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Data-driven Discovery of The Quadrotor Equations of Motion Via SINDy

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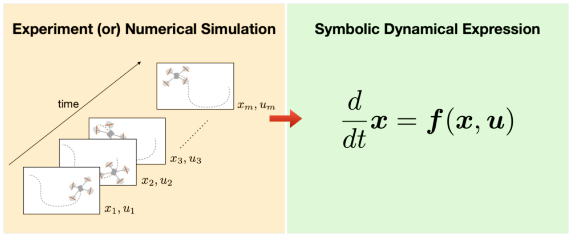
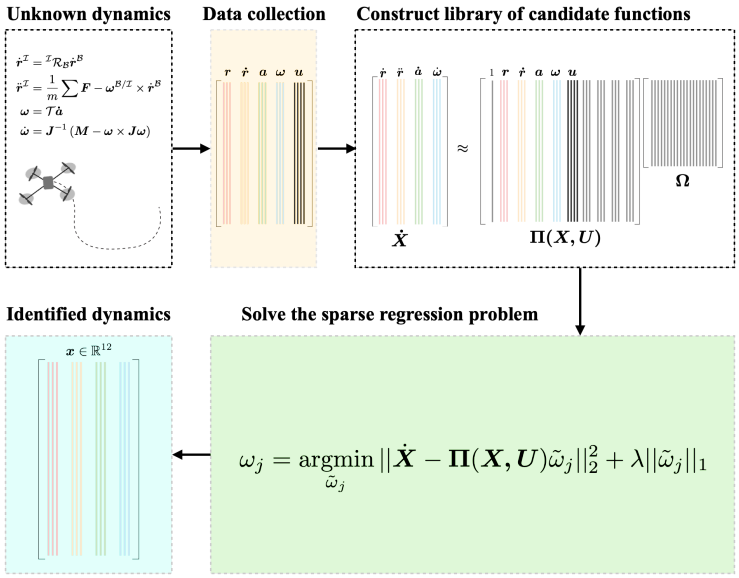
Main takeaway

Goal: We want to Discover the quadrotor Equations of Motion symbolically from data

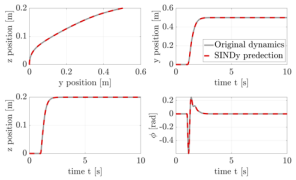


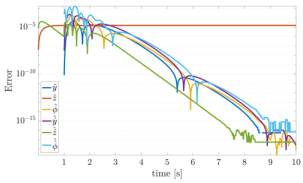
This research highlights the application of the SINDy algorithm in extracting the quadrotor mathematical model from data. The predicted states exhibit at most a RMSE of order of magnitude approximately 10^{-4} manifestation of the algorithm's effectiveness.

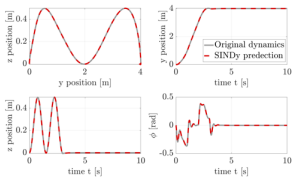
Methodology

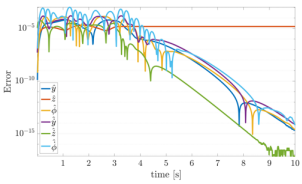


Results and Conclusion









States	SINDy	Mathematical Model
$\dot{y}$	$1.000\dot{y}$	$1.000\ \dot{y}$
$\dot{z}$	$1.000\ \dot{z}$	$1.000\ \dot{z}$
$\dot{\phi}$	$0.993\ \dot{\phi}$	$1.000\ \dot{\phi}$
$\ddot{y}$	$-5.549\ u_1 \sin(\phi)$	$-5.5556\ u_1\ \sin(\phi)$
$\ddot{z}$	$-9.811 + 5.556\ u_1 \cos(\phi)$	$-9.81 + 5.556\ u_1 \cos(\phi)$
$\ddot{\phi}$	$4000.000\ u_2$	$4000.000\ u_2$

Acknowledgements

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