运行说明

代码思路

最小二乘法

$$
\begin{aligned}
&\varphi(x) = asin(x) + bcos(x)\\
&L = \Sigma_i(\varphi(x_i) - y_i)^2 = \Sigma_i(asin(x_i) + bcos(x_i) - y_i)^2\\
&\frac{\partial L}{\partial a} = 2(a\Sigma_i sin(x_i)^2 + b\Sigma_i sin(x_i)cos(x_i) - \Sigma_i y_i sin(x_i))\\
&\frac{\partial L}{\partial b} = 2(a\Sigma_i sin(x_i)cos(x_i) + b\Sigma_i cos(x_i)^2 - \Sigma_i y_i cos(x_i))\\
&L\text{最小时对应}\frac{\partial L}{\partial a} = 0, \frac{\partial L}{\partial b} = 0.\\
&\begin{cases} a\Sigma_i sin(x_i)^2 + b\Sigma_i sin(x_i)cos(x_i) = \Sigma_i y_i sin(x_i) \\ a\Sigma_i sin(x_i)cos(x_i) + b\Sigma_i cos(x_i)^2 = \Sigma_i y_i cos(x_i) \end{cases}\\
&\text{记}A = \Sigma_i sin(x_i)^2, B = \Sigma_i sin(x_i)cos(x_i), C = \Sigma_i cos(x_i)^2,\\
&D = \Sigma_i y_i sin(x_i), E = \Sigma_i y_i cos(x_i).\\
&\text{则}\\
&\begin{cases} a = \frac{CD-BE}{AC-BB} \\ b = \frac{AE-BD}{AC-BB} \end{cases}\\
&\text{均方误差}mse = L/i.
\end{aligned}
$$

实现细节

输入插值节点个数，使用动态数组储存x、y，输入插值节点x、y，计算A、B、C、D、E解得a、b。代入L计算均方误差。细节见代码注释。

运行结果

```
Enter number of nodes:
10
Enter list of x:
0.25
0.5
0.75
1.0
1.25
1.5
1.75
2.0
2.25
2.50
Enter list of y:
1.284
1.648
2.117
2.718
3.427
2.798
3.534
4.456
5.465
5.894
a = 4.407264412474432e+00
b = -1.675711420892508e+00
均方误差 = 1.258139370828297e+00
```