

Real-Time Distributed IMU

with an Implemented **Sensor-Network Processing Framework**

Lewis Collum, Mahesh Banavar

1. Packaging

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{ "name": "Acceleration",  
  "millis": 1053744,  
  "values": [0.214, 8.892, 3.234] }  
  
{ "name": "Rotation",  
  "millis": 1053745,  
  "values": [0.024, 0.576, 0.816, 0.016] }
```

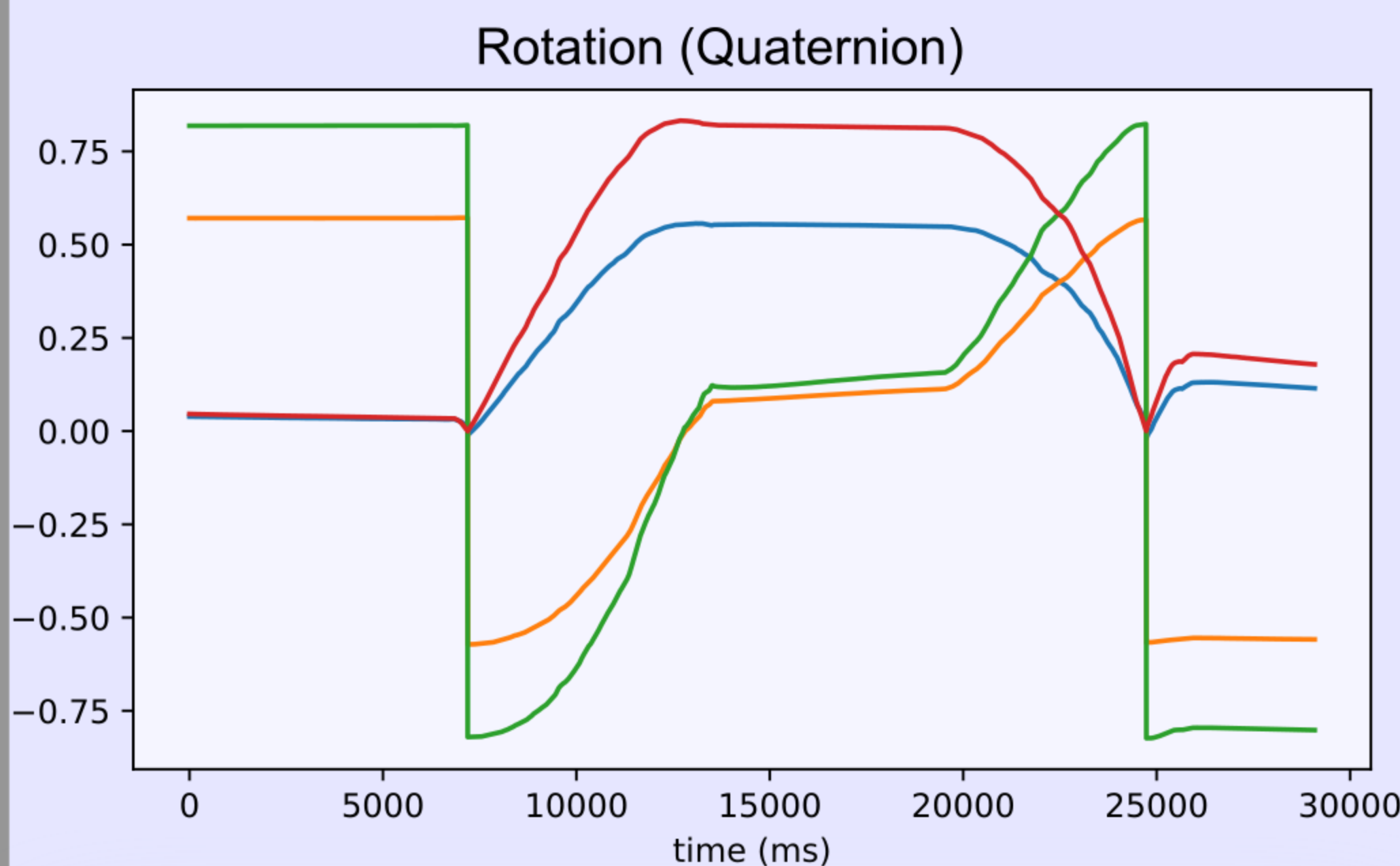
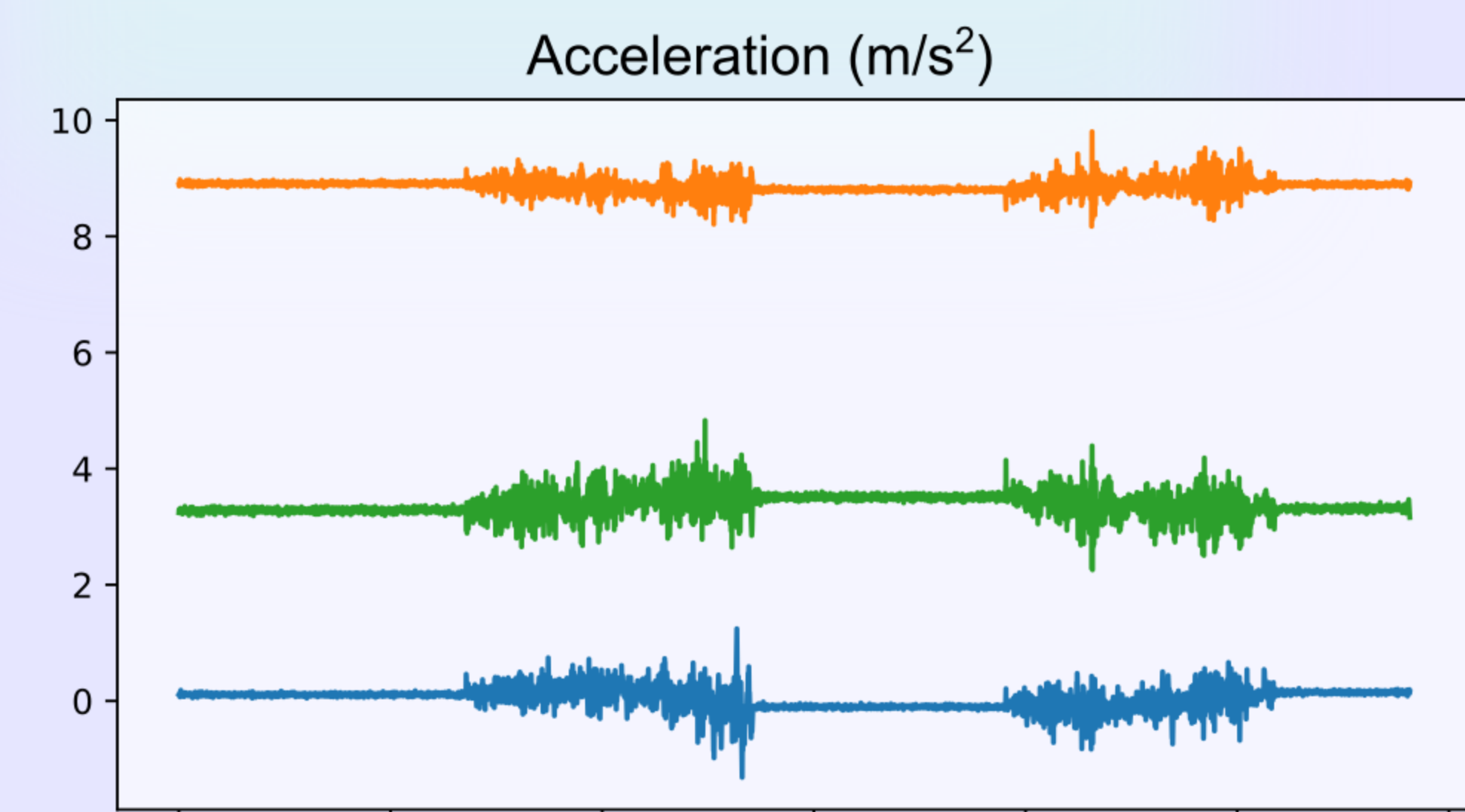
Sensor
Splitter

Local
Acceleration

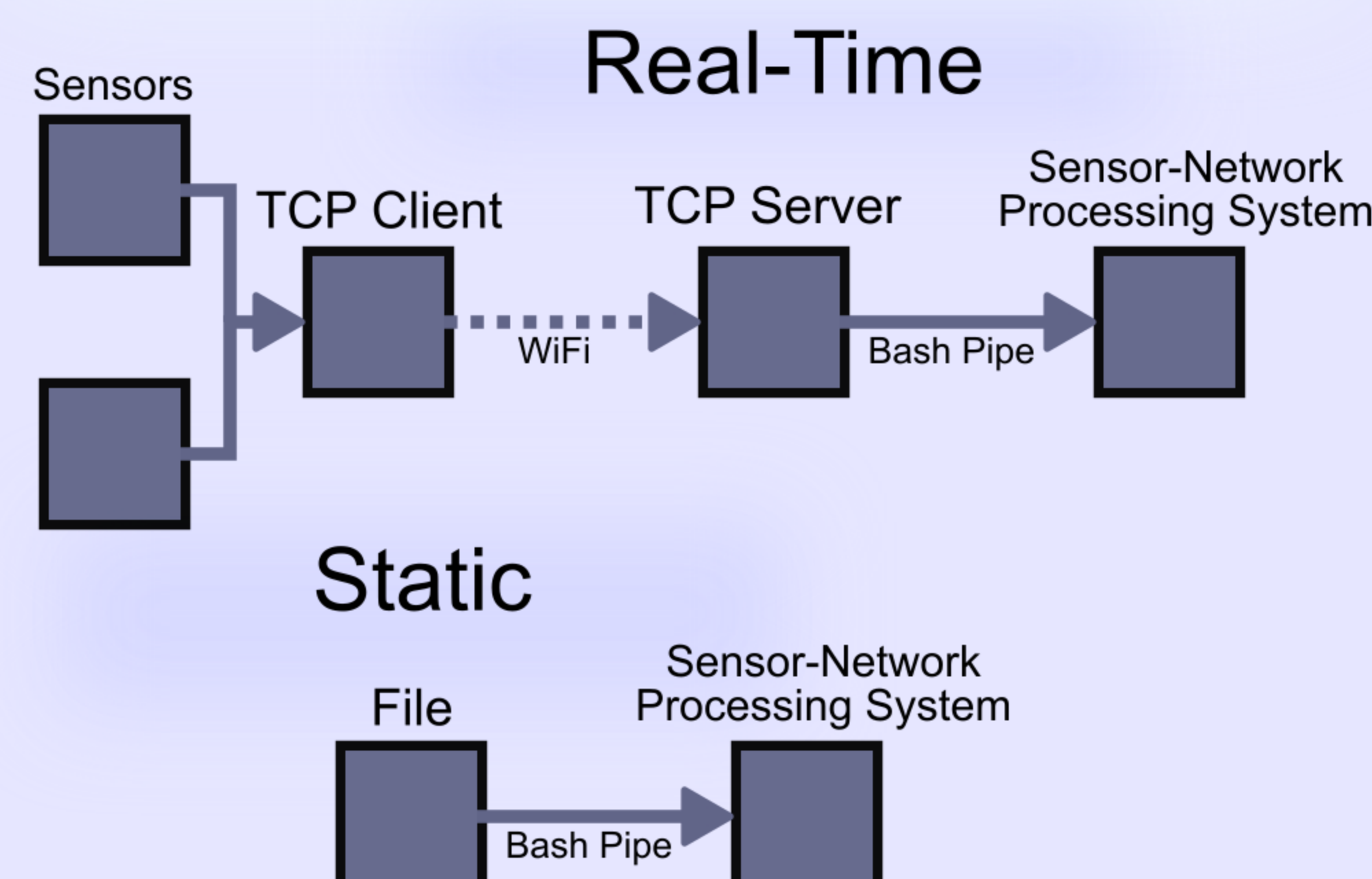
Rotation

IMU

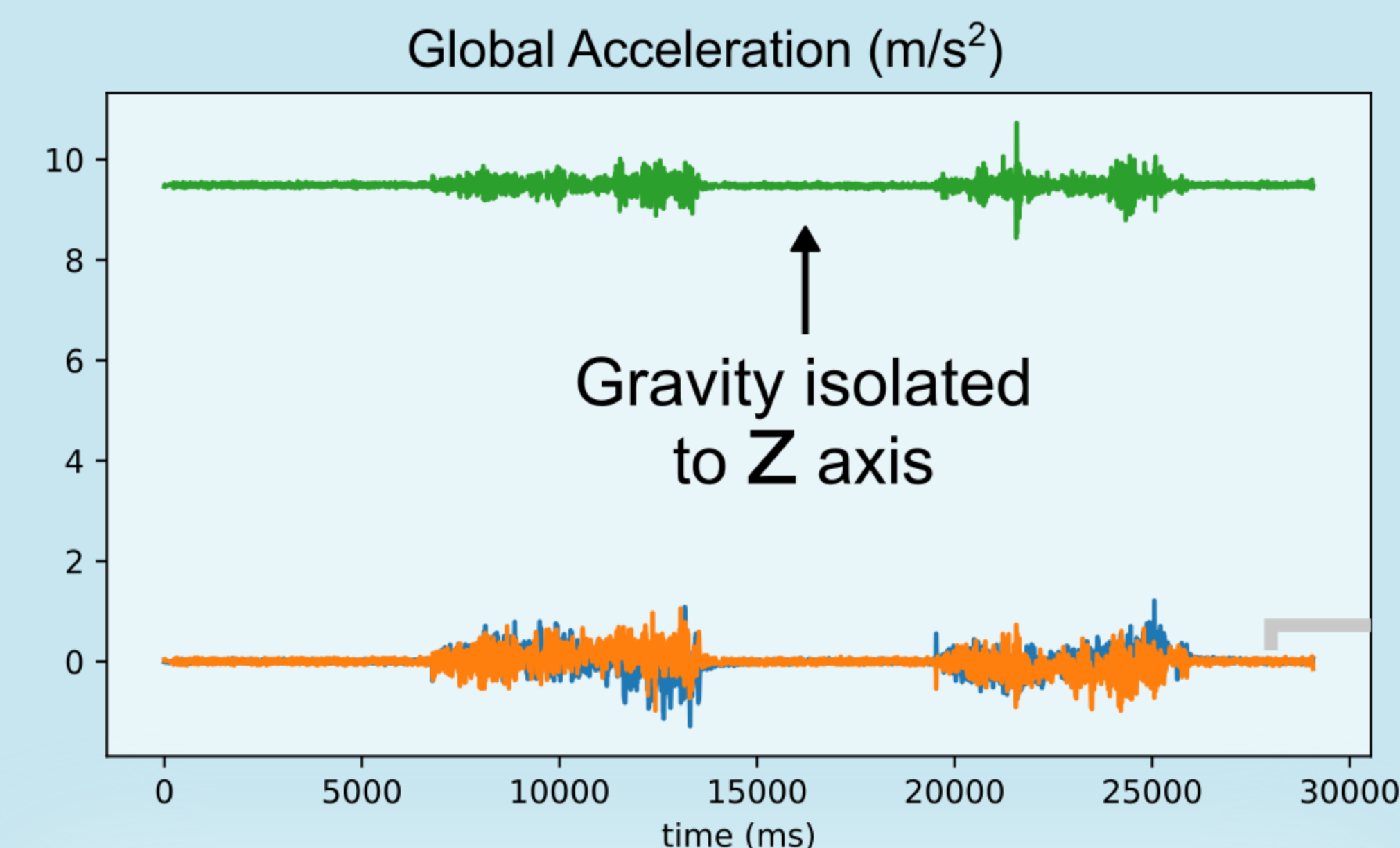
Global
Acceleration



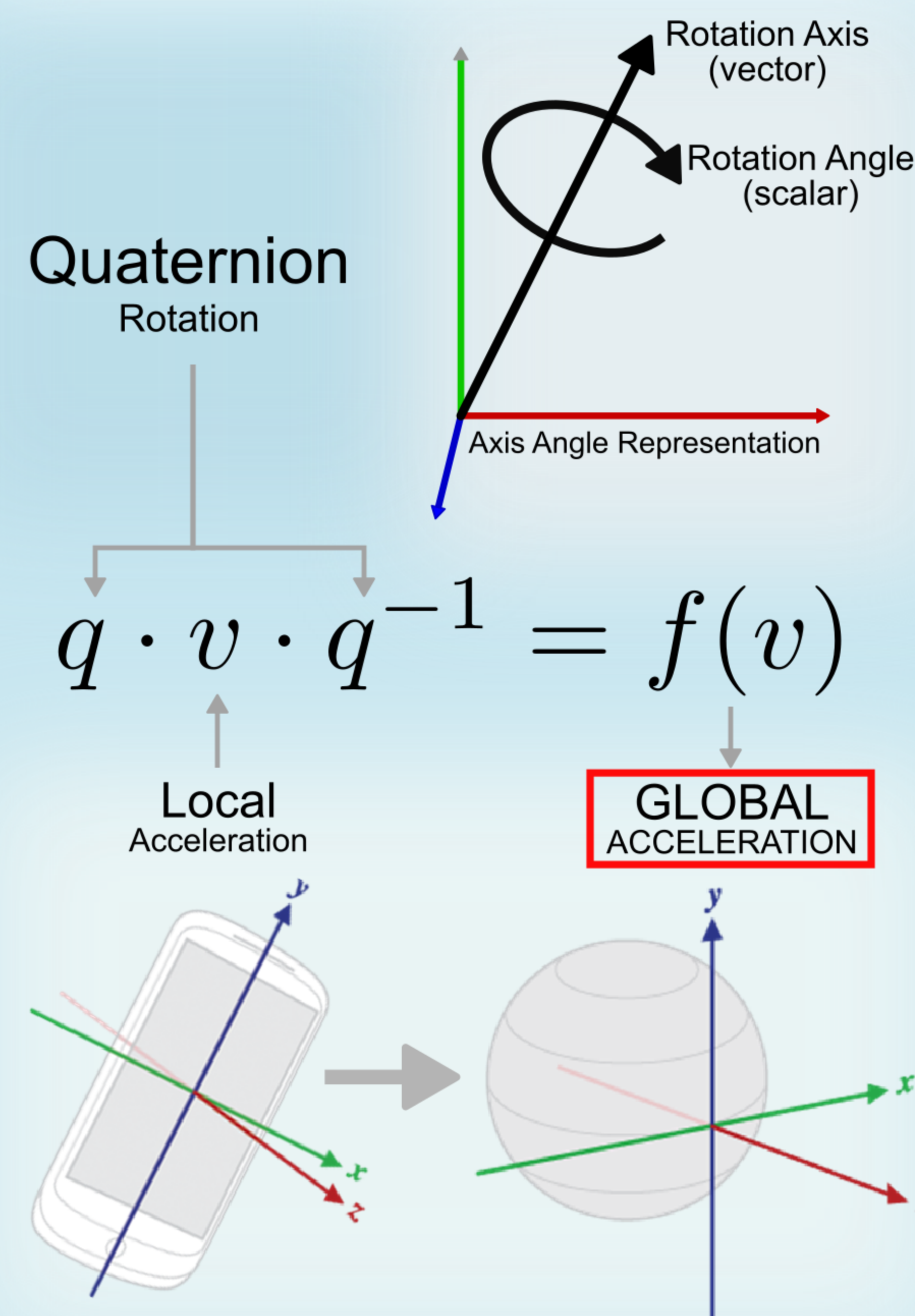
Package Collecting



2. Fusing

