Detection and Mitigation of Corrupted Information in Distributed Model Predictive Control Based on Resource Allocation

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5th International Conference on Control and Fault-Tolerant Systems, 2021

https://git.io/JEFGW

Algorithm 1: Secure DMPC.

Detection Phase:

$h := 0$

repeat

    Coordinator sets random $\boldsymbol{\theta}_i^{(h+1)}$

    Subsystems solve (??), and send $\boldsymbol{\lambda}_i^{\star}(\boldsymbol{\theta}^{(h)})$

    Coordinator estimates $\widehat{\widehat{P}}_i(k)^{(h)}$ and $\widehat{\boldsymbol{s}}_i(k)^{(h)}$

    $h := h + 1$

until $\|\eta_i^h - \eta^{h-1}\| \leq \epsilon$

Coordinator computes d_i using (??)

Negotiation Phase:

Coordinator initializes $\boldsymbol{\theta}^{(0)}$

$p := 0$

repeat

    Subsystems solve (??), and send $\boldsymbol{\lambda}_i^{\star}(\boldsymbol{\theta}^{(p)})$

    Coordinator updates allocation (??) using adequate versions of $\boldsymbol{\lambda}_i$ for each

    agent: $\boldsymbol{\lambda}_i^{\star}(\boldsymbol{\theta}^{(p)})$, if $d_i = 0$ and $\boldsymbol{\lambda}_{i_{\text{rec}}}$, if $d_i = 1$

    $p := p + 1$

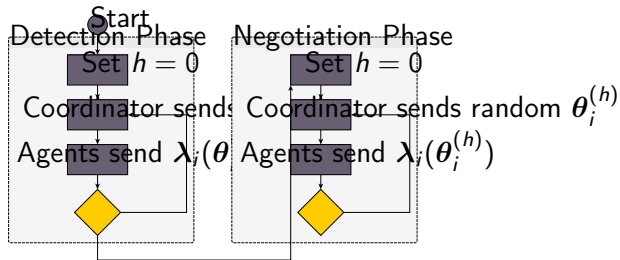**until** $\|\boldsymbol{\theta}^{(p)} - \boldsymbol{\theta}^{(p-1)}\| \leq \epsilon$

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Figure: Scheme of DMPC using a *coordinator* and *M* agents.

Algorithm 2: Quantity decomposition based DMPC.

Coordinator initializes $\boldsymbol{\theta}^{(0)}$

$p := 0$

repeat

  Subsystems solve (**??**), and send $\boldsymbol{\lambda}_i^\star(\boldsymbol{\theta}^{(p)})$

  Coordinator updates allocations (**??**)

  $p := p + 1$

until $\|\boldsymbol{\theta}^{(p)} - \boldsymbol{\theta}^{(p-1)}\| \leq \epsilon$

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Make Titles Informative. Use Uppercase Letters.
Subtitles are optional.

- Use `itemize` a lot.
- Use very short sentences or short phrases.

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You can create overlays. . .

- using the pause command:
  - First item.
  - Second item.
- using overlay specifications:
  - First item.
  - Second item.
- using the general uncover command:
  - First item.
  - Second item.

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Summary

1. Resource allocation based DMPC is vulnerable to attacks.

2. Sub-problems structure has time invariant parameters.

3. Attack can be estimated using these parameters.

- Outlook
  - Inequality Constraints yield Hybrid behavior
  - Non-linear attack model

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For Further Reading I

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Springer, 2014, vol. 69.

P. Velarde, J. M. Maestre, H. Ishii, and R. R. Negenborn,
"Scenario-based defense mechanism for distributed model predictive control,"
2017 IEEE 56th Annual Conference on Decision and Control (CDC). IEEE, Dec 2017, pp. 6171–6176.

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Journal of This and That, 2(1):50–100, 2000.

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Questions?

Repository
https://github.com/Accacio/SysTol-21

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