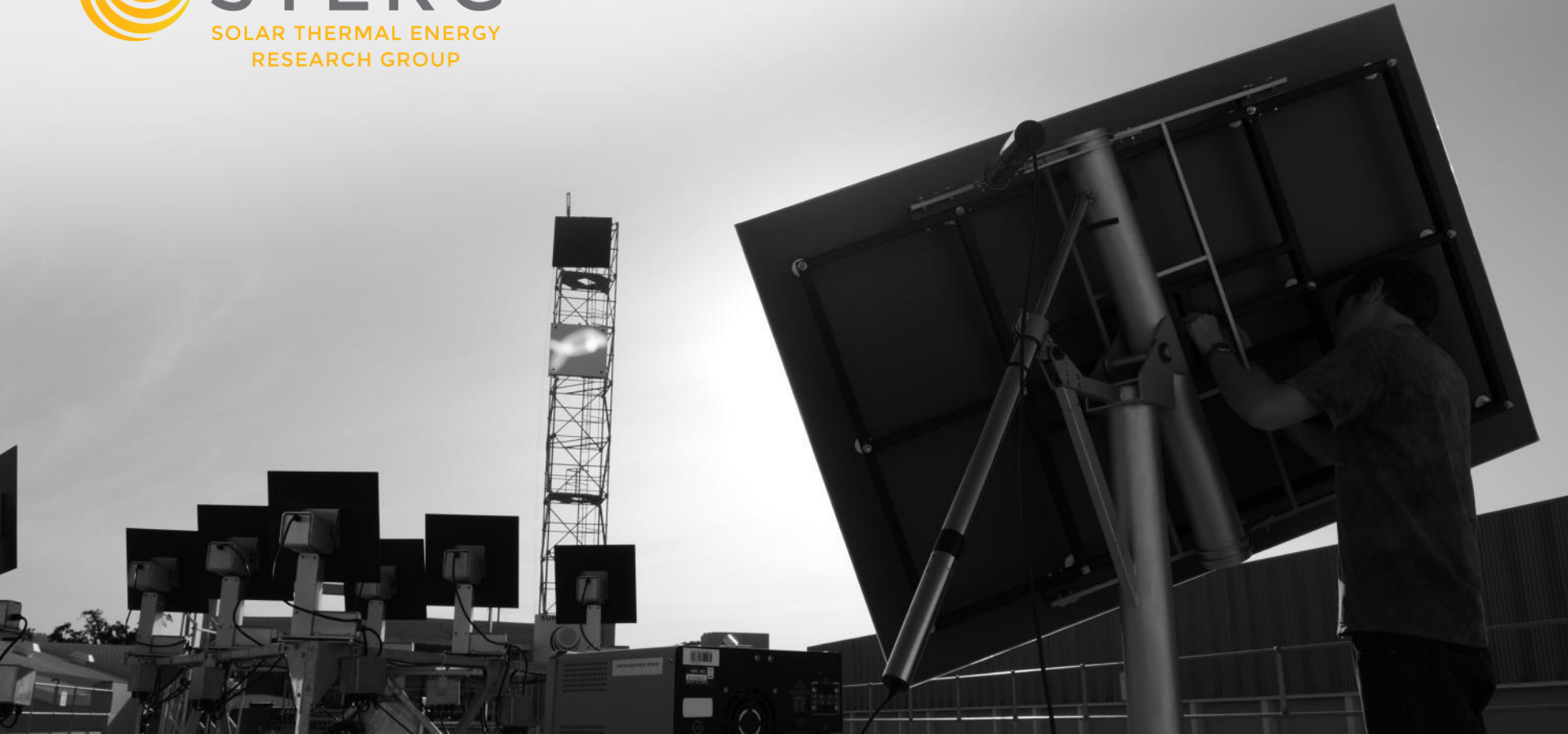




STERG

SOLAR THERMAL ENERGY
RESEARCH GROUP



An accurate altitude estimator for an Unmanned Aerial Vehicle (UAV)

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University of Stellenbosch
Centre for Renewable and Sustainable Energy Studies (CRSES),
University of Stellenbosch

