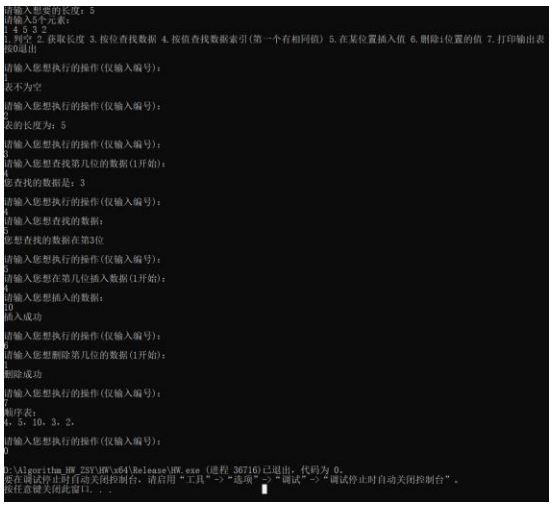
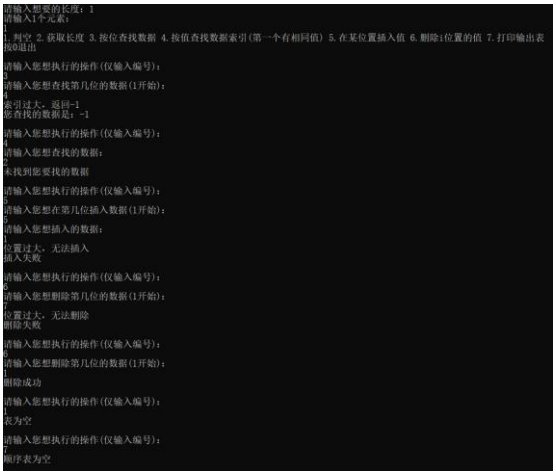
HW2—顺序表构建

实验结果：





实验代码：

HWs.h

```
//作业 2：顺序表
template <typename T, int maxSize>
class HW2_SequenceList {
public:
    HW2_SequenceList();
    ~HW2_SequenceList();
private:
    T data[maxSize];
    int length;

public:
    void process();

private:
    void createList();
    bool isