



深蓝学院
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第二章思路提示

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●PID控制公式

$$u(t) = K_P e(t) + K_I \int_0^t e(\tau) d\tau + K_D \frac{de(t)}{dt}$$

●采样的时间短，可用一阶差分代替一阶微分，用累加代替积分

$$u(k) = K_P \cdot e(k) + K_I \cdot \sum_0^k e(k) dt + K_D \left(\frac{e(k) - e(k-1)}{dt} \right)$$

● 实际代码

```
// /**to-do**/ 实现PID控制
double PIDController::Control(const double error, const double dt) {
    if (dt <= 0) {
        return previous_output_;
    }
    double diff = 0;
    double output = 0;

    if (first_hit_) // first_hit_: 用来选择是否计算diff
    {
        first_hit_ = false;
    } else {
        diff = (error - previous_error_) / dt;
    }

    integral_ += ki_ * error * dt; // 积分环节

    output = kp_ * error + integral_ + diff * kd_;
    previous_output_ = output;
    previous_error_ = error;
    return output;
}
```

```
// /**to-do**/ 重置PID参数
void PIDController::Reset() {
    previous_error_ = 0.0;
    previous_output_ = 0.0;
    integral_ = 0.0;
    first_hit_ = true;
}
```





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感谢各位聆听 !
Thanks for Listening

