Lero THE IRISH SOFTWARE RESEARCH CENTRE
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Improving security and resilience of Cyber Physical Systems

Distinction between attacks and faults

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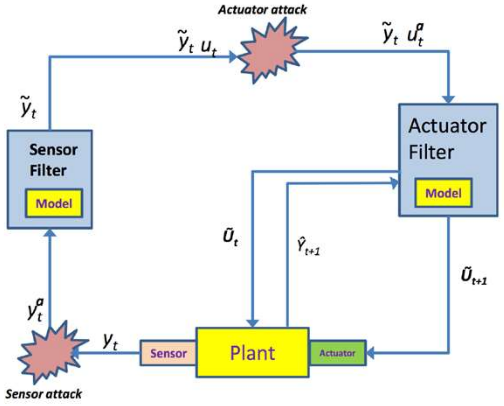
❑ General Problem



Can we create a tool that can help Cyber Physical Systems in ***detecting***, ***identifying*** and ***correcting*** an anomaly *whenever* one would occur?

Can it be used for critical systems?

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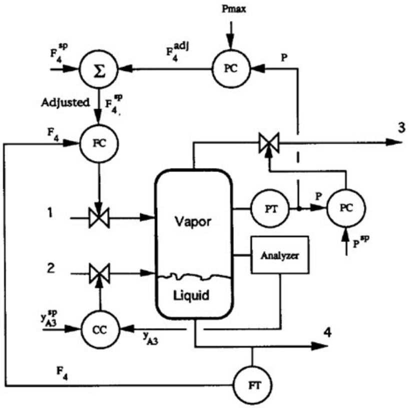
❑ Impact

- Innovative: combination of model based and data driven techniques;
- Adaptable to different systems;
- Efficient and reactive.



Model of the Tennessee Eastman Process, used for testing. (Ricker, 1993)

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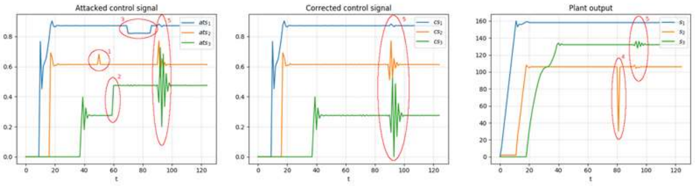
❑ Methodologies

- Pure model based: $x_i = f_j^{-1}(y_j)$;
- Residuals study: $r_i = \tilde{y}_k - C\hat{x}_k$;
- Algebraic, residuals and patterns: $r_i,\ \frac{\delta}{\delta t}^{(I,II,III)} y$;
- Data driven: NN, HMM, LSTM.

❑ Results

- Anomaly distinction: attacks vs faults;



- Increased NN detection and identification success rate from 10% to 90%.

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❑ Future

- Integration of HMM and LSTM methods;
- Improving identification effectiveness;
- Testing on real systems data (e.g. FCU and HVAC systems).

❑ Publications

- Physics-Based Methods for Distinguishing Attacks from Faults, CENICS 2017
- Comparing Physics-Based Methods for Distinguishing Attacks from Faults, DX'18

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