Content



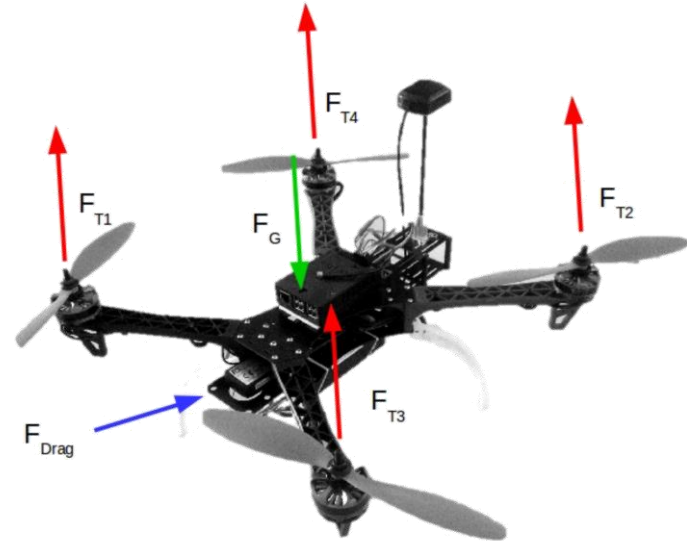
- Background
- Methodology
 - Problem Formulation
 - Simulation
 - Experimentation
 - Results
- Conclusions

Background



Unmanned Aerial Vehicles

- What are UAVs?
- How may UAVs serve a CSP plant?



Background



Challenges

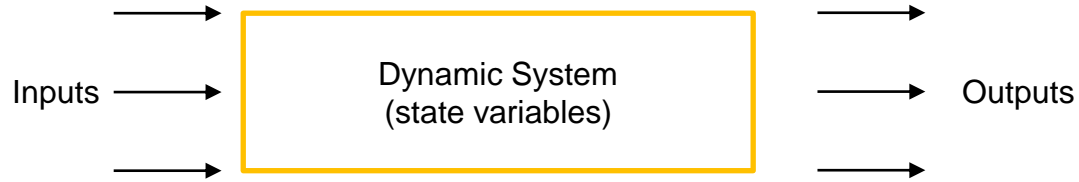
- Obstacle Avoidance
- Accurate Navigation
 - Control System
 - State Estimation



