Consensus Problems in Networks of Agents with Switching Topology and Time-Delays

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分享暨个人总结

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Some Basic Notations

- 邻接矩阵
- 邻居节点
- 决策值
- χ-一致性问题
- 平均/最大/最小一致性

- $\mathcal{A} = [a_{ij}]$
- N_i
- α
- χ
- Ave(x)/Max(x)/Min(x)

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Model Consensus Protocols

CT Model

$\dot{x}_i = u_i(t)$

DT Model

$x_i(k+1) = x_i(k) + \epsilon u_i(k), \epsilon > 0$

A1 Zero Communication Time-Delay

$u_i = \sum_{j \in N_i} a_{ij}(x_j - x_i)$

A2 Communication Time-Delay $\tau_{ij} > 0$

$u_i(t) = \sum_{j \in N_i} a_{ij}[x_j(t - \tau_{ij}) - x_i(t - \tau_{ij})]$

Laplacians

Laplacians

$$l_{ij} = \begin{cases} \sum_{k=1,k\neq i}^{n} a_{ik}, & j = i \\ -a_{ij}, & j \neq i \end{cases}$$

A1 State Evolves

$$\dot{x}(t) = -Lx(t)$$

A1 State Evolves with Switchin Topology

$$\dot{x}(t) = -L_k x(t), \;\; k = s(t)$$

A1 DT

$$x(k+1) = P_\epsilon x(k), \;\; P_\epsilon = I - \epsilon L$$

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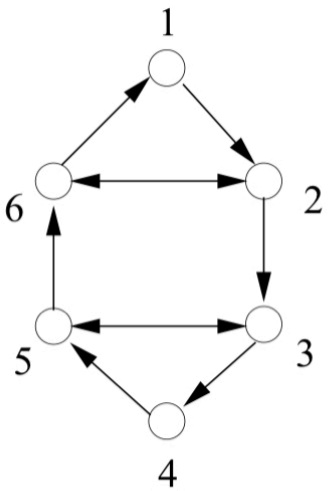
Balanced Graph

Balanced Node

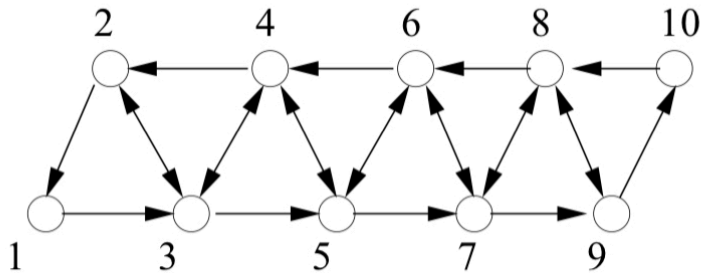
$$\deg_{out}(v_i) = \deg_{in}(v_i)$$

Balanced Graph

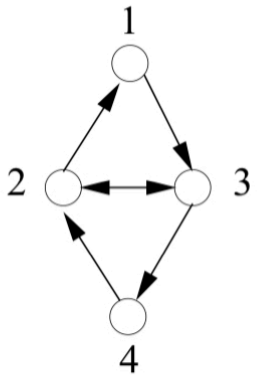
$$\deg_{in}(v_i) = \sum_{j=1}^{n} a_{ji}, \quad \deg_{out}(v_i) = \sum_{j=1}^{n} a_{ij}$$



(a)



(b)



(c)

Laplacians

$$L = \mathcal{L}(G) = \Delta - \mathcal{A}$$

Δ (degree matrix) diag($\deg_{out}(v_i)$)
$\mathcal{A}$ (adjacency matrix) $\{0,1\}$
w_r
w_l
SC (Strongly Connected)

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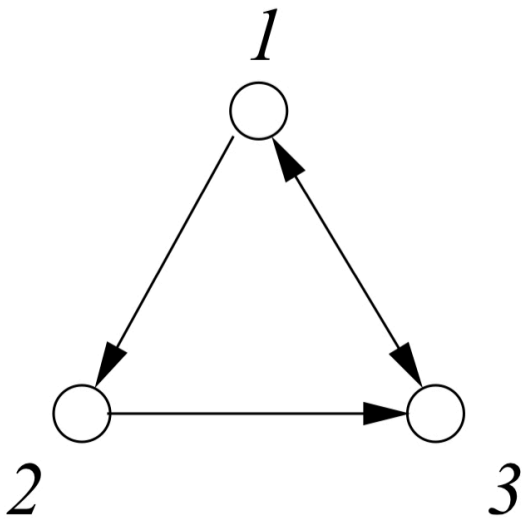
Counterexample



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And finally everything will be there

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一致性协议

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