Absolute scale velocity determination combining visual and inertial measurements for micro aerial vehicles

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Team Chroma, INRIA

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State estimation for drones

State estimation for drones

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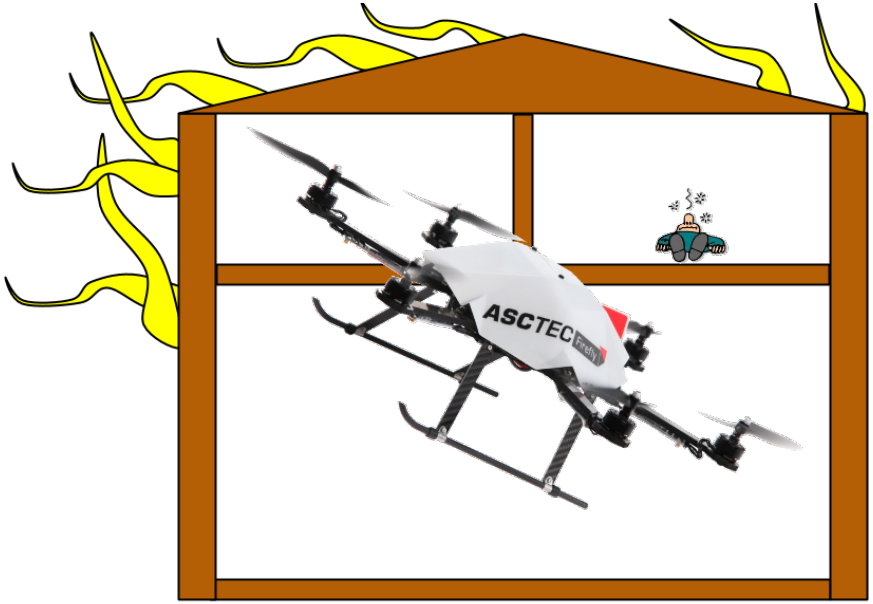
State estimation for drones



State estimation for drones

Localization in **various environments**

State estimation for drones

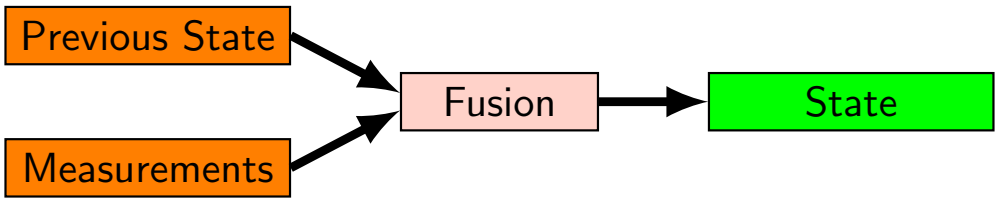
Localization in **various environments**

Reliable sensors:

- Camera;
- Inertial Measurement Unit (IMU).