Background



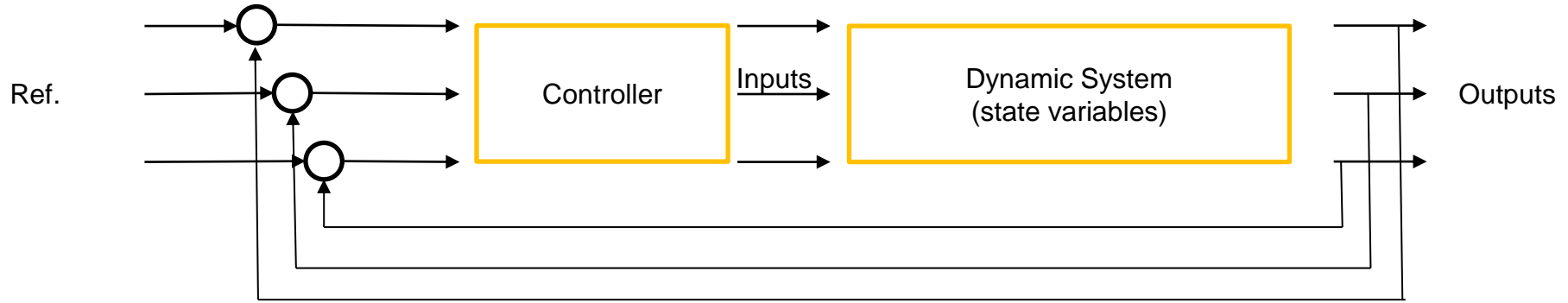
System Modelling



Background



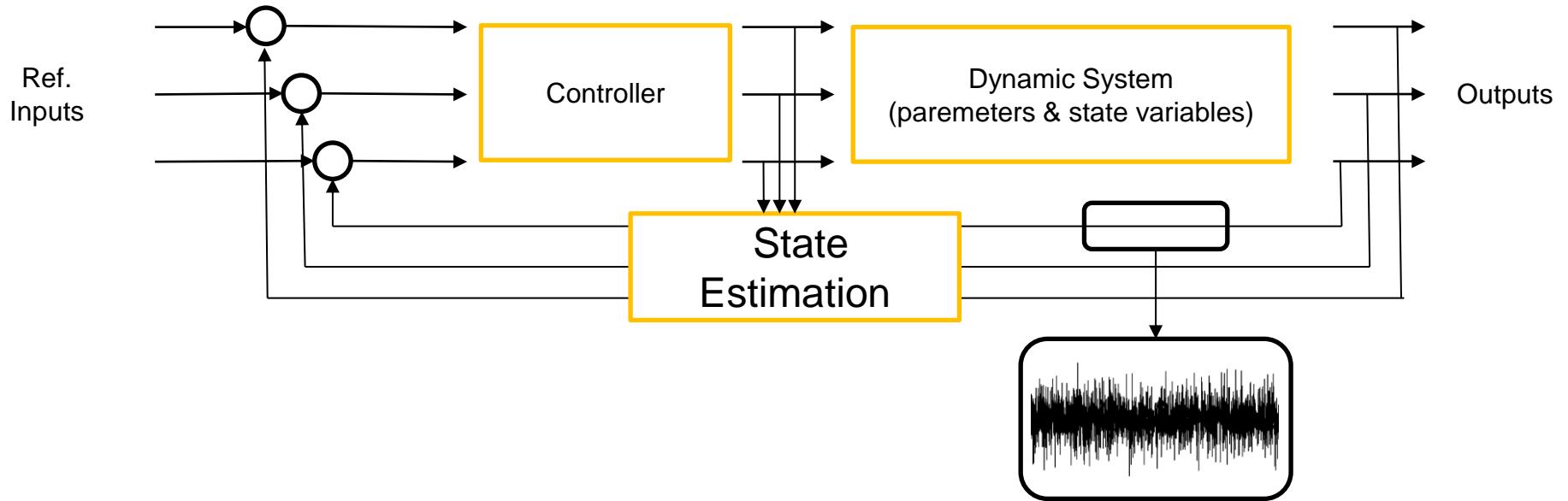
Feedback Control



Background



State Estimation

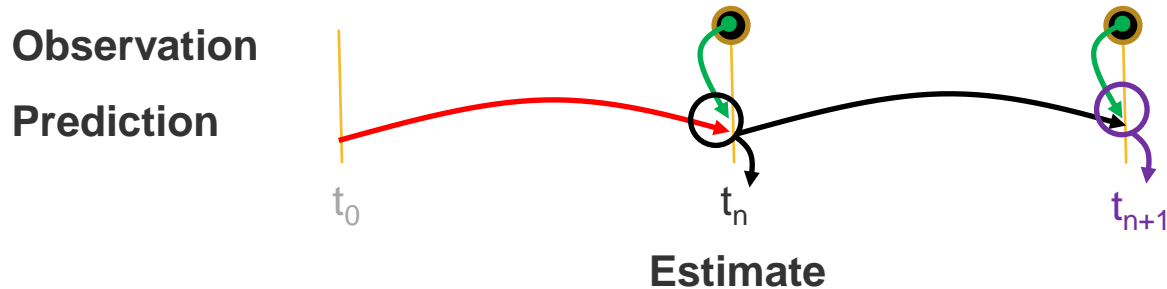


Background



The Kalman Filter

- Sensor fusion
- Iterative (Real time)