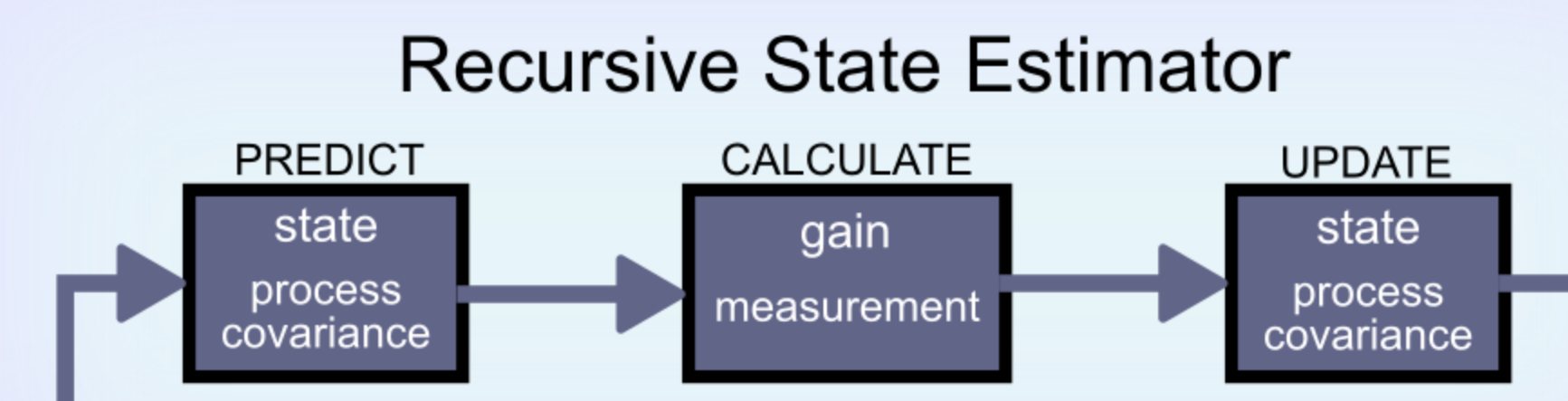
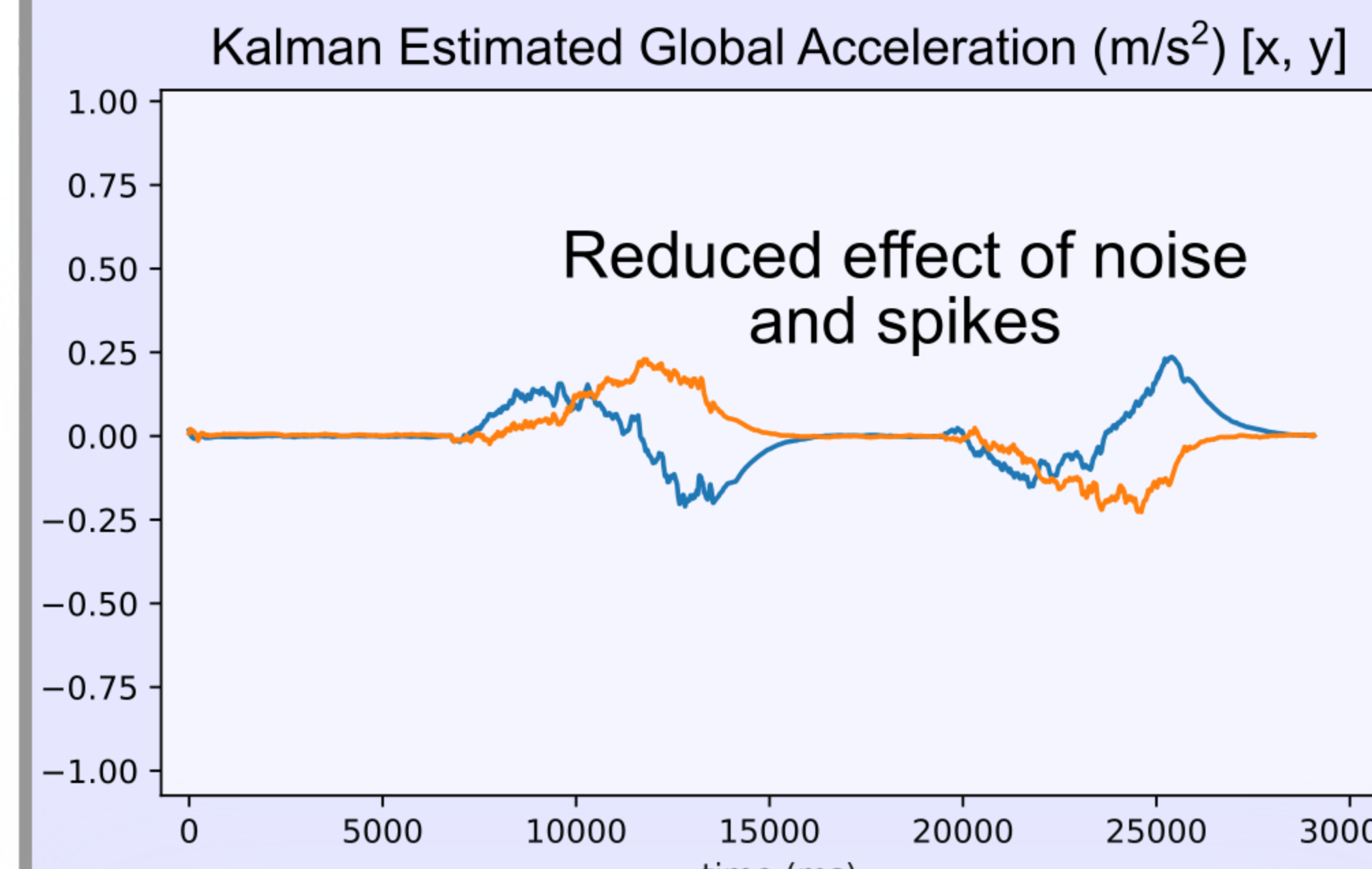
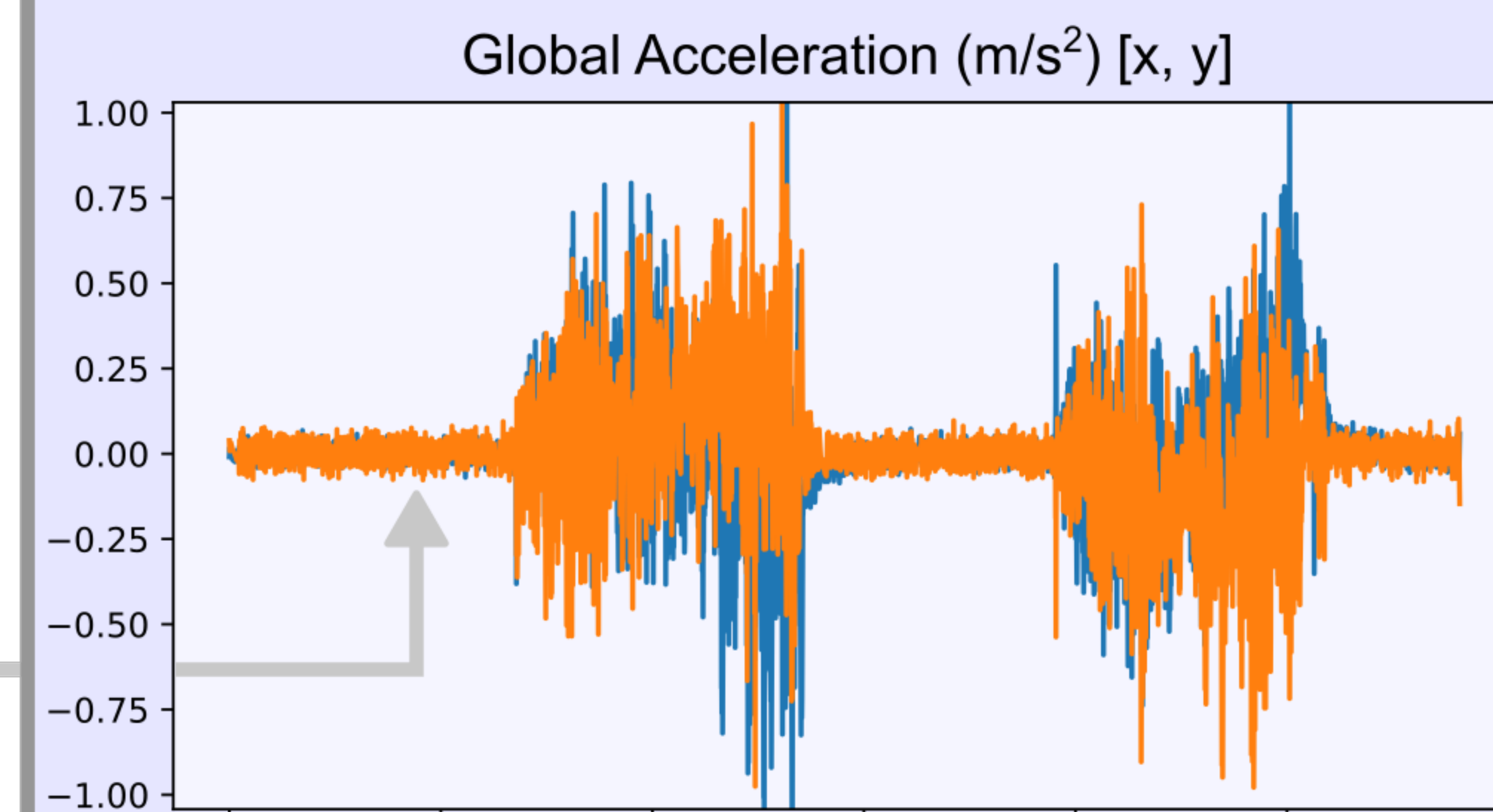


Applying Rotation to Acceleration



3. Filtering

Kalman
Filter