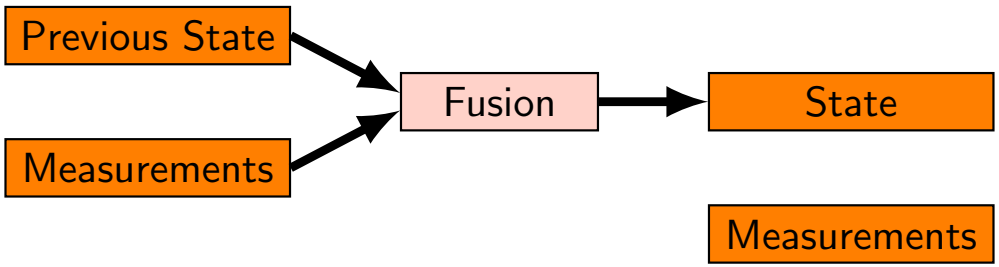
Visual-inertial sensor fusion

Filter based method



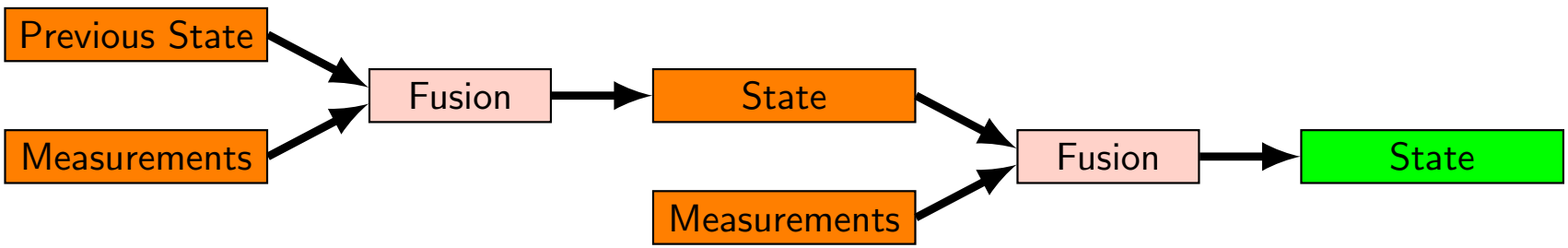
Visual-inertial sensor fusion

Filter based method



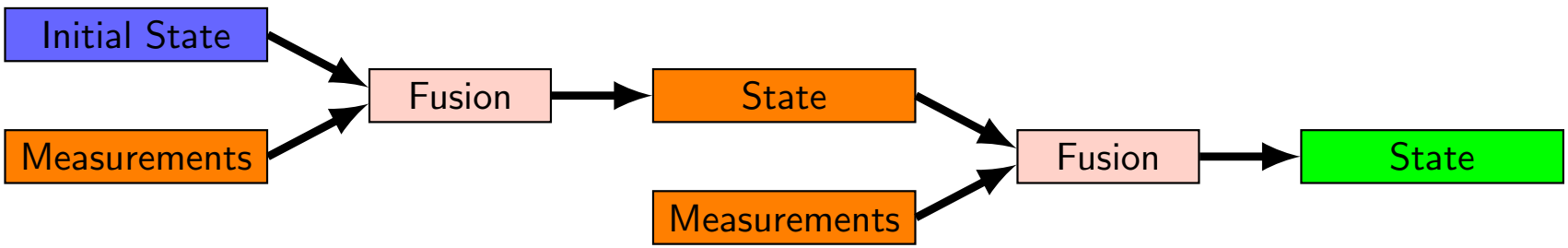
Visual-inertial sensor fusion

Filter based method



Visual-inertial sensor fusion

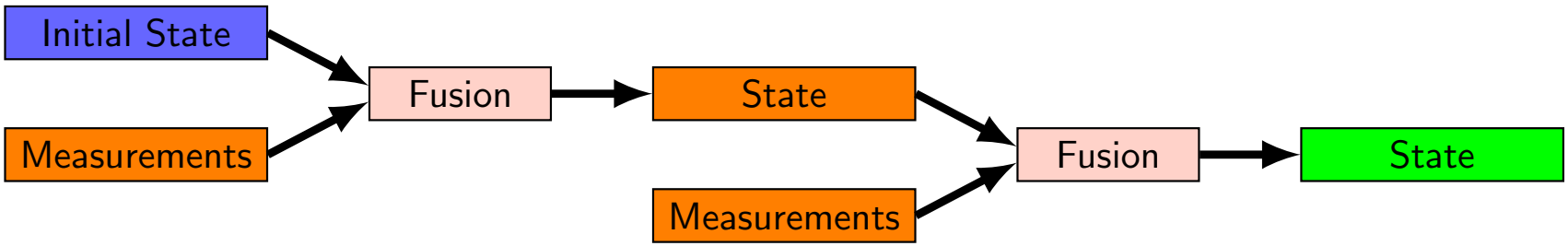
Filter based method



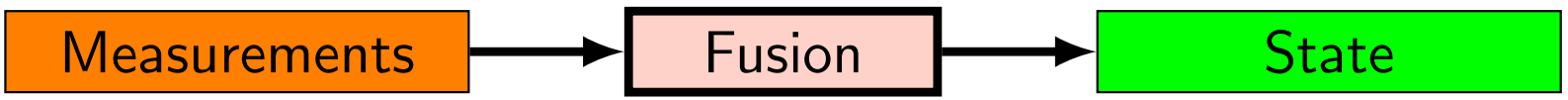
How to recover the **initial state**?

