Three Term PID Control

Basic Open Loop Control

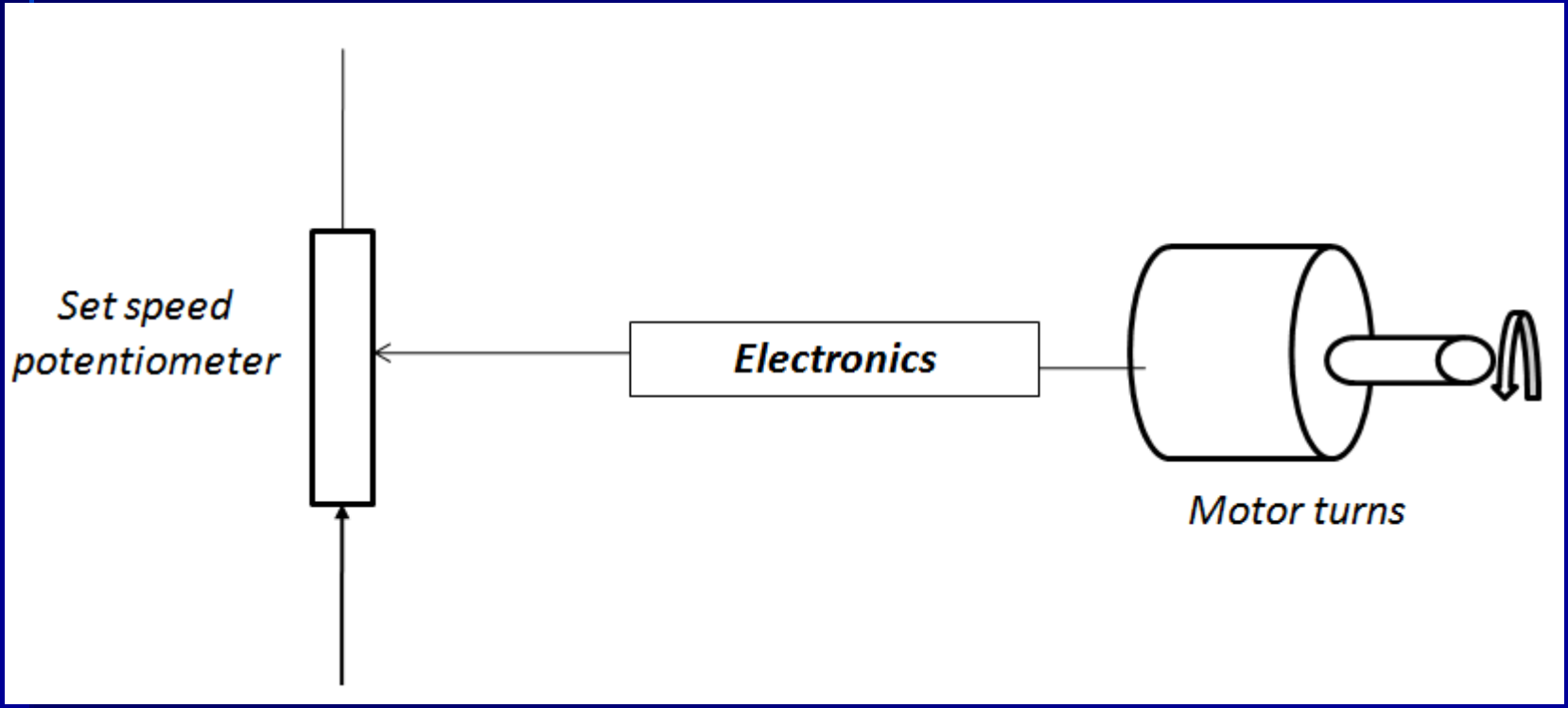
Everyone uses control loops.

Anytime you adjust how you do something based on previous results, you are forming your own control loop.

For example, when you want to drive your car at 65 mph, you depress the accelerator until the speedometer reports the target speed — simple. But what happens when you start driving up a hill? The car slows because the torque to move a car at 65 mph on flat road is no longer enough — so you respond by pressing the accelerator further down. Your foot, the speedometer, and your brain have formed a control loop.

American cars have offered automated speed control loops — also known as cruise control — since 1958.