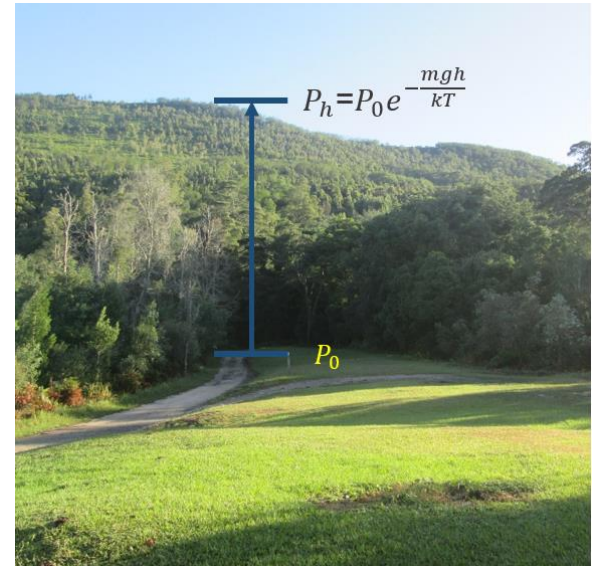


Methodology



Problem Formulation & Proposed Solution

- Bad altitude estimates
- Fuse accelerometer/ GPS

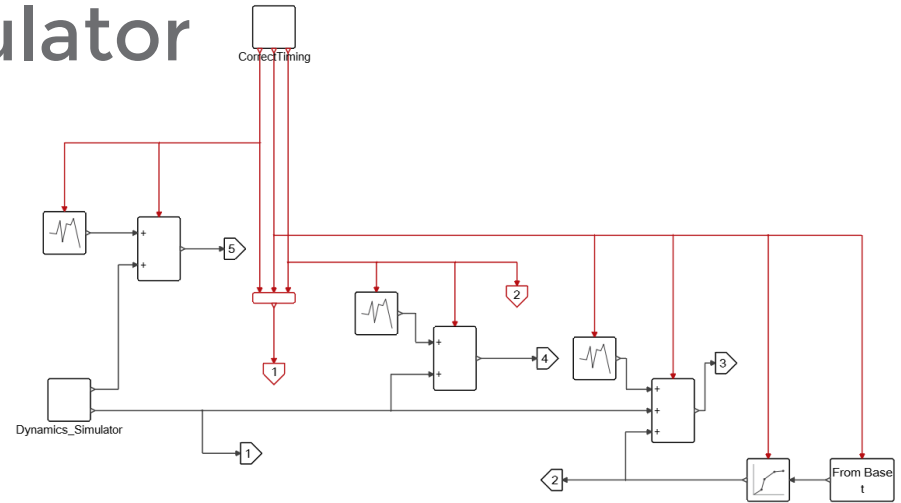
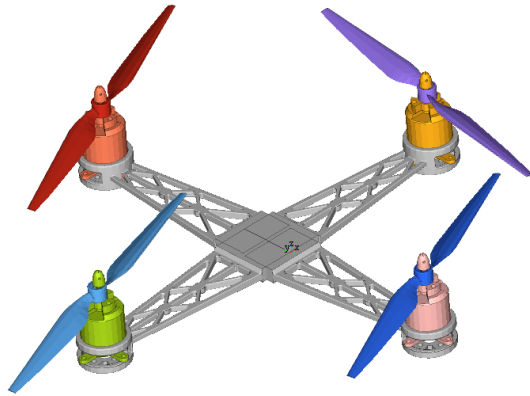


Methodology



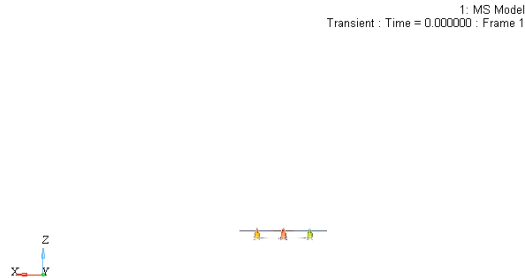
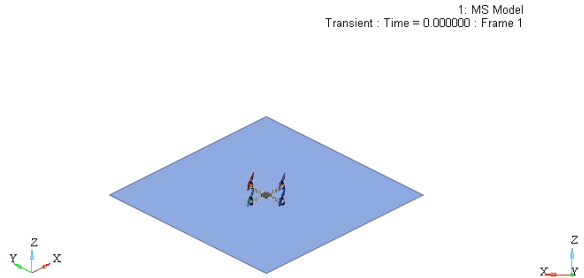
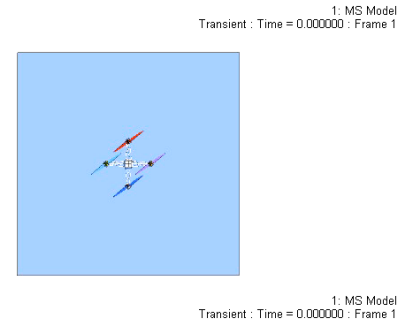
Simulation

- System Identification
- Measurement Simulator



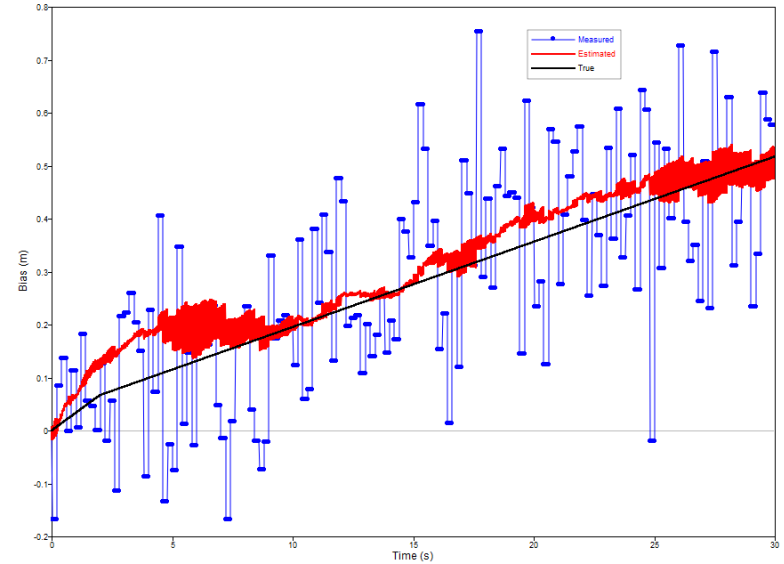
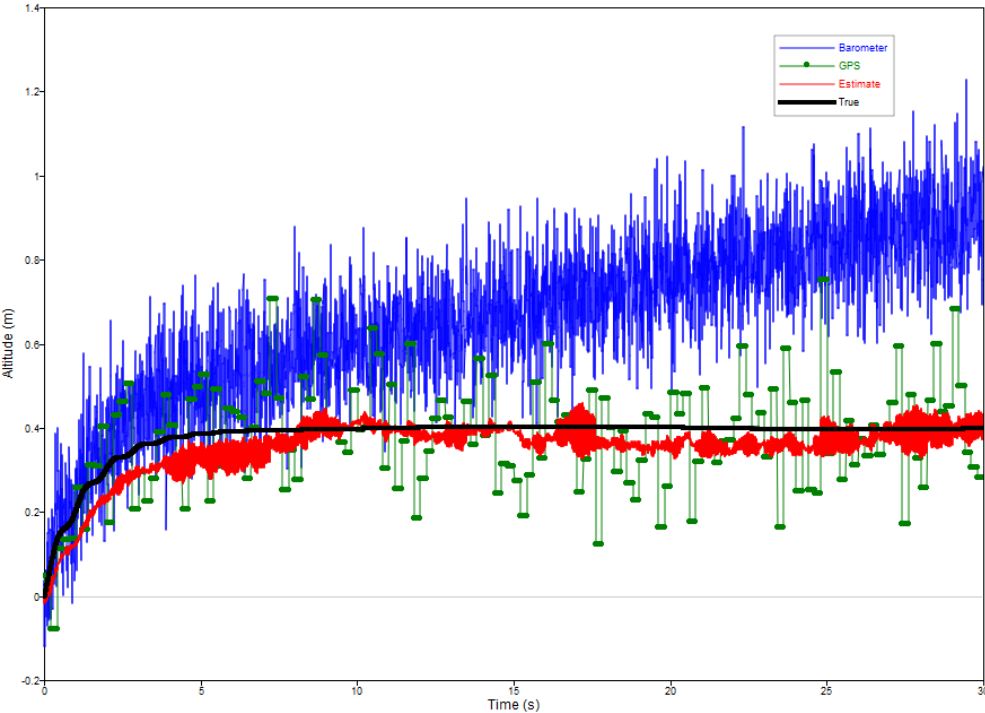
Methodology

Simulation Details



Methodology

Simulation Results



Methodology



Current/Future Work

- Implementation (Pixhawk Autopilot)
- Experimental validation of estimation performance

Conclusions



- Better Estimates than what any one sensor can provide alone
- Estimator does not suffer pitfalls of individual sensors
- Estimator is not sensitive to environmental changes

Thank You

ACKNOWLEDGEMENTS:

NRF, CRSES, STERG,
M&M Engineering

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