estimated states = [p_x p_y p_z v_x v_y v_z a_x a_y a_z]

State Model

$$p = p_0 + v\Delta t$$

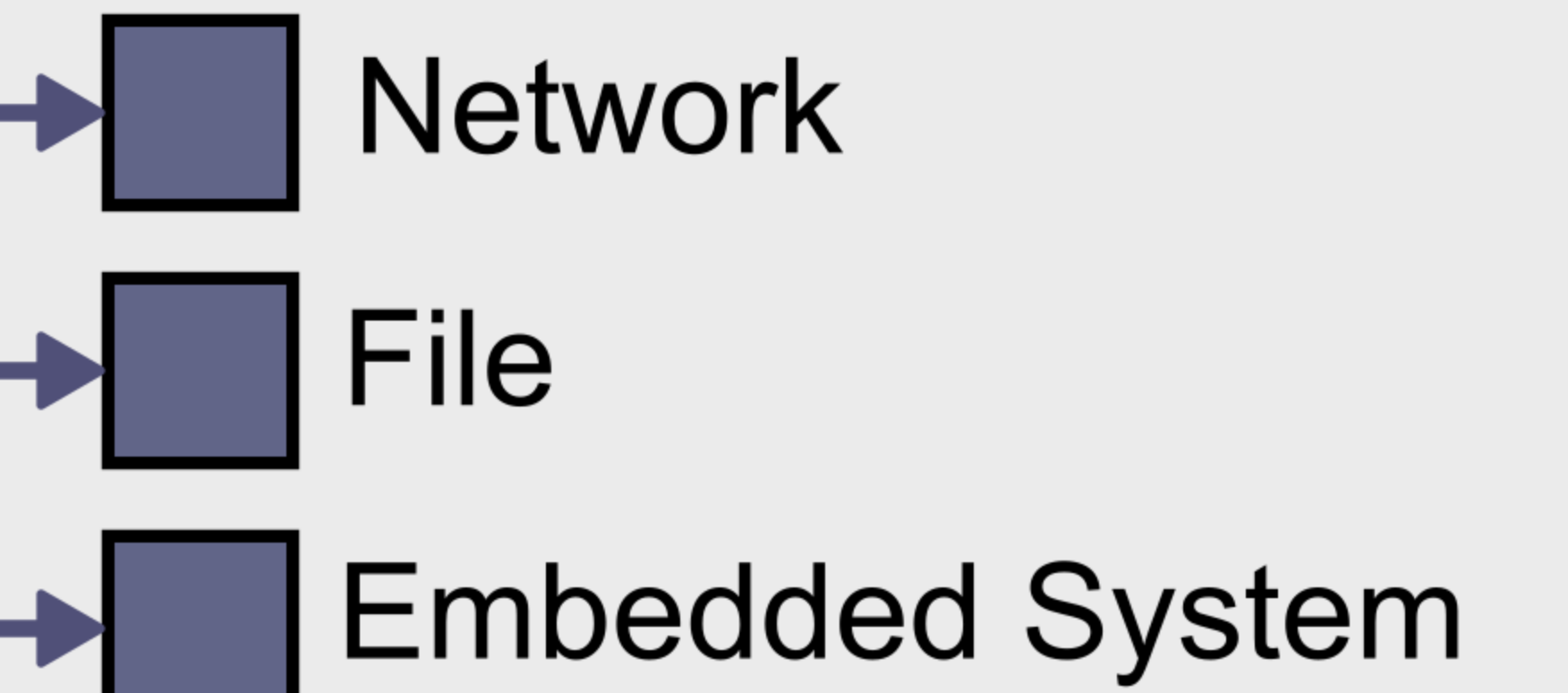
$$v = v_0 + a\Delta t$$