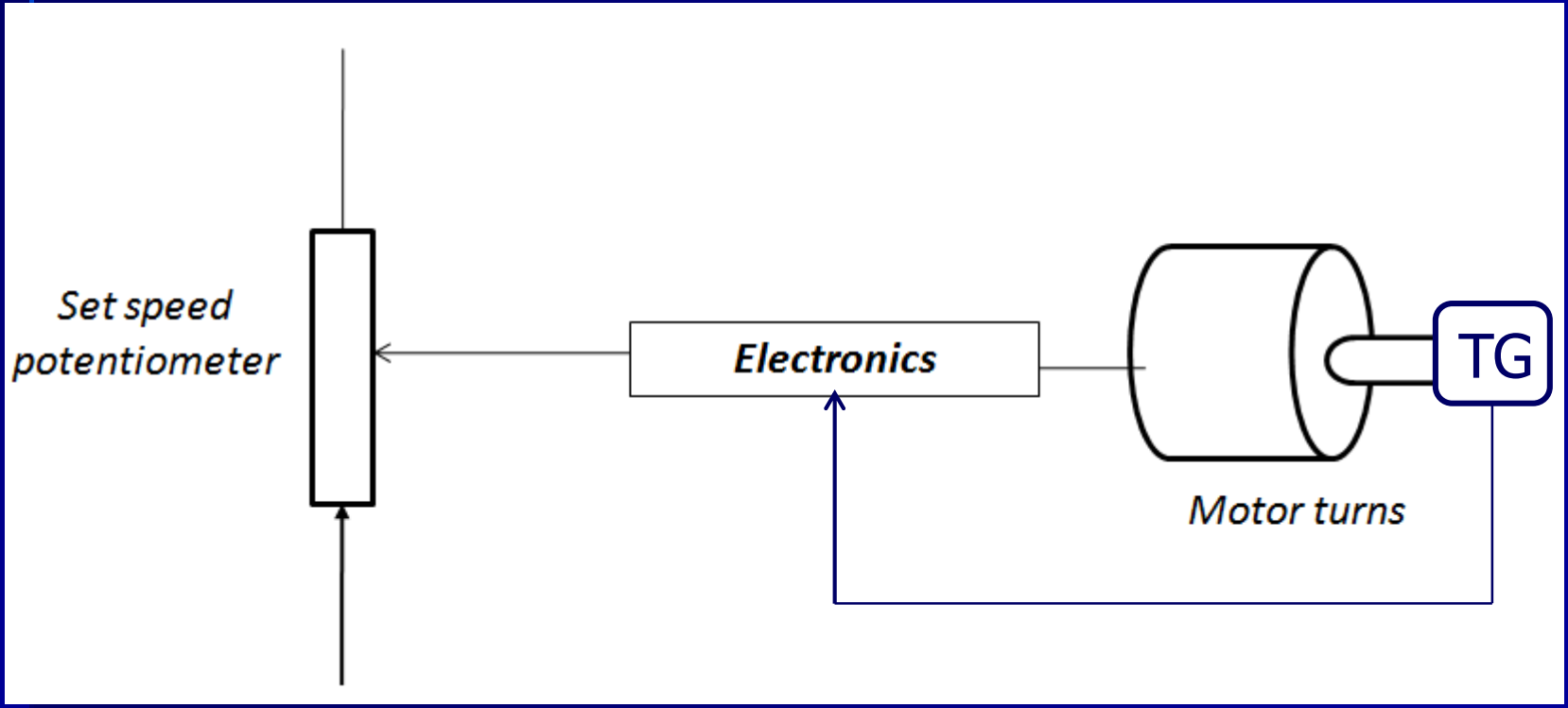
Basic Open Loop Control



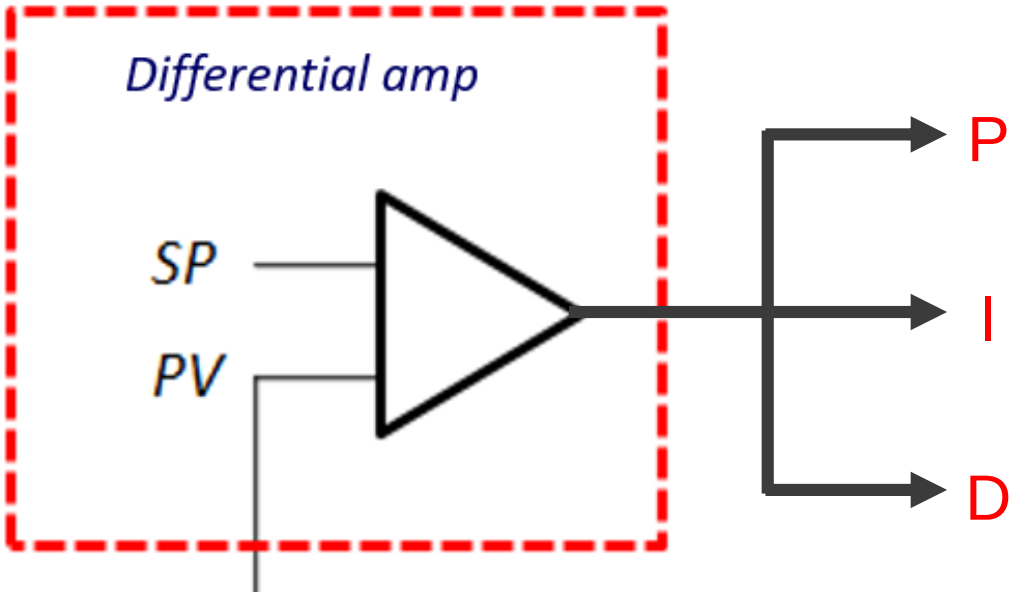
Basic Closed Loop Control

Modern industrial controls are often required to regulate processes as part of a control loop. The controller receives a setpoint request from the programmer and compares it to a measured feedback. The setpoint can be thought of as *where I want to be* and feedback can be thought of as *where I really am*. The difference between the setpoint and feedback is called the error (ε). The job of the controller is to eliminate the error — so *where I am is where I want to be*.

