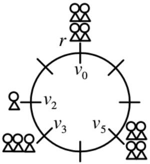
- **The scheduler is an enemy !**
- Less than M(C) nodes should move in the same direction !

Case 2 There are multiple such nodes :



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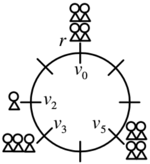

Take h_{min} the minimal distance between a M(C)-robot node and a neighboring robot node. Take V the set of nodes at distance h_{min} of a M(C)-node and R the robots on these nodes.

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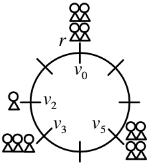

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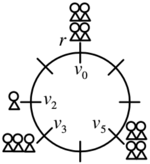

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Complexity : $O(n \log k)$ rounds and $O(kn)$ moves.

We can now apply the two previous algorithms to solve the **set formation problem**.

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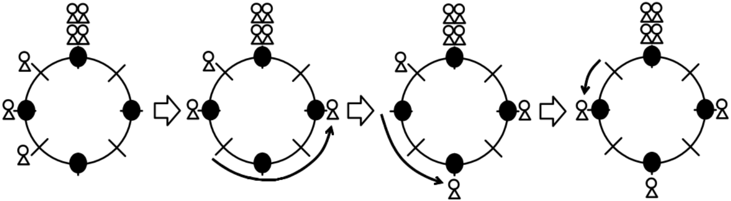

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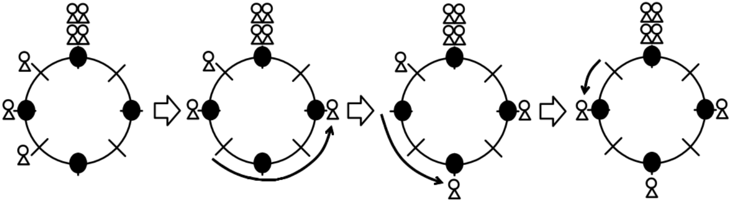

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In order to go further we could :

- Find the problems we can solve with weaker hypotheses,
- Work with a weaker scheduler, like an oblivious one,
- Work with a more complex graph than a ring.