Equations of Motion

$$\begin{bmatrix} I_3 & \Delta t \cdot I_3 & 0_3 \\ 0_3 & I_3 & \Delta t \cdot I_3 \\ 0_3 & 0_3 & I_3 \end{bmatrix}$$

State Matrix

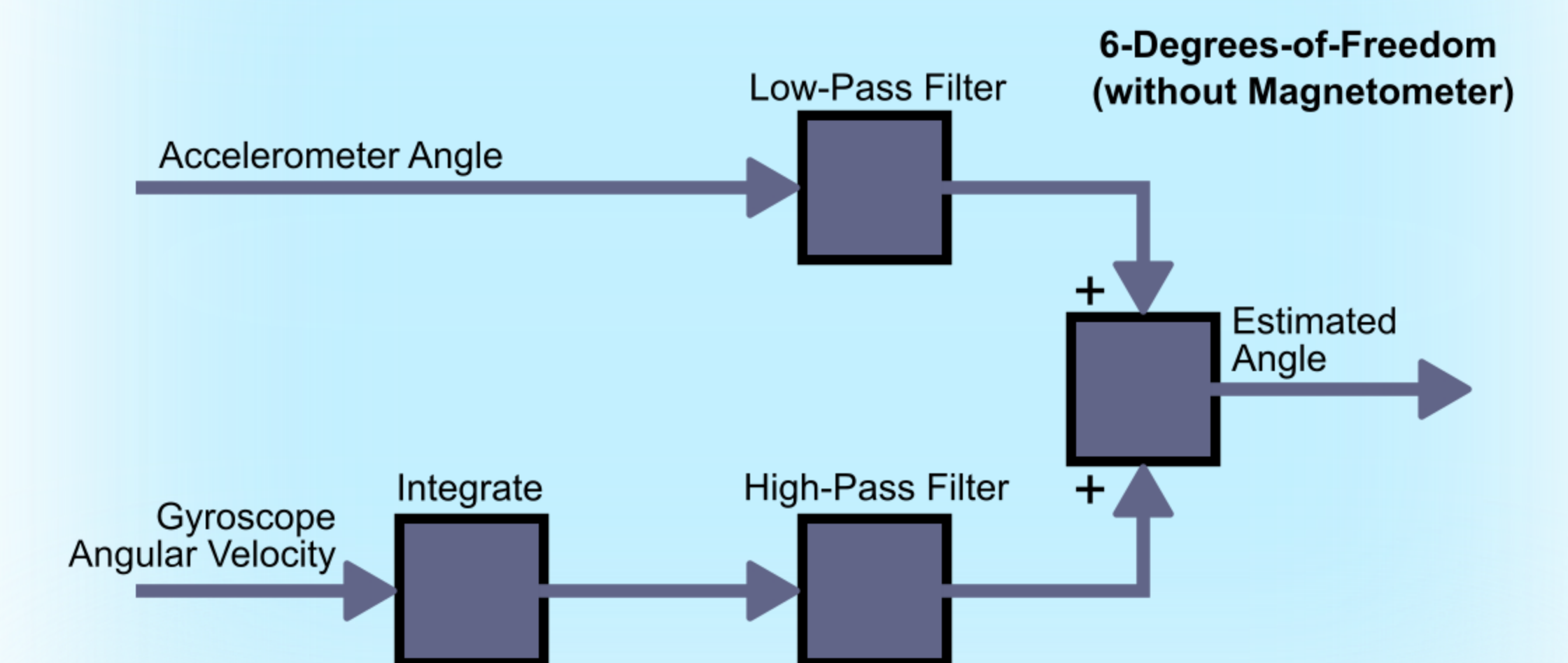
4. Distributing



Next Step

Orientation from Accelerometer and Gyroscope

Complementary Filter to obtain Orientation



Dependency Injected Processing Framework