Basic Closed Loop Control

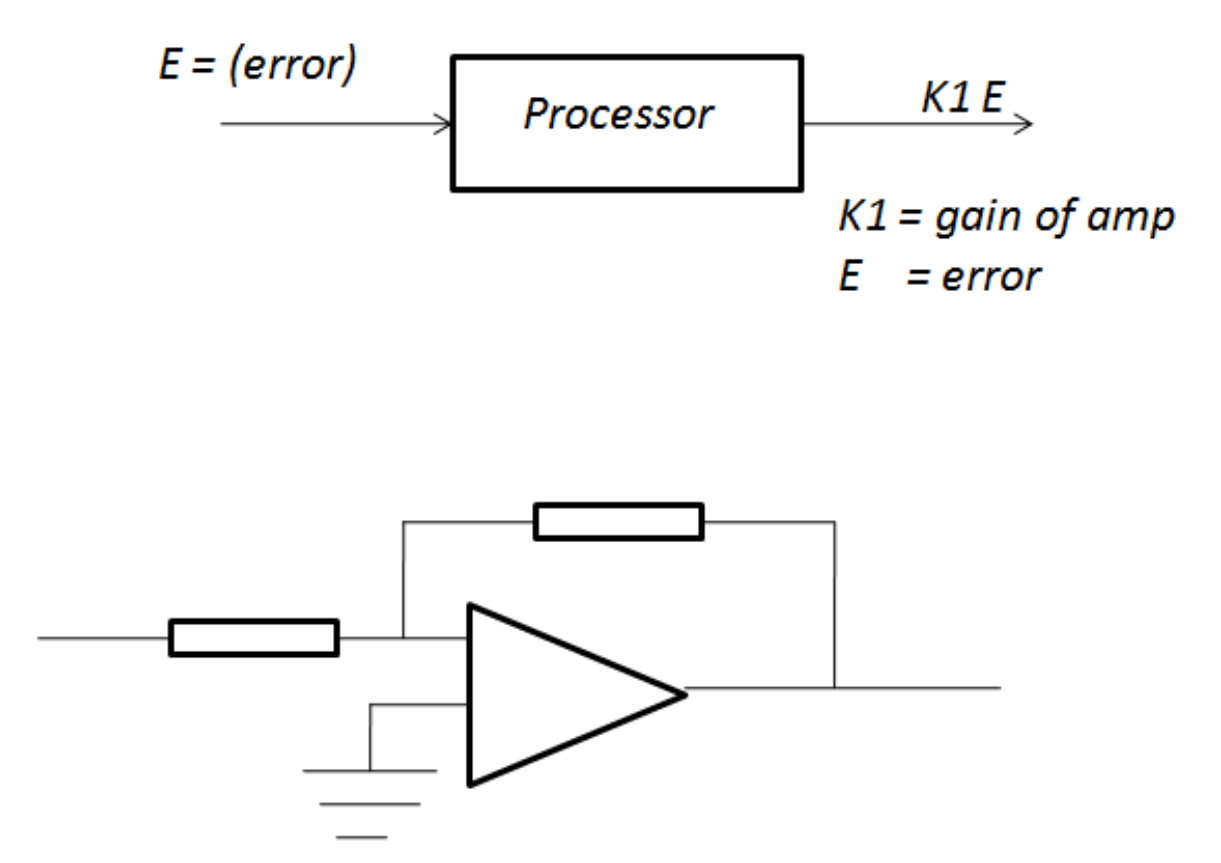


Basic Closed Loop Control



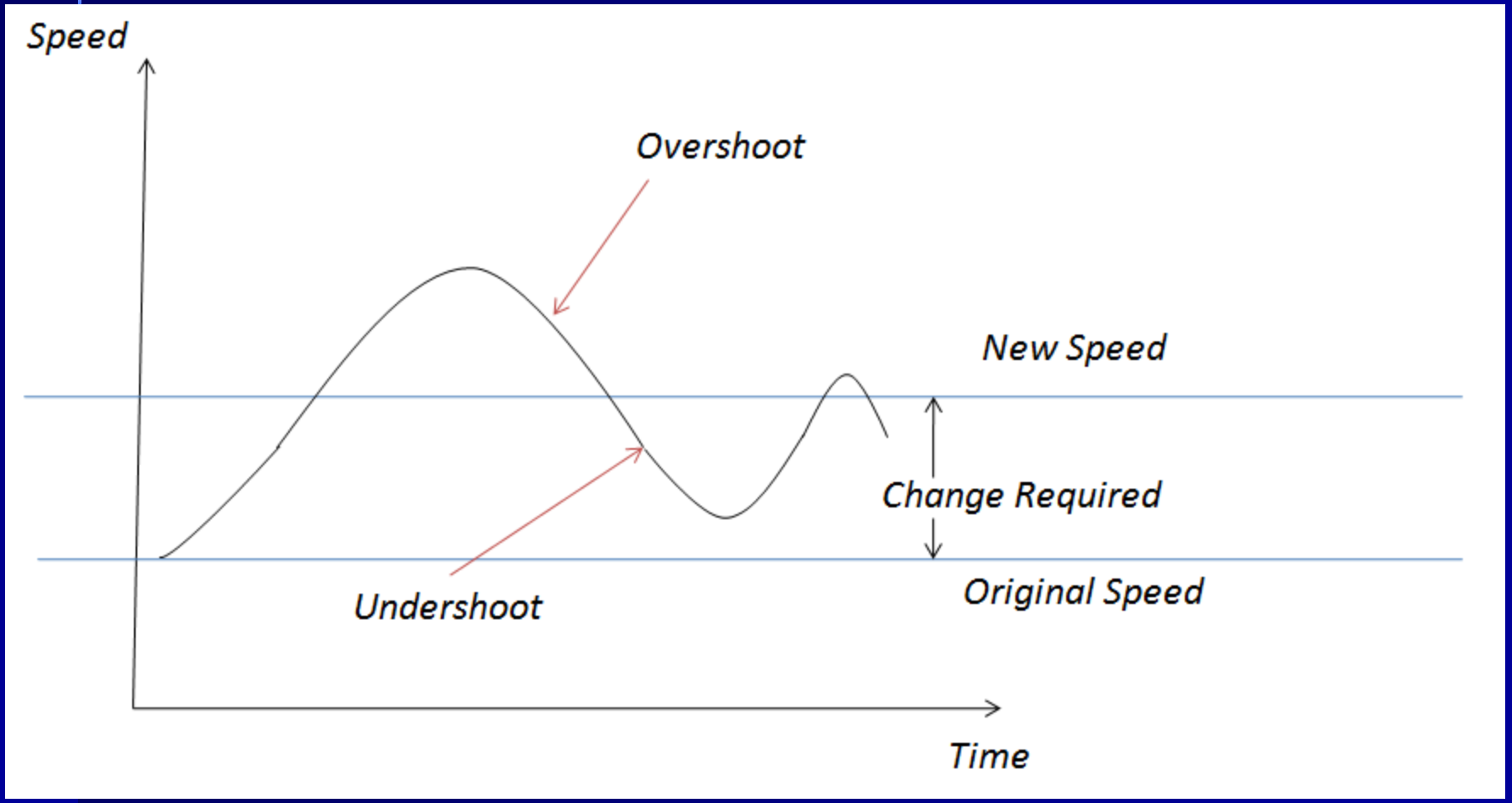
Output fed
to PID Amps

Proportional Control

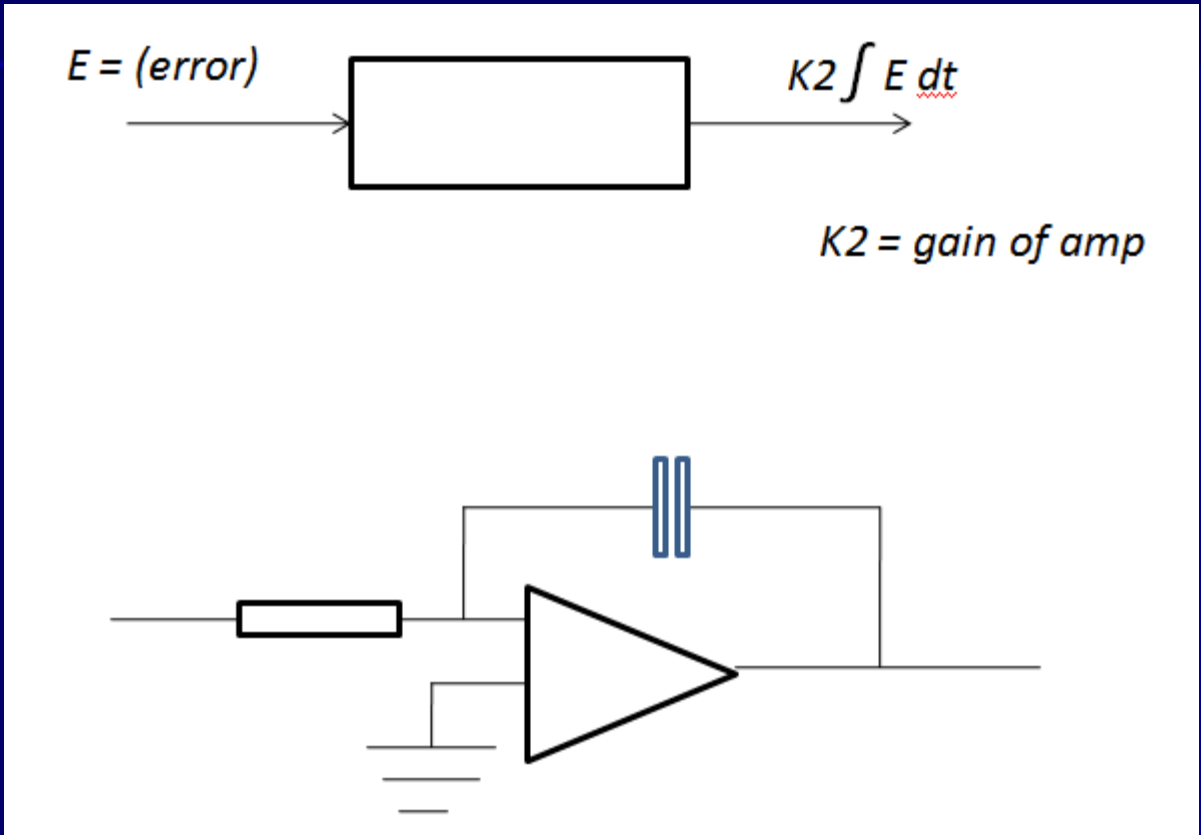


The Proportional Op-amp produces an output voltage that is proportional to the amplitude of the input signal

Proportional Control

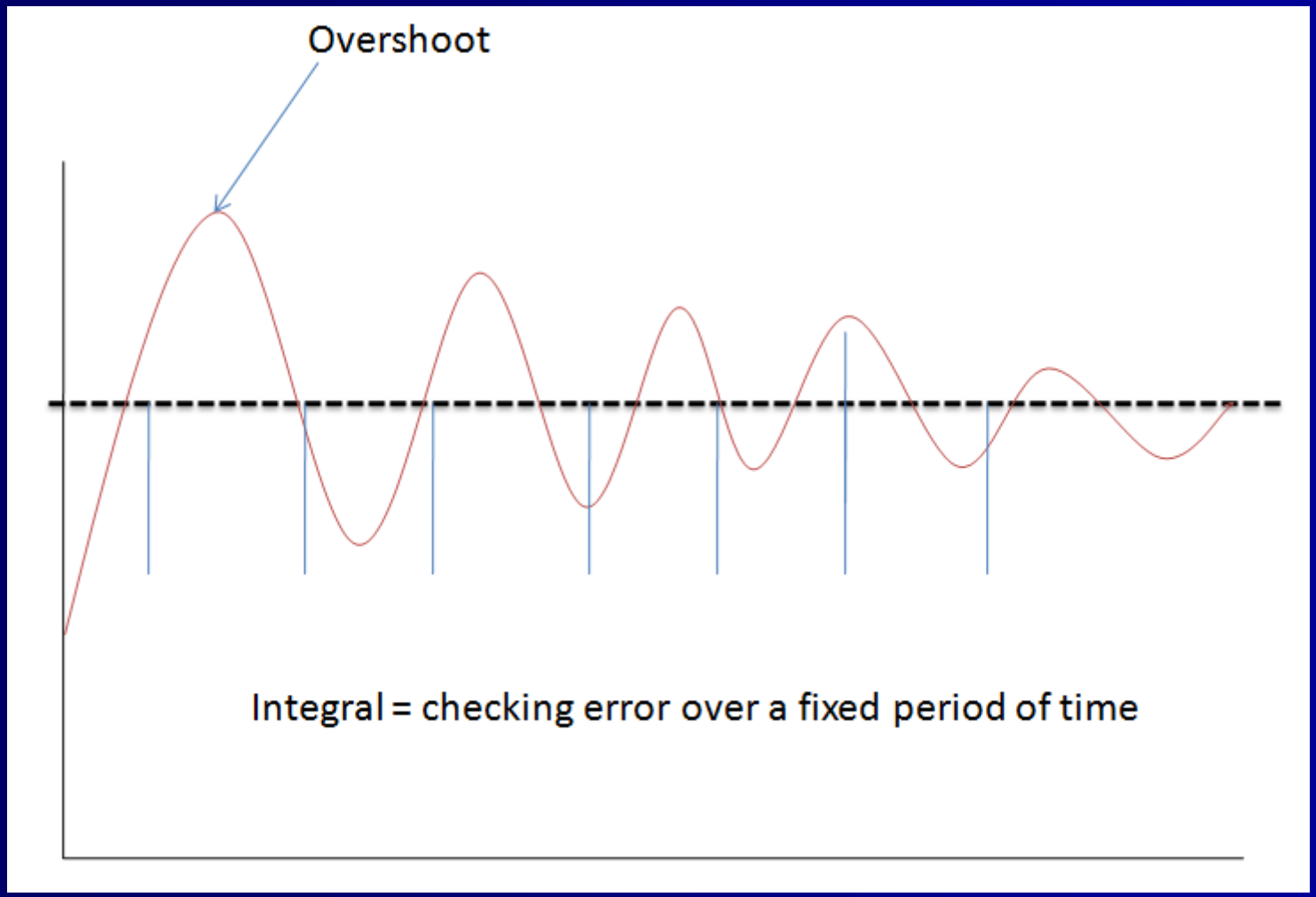


Integral Control

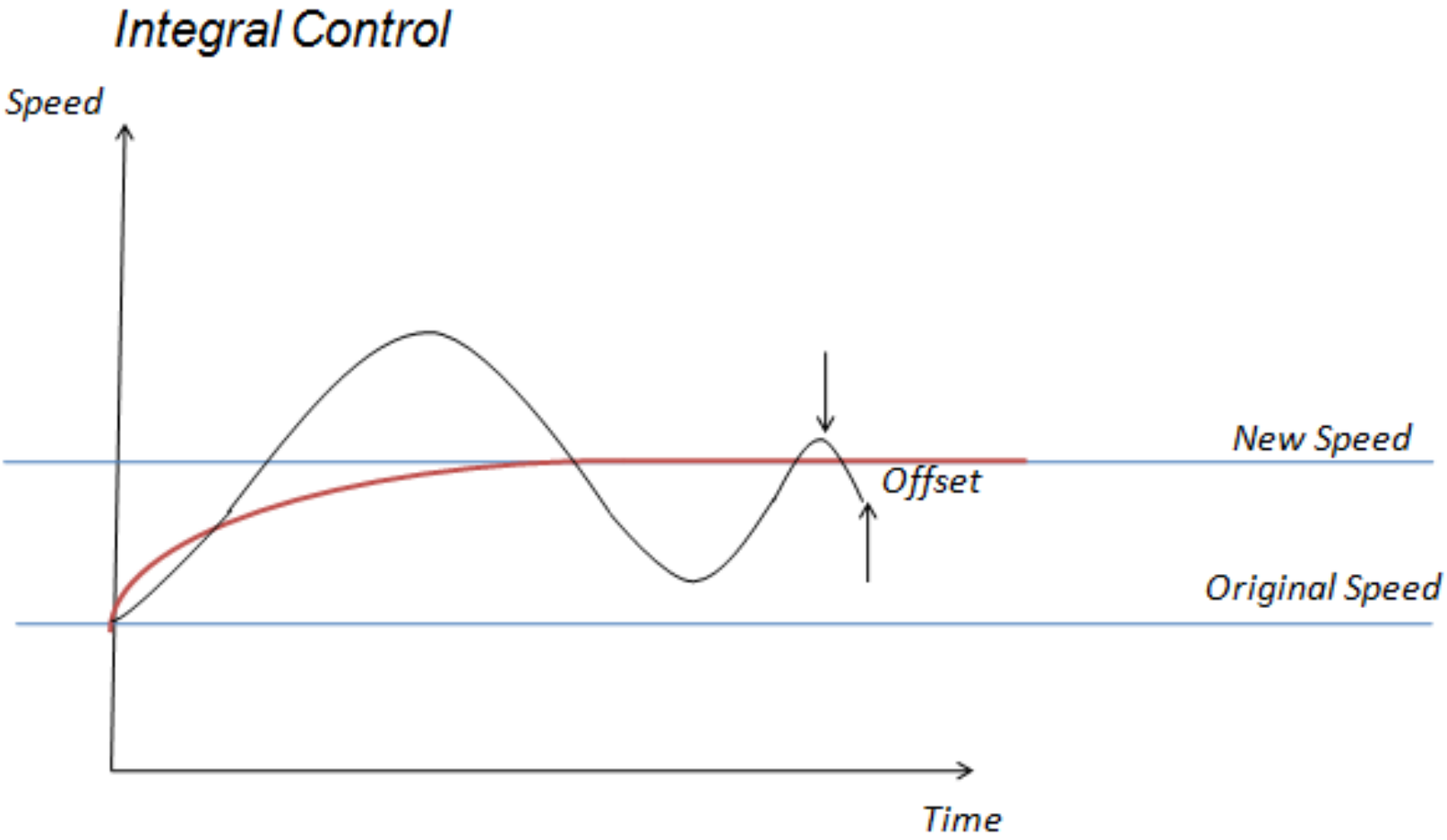


The Integrator Op-amp produces an output voltage that is both proportional to the amplitude and duration of the input signal