Visual-inertial sensor fusion

Filter based method



How to recover the **initial state**?
We need a **deterministic solution**



The Closed-Form Solution

Transactions on Robotics (T-RO) 2012
International Journal of Computer Vision (IJCV) 2014

The Closed-Form Solution

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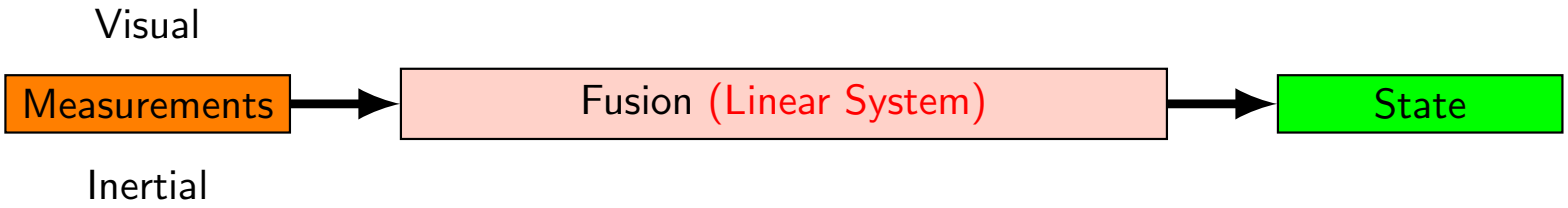
Theory:



The Closed-Form Solution

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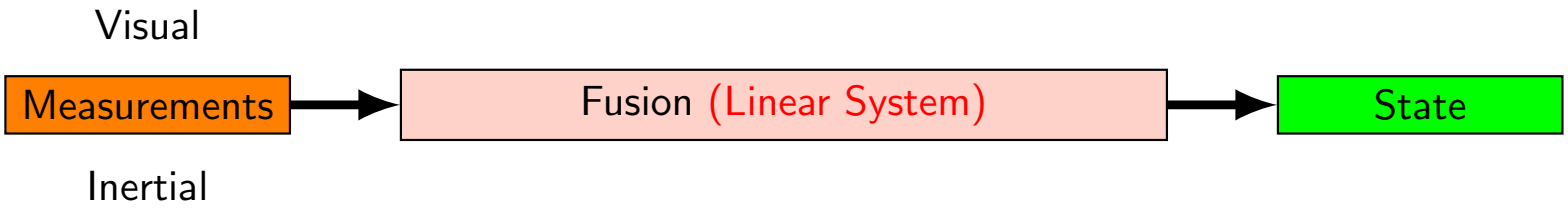
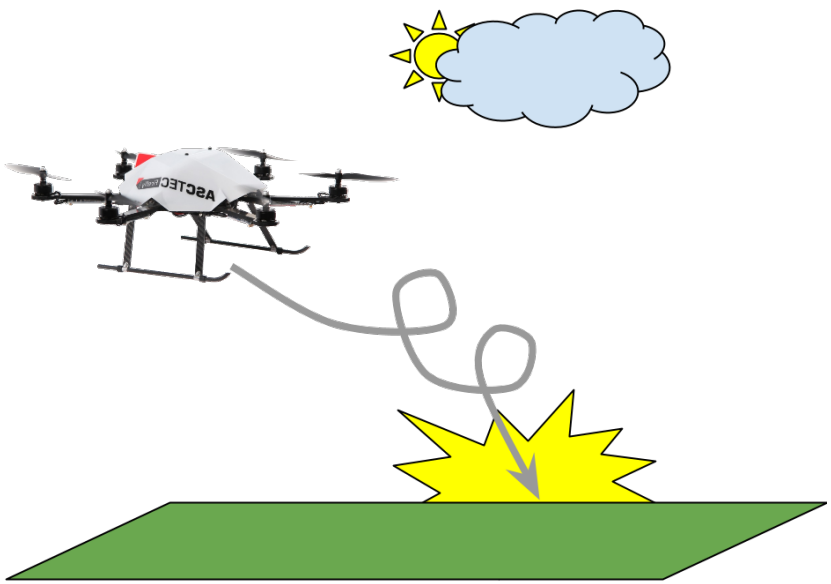
Theory:



Practice:

