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Università di Pisa

FORESEEN

PRIN PNRR 2022

PROJECT WORKSHOP

FORMAL METHODS FOR ATTACK DETECTION IN AUTONOMOUS DRIVING SYSTEMS

Università degli Studi di Milano
Università degli Studi del Molise
Università degli Studi di Palermo
Università di Pisa

Workshop program

14:00	Project overview	
	Cinzia Bernardeschi (PI)	Università di Pisa
14:15	Models and Controllers for Self-driving Vehicles	
	Adriano Fagiolini	Università degli Studi di Palermo
14:30	CPS model-based attack injection and simulation traces analysis	
	Dario Pagani	Università di Pisa
14:50	Multi Radio Access Technology platooning	
	Christian Quadri	Università degli Studi di Milano
15:10	Formal Models Generation and Properties Specification	
	Vittoria Nardone	Università degli Studi del Molise
15:30	Closing	
	Cinzia Bernardeschi (PI)	Università di Pisa

PROJECT OVERVIEW

Starting date: 30/11/2023
Ending date: 30/11/ 2025 extended to 28/02/2026

Project type:
PRIN PNRR
Funding body:
MINISTERO (MUR)

Project identification number:
P2022WYAEW

Research units:
- Università di PISA
- Università degli Studi del MOLISE
- Università degli Studi di MILANO
- Università degli Studi di PALERMO

- Multi-disciplinary project
- Strict collaboration between partners
- Two research fellowship: first year/second year

Project objective

The main objective of the project is the development of a ***formal-method based methodology*** with *supported tools* for the detection of sensor and actuator **attacks** in autonomous driving systems.

While formal methods usually involve expensive computations, our methodology consists in using formal methods to generate simple tests that can be run online on limited resources available in a CAV.

The results of FORESEEN enables ***on-line monitoring services development***.

DELIVERABLES and MILESTONES

***Milestone 1**: CPS modelling, identification of critical attack points and attack scenarios*
-*Deliverable D1.1*: Report on the component and system definition of the CPS
-*Deliverable D1.2*: Report on threats analysis and identification of critical physical devices
-*Deliverable D1.3*: Report on attack scenarios and their impact on the sensory and actuation systems

***Milestone 2**: Data set generation without attacks*
-*Deliverable D2.1*: Report on co-simulation framework features and configurable parameters to generate trace dataset

***Milestone 3**: Data set generation with injected attacks*
-*Deliverable D3.1*: Report on how to include and configure attacks in co-simulation architectures

DELIVERABLES and MILESTONES

***Milestone 4**: Formal models generation and robustness analysis*

-*Deliverable D4.1*: Report on the process to build a formal model for vehicular behavior traces and on-line tests generation

-*Deliverable D4.2*: Report on the use of Abstract Interpretation for Robustness assessment

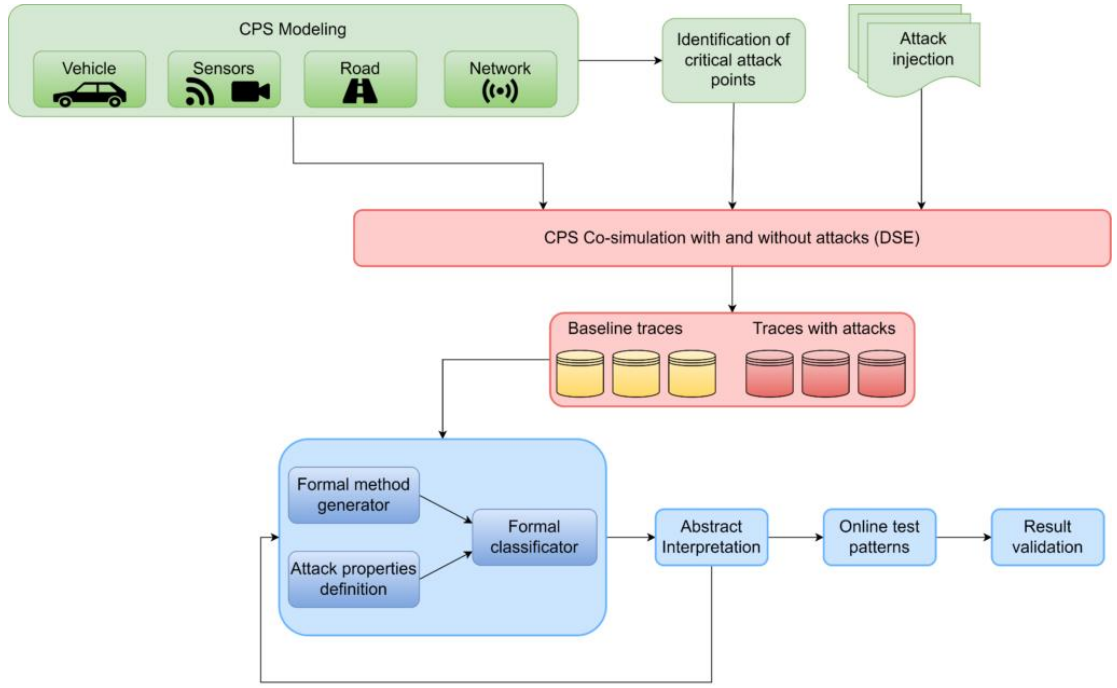
***Milestone 5**: Validation of results*

-*Deliverable D5.1*: Report on the use case and requirement definitions

-*Deliverable D5.2*: Final report on the application of the FORESEEN to the use case

Project poster:
https://foreseen.dii.unipi.it/wp-content/uploads/2024/09

The FORESEEN methodology



Closing

The FORESEEN project

- produced a platoon simulation case study, **based on well-known modeling tools**, provided with **a clear interactive user interface** that can be used by different users to gain insights on the CAV
- delivered **patterns of attacks** to the platoon and a data set of **simulation traces** generated in different scenarios
- using formal methods and abstraction delivered results that can enable a runtime monitor to defense against attacks

Dissemination of results

- papers presented / published at conferences/ workshops
- project poster presentation
- one journal paper accepted and one in preparation

Project website: foreseen.dii.unipi.it

Publications:
https://foreseen.dii.unipi.it/publications/

Project Github repository:
https://github.com/ForeseenPRIN

Contact: https://foreseen.dii.unipi.it/contacts/