Sensor Fusion

* Phil’s Lab example
  + 3 Axis accelerometer and 3 Axis gyroscope.
  + Possibly applying a low-pass filter to the measurement.

**Accelerometer Equations:**

* Where is the bias of the accelerometer and is the noise of the accelerometer.
* If we assume the body which the accelerometer is attached to is at rest:

Through variable cancellation.

**Gyroscope Equations:**

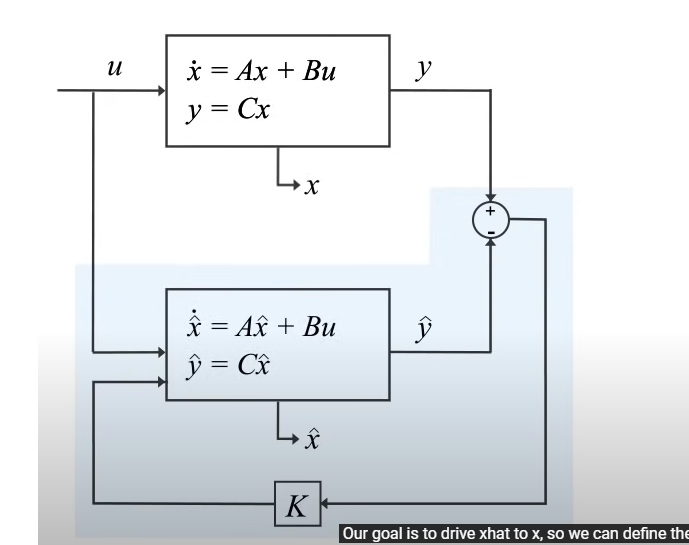
Measure angular rate of rotation around body axes:

A diagram of a mathematical model

Description automatically generated

A diagram of a mathematical model

Description automatically generated



# Kalman Filter

**Kalman Filter** is a two step process, that starts from the prediction step.

Surprise term is the difference between the measured velocity and the estimated velocity.

* Where is the difference in time between two updates. ( is some measurement of )
* **Time update:** based on the current state of the system, we predict its new state. In the case of a train, this means predicting its next position based on its previous position and previous velocity.
* **Measurement update:** the prediction generated in the step before is corrected using the data from a sensor.
* We can calculate the standard deviation of the sensor through experimentation.
  + I propose an experiment that we go from 0 degree to 90 degree and 90 degree to 180 degree and take the measurement from that.
  + The above method is just linear interpolation, which is an interesting strategy.

**Sensor Fusion:**