PID – Introduction to Arduino

Here's the PID equation as everyone first learns it:

$$\text{Output} = K_P e(t) + K_I \int e(t)\,dt + K_D \frac{d}{dt} e(t)$$

Where : $e = \text{Setpoint} - \text{Input}$

This leads pretty much everyone to write the following PID controller:

```
     /*working variables*/
1    unsigned long lastTime;
2    double Input, Output, Setpoint;
3    double errSum, lastErr;
4    double kp, ki, kd;
5    void Compute()
6    {
7       /*How long since we last calculated*/
8       unsigned long now = millis();
9       double timeChange = (double)(now - lastTime);
10
11      /*Compute all the working error variables*/
12      double error = Setpoint - Input;
13      errSum += (error * timeChange);
14      double dErr = (error - lastErr) / timeChange;
15
16      /*Compute PID Output*/
17      Output = kp * error + ki * errSum + kd * dErr;
18
19      /*Remember some variables for next time*/
20      lastErr = error;
21      lastTime = now;
22   }
23
24   void SetTunings(double Kp, double Ki, double Kd)
25   {
26      kp = Kp;
        ki = Ki;
        kd = Kd;
     }
```