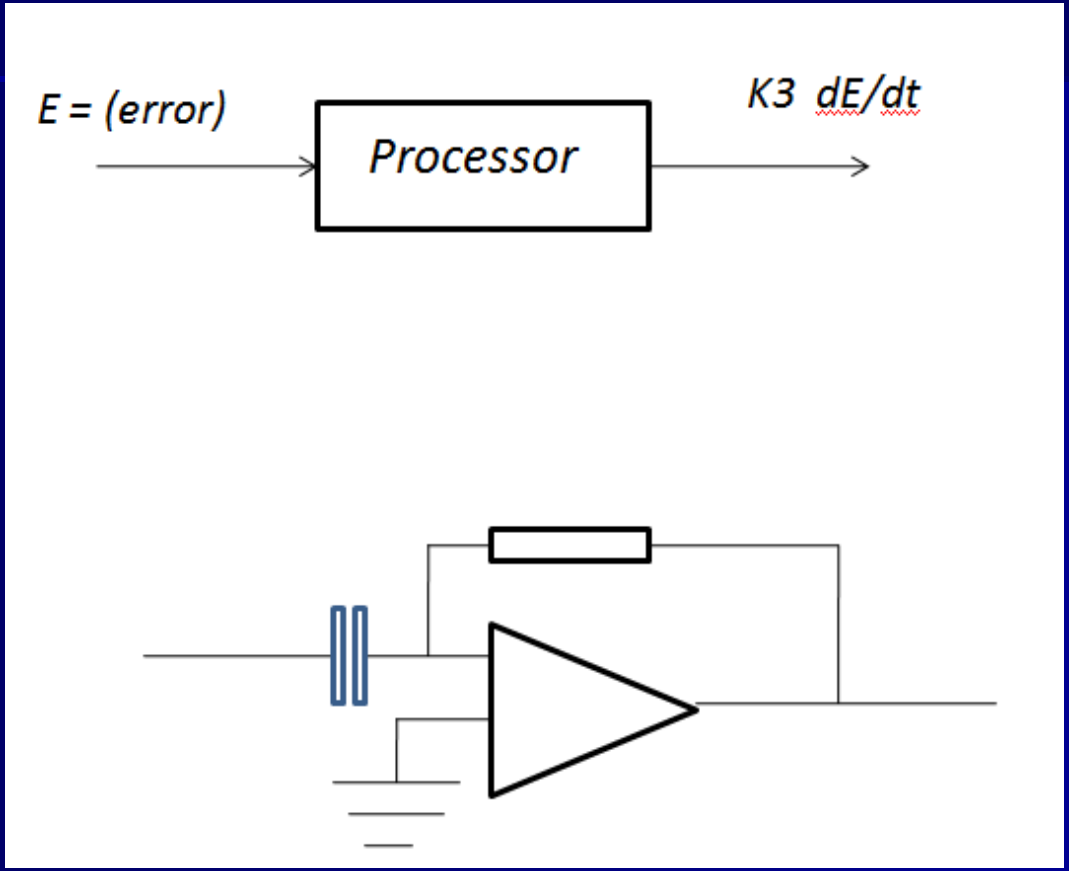
Integral Control



Integral Control

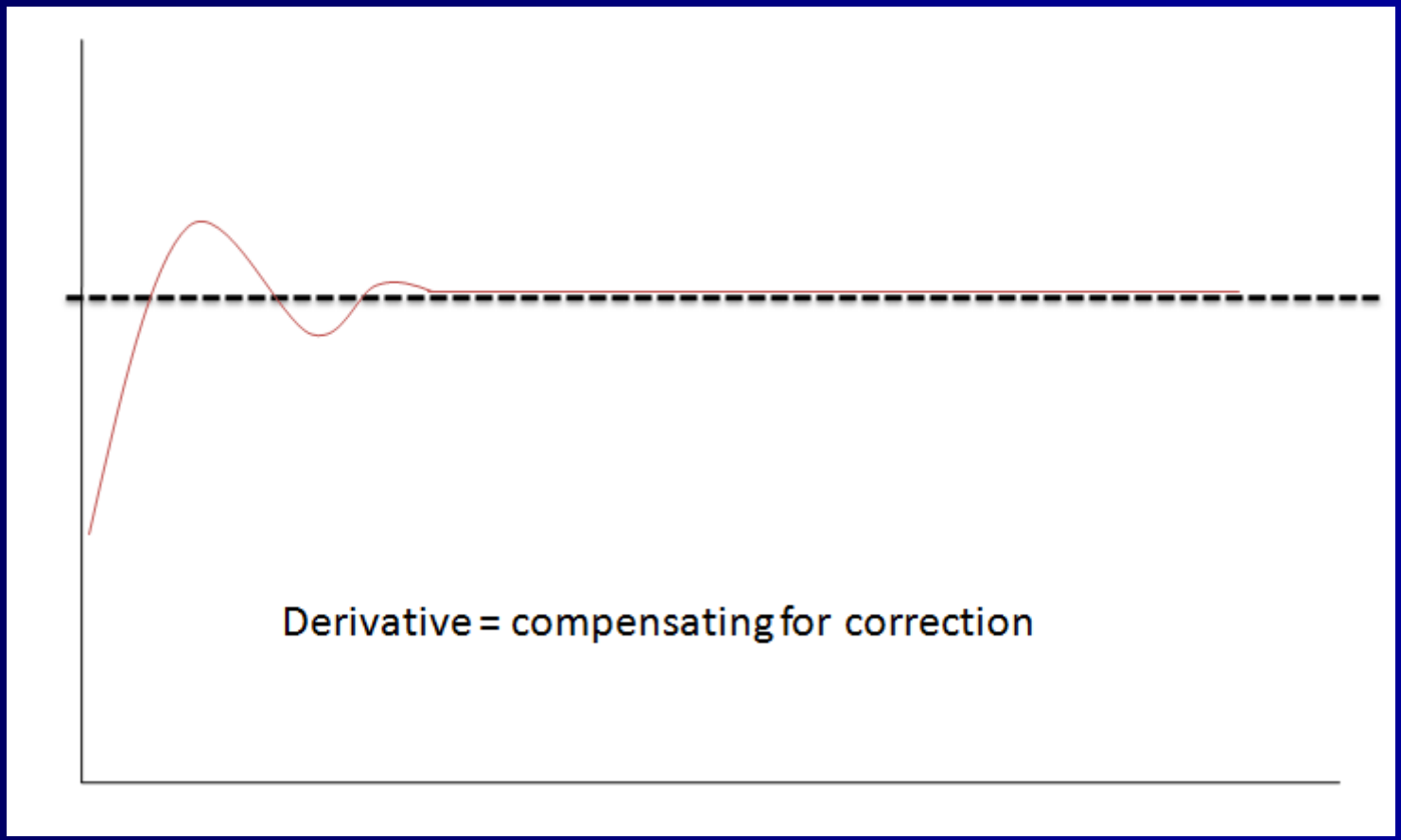


Derivative Control

