
陷波器算法和 C 代码实现

陷波器传递函数

$$h(s) = as^2 + cs + 1 / as^2 + bs + 1$$

$$\text{其中: } a = 1/w_0^2, c = k_2/w_0, b = k_1/w_0$$

k1 为陷波器带宽, k2 为陷波器作用程度, w0 为陷波器中心频率

离散后差分方程为:

$$y(k) = a_0x(k) + a_1x(k-1) + a_2x(k-2) - b_1y(k-1) - b_2y(k-2)$$

其中 $x(0) = x(1) = 0$; $y(0) = y(1) = 0$ T: 采样频率

$$a_0 = \frac{4a + 2cT + T^2}{4a + 2bT + T^2} a_1 = \frac{2T^2 - 8Ta}{4a + 2bT + T^2} a_2 = \frac{4a - 2aT + T^2}{4a + 2bT + T^2}$$
$$b_1 = \frac{2T^2 - 8Ta}{4a + 2bT + T^2} b_2 = \frac{4a - 2bT + T^2}{4a + 2bT + T^2}$$

根据上边的算法 C 代码实现

```
float NotchFilter(float InputVar, float Fre, float T, float k1, float k2)
```

```
{  
    float w;  
    float a,b,c;  
    float a0,a1,a2,b1,b2;  
    float x_k;  
    float x_k1=0;  
    float x_k2=0;  
    float y_k;  
    float y_k1=0;  
    float y_k2=0;  
    w=2*PI*Fre;  
    if (w!= 0)  
    {a=1/(w*w);}  
    else{a=0}  
    b=k1/w;  
    c=k2/w;
```

```
a0=(4*a+2*b*T+T*T)/(4*a+2*b*T+T*T);
a1=(2*T*T-8*a)/(4*a+2*b*T+T*T);
a2=(4*a-2*c*T+T*T)/(4*a+2*b*T+T*T);
b1=(2*T*T-8*a)/(4*a+2*b*T+T*T);
b2=(4*a-2*b*T+T*T)/(4*a+2*b*T+T*T);
x_k=InputVar;
y_k=a0*x_k+a1*x_k1+a2*x_k2-b1*y_k1-b2*y_k2;
x_k2=x_k1;
x_k1=x_k;
y_k2=y_k1;
y_k1=y_k;
return y_k;
}
```