50% error on speed estimation



The Closed-Form Solution

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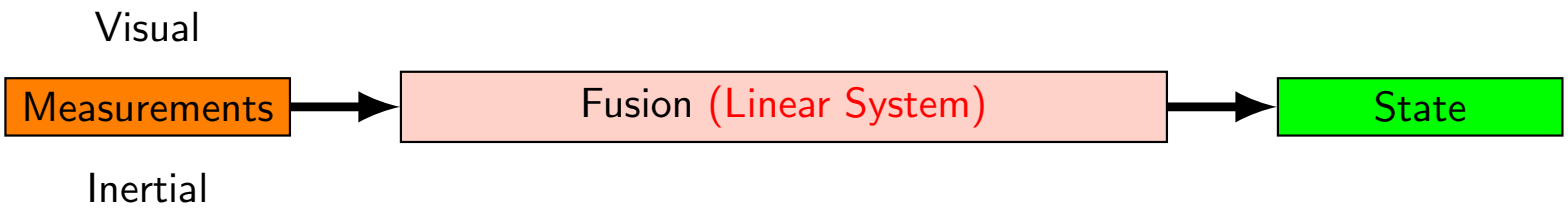
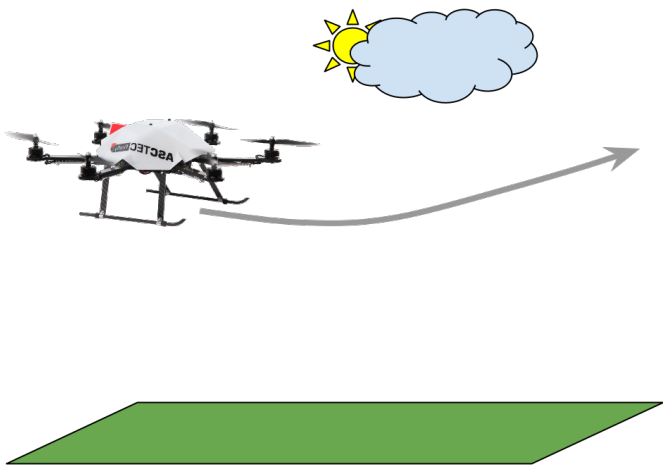
Theory:

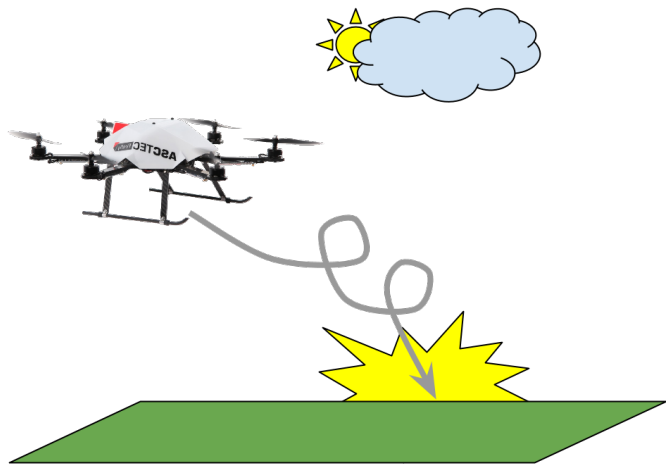


Practice:

Acclerometer bias?



Gyroscope bias?



The Closed-Form Solution

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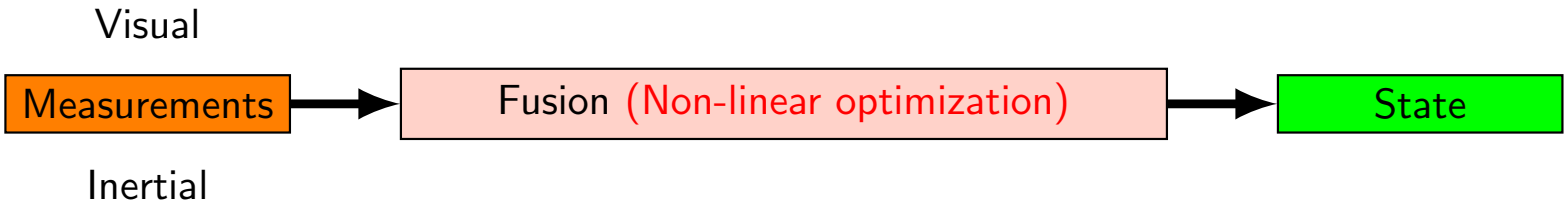
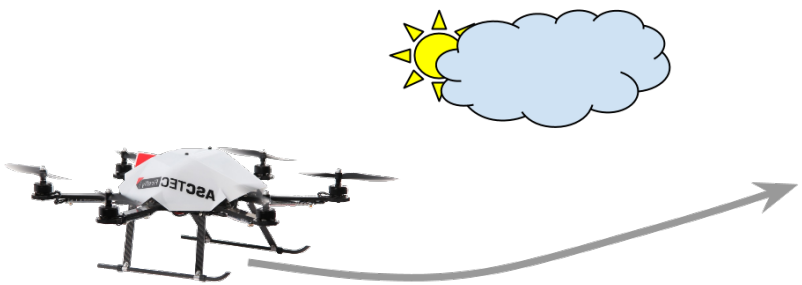
Theory:



Practice:



Optimization to recover the gyroscope bias

10% error on speed estimation

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