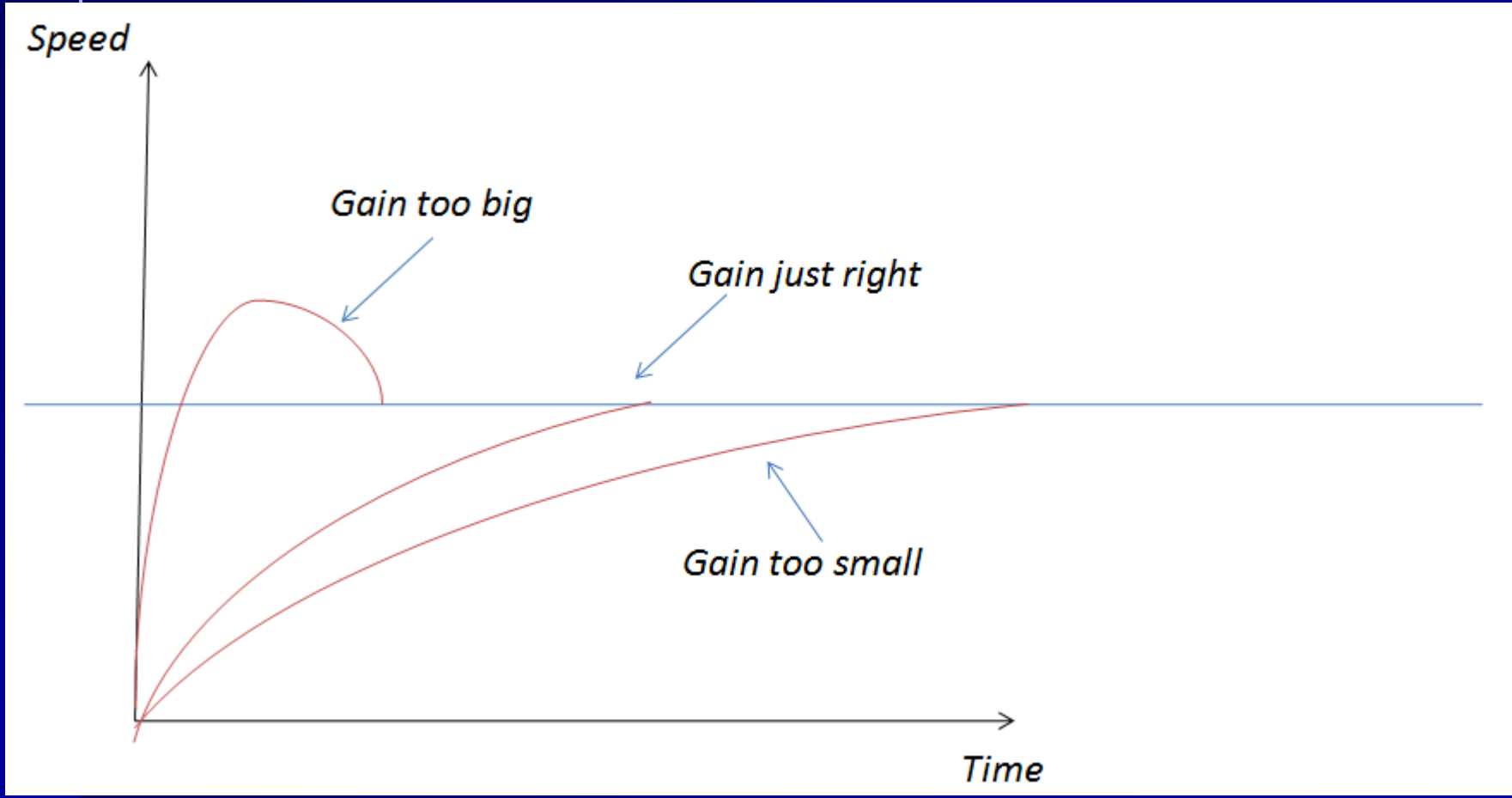


The Derivative Op-amp produces an output voltage that is proportional to the rate of change of the input signal over time

