

Terminating Ring Exploration  
with  
Myopic Oblivious Robots

*GRASTA-MAC Open Problem Session*

# Terminating Exploration

*Starting from an arbitrary configuration where no pair of robots are located on the same node*

- ✓ Exploration

*Each node must be visited by at least one robot*

- ✓ Termination

*Eventually, every robot stays idle*

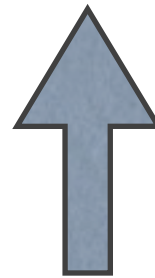
# Challenges

*What are the minimal conditions to solve the exploration problem **deterministically** (**probabilistically**)?*

*What is the minimal number of robots?*

# Related Work

[Flocchini et al., OPODIS 2007] [Devismes et al., SIROCCO 2009]  
[Lamani et al., SIROCCO 2010] [Flocchini et al., SIROCCO 2008]  
[Flocchini et al., IPL 2011] [Devismes et al., SSS 2012]  
[Devismes et al., NETYS 2015]



**Unlimited visibility**

What is the *solvability* of terminating exploration  
assuming *limited visibility*?

# Myopia

Visibility **limited** to a certain fixed distance  $\varphi$

*What is the **solvability** of terminating exploration  
assuming **visibility limited to  $\varphi$** ?*

# Results & Open Problems

$\varphi = 1$  [Datta, Lamani, Larmore, and Petit, ICDCS 2013]

- ▶ Deterministic terminating exploration possible with **synchronous** robots only.

$\varphi = 2$

- ▶ Deterministic terminating exploration enabled with **7 asynchronous** robots that start from a strongly connected configuration. [Datta, Lamani, Larmore, and Petit, APDCM 2015]
- ▶ Does there exist another algorithm?
- ▶ Does there exist an algorithm that starts from a **weak** connected configuration?
- ▶ Optimality in terms of number of robots?

# Results & Open Problems

$$\varphi = 3$$

- ▶ Deterministic terminating exploration enabled with an optimal number of asynchronous robots (**5**) that start from a strongly connected configuration.
- ▶ Deterministic terminating exploration **7** asynchronous robots that start from a **weak** connected configuration.

*[Datta, Lamani, Larmore, and Petit, APDCM 2015]*

- ▶ Does there exist a deterministic algorithm that start from a **weak** connected configuration with less robots?
- ▶ Is  $\varphi = 3$  as powerful as  $\varphi = \infty$  (with the extra requirement of initial weak connection)?
- ▶ Does there exist a generic algorithm with  $5 \leq k \leq n-1$ ?

# Results & Open Problems

$$3 < \varphi \leq n/2 \text{ (equiv. } \infty)$$

- ▶ Generic algorithm from some  $\varphi \geq 3$ ?
- ▶ Relationship between  $\varphi$  different knowledges, namely  $n$  and  $k$ ?
- ▶ Relationship between  $\varphi$  different knowledges, namely  $n$ ,  $k$  and **multiplicity**?
- ▶ Extension to other topologies?