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Unicycle and omnidirectional mobile robot fault detection and isolation

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Unicycle and omnidirectional mobile robot fault detection and isolation

Collaborators

- Laboratoire d'Informatique et des Systèmes LIS
- ST Microelectronics, Rousset

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OBJECTIVES

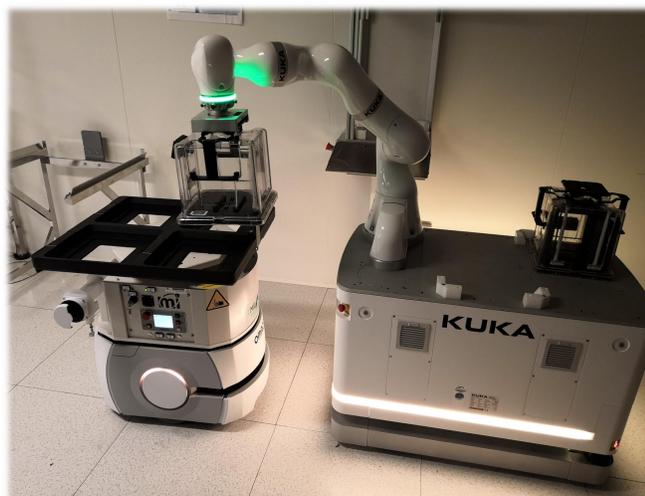
- Unicycle and omnidirectional mobile robot actuator and sensor fault detection and isolation.
- Actuator state of health supervision and its impact on the robot behavior study.

UNICYCLE MOBILE ROBOT DIAGNOSIS

Unicycle mobile robots are characterized by two actuated wheels and one steering wheel.

Actuator and sensor fault detection and isolation using Kalman filter based on the mathematical model.

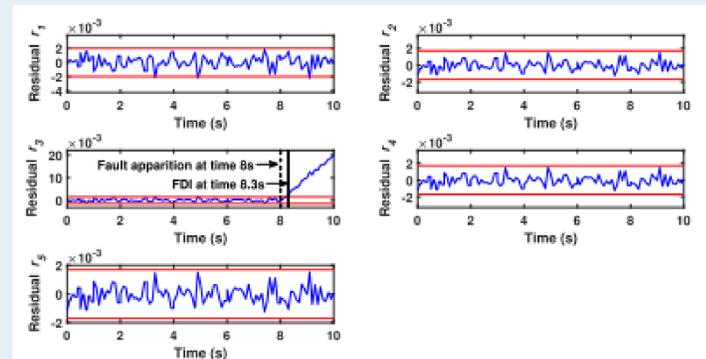
Fault Res.	\emptyset	E_r	E_l	W_r	W_l	G_1	G_2	G_3
R_1	0	1	0	1	0	0	0	0
R_2	0	0	1	0	1	0	0	0
R_3	0	0	0	1	1	0	0	0
R_4	0	0	0	1	1	0	0	0
R_5	0	0	0	1	1	0	0	0
R_6	0	0	0	0	0	1	1	0
R_7	0	0	0	0	0	1	0	1
R_8	0	0	0	0	0	0	1	1



OMNIDIRECTIONAL MOBILE ROBOT DIAGNOSIS

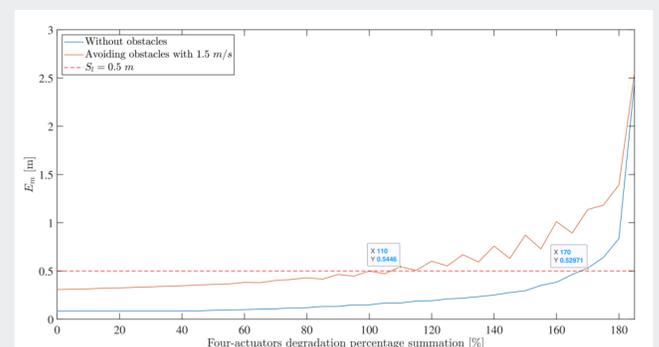
Omnidirectional mobile robots are characterized by their ability of moving in any direction without any reorientation.

Based on the dynamic model, and using the extended Kalman observer, sensor and actuator additive faults are detected and isolated.



OMNIDIRECTIONAL MOBILE ROBOT ACTUATOR SUPERVISION

Using a bank of unknown input observers, actuator degradation are detected and easily isolated. Added to that, the degradation is estimated by filtering the residuals. After that, a methodology is proposed to study the impact of the actuators state of health on the robot behavior. Then, safety limits are defined to determine the maximum reachable degradation while respecting the fab working conditions.



The main objective is to provide a decision-making support regarding if stopping the robot is required.