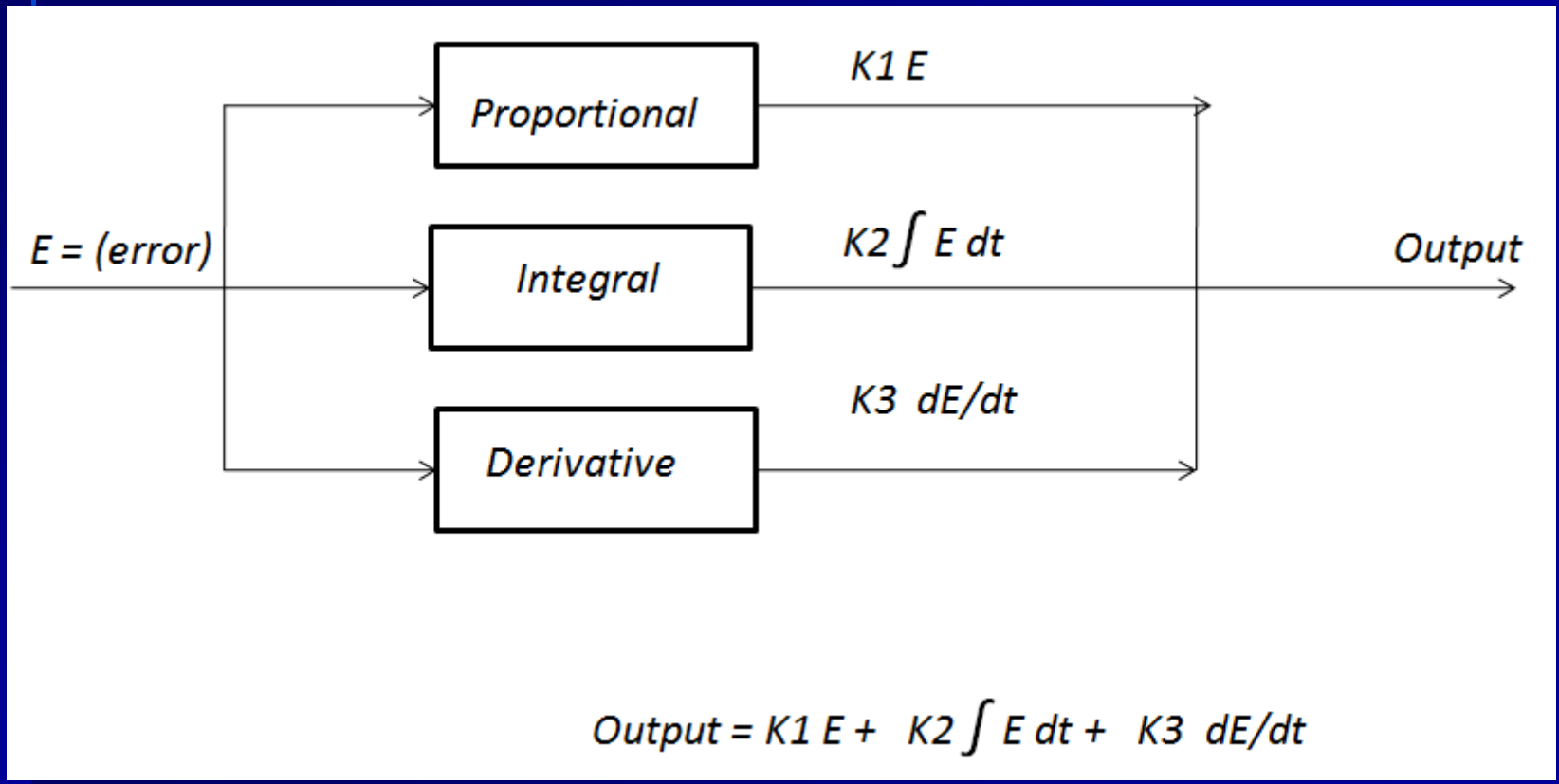
Derivative Control

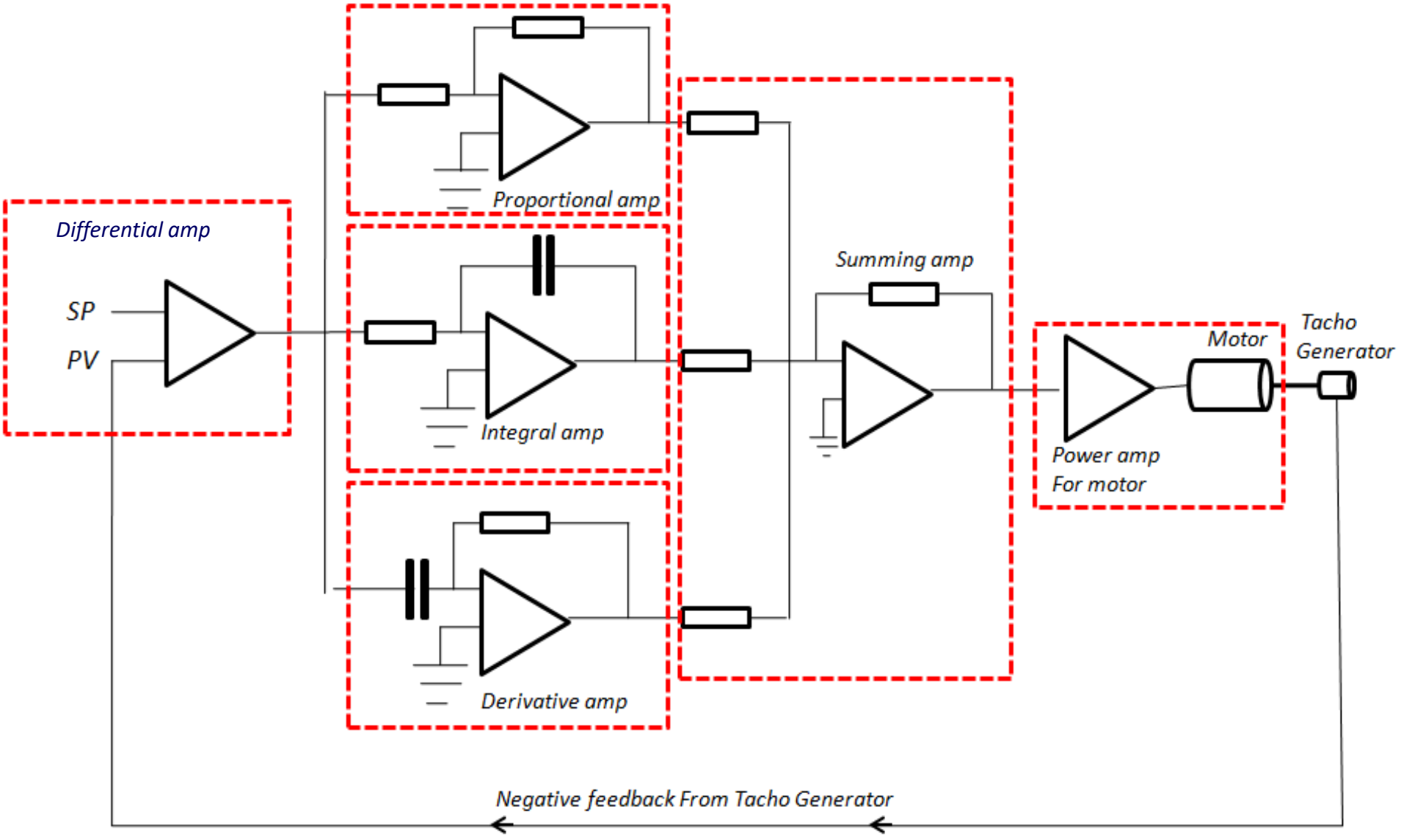


Derivative Control



PID
Proportional Integral Derivative




Differential amp
SP
PV
Proportional amp
Integral amp
Derivative amp
Summing amp
Power amp
For motor
Motor
Tacho
Generator
Negative feedback From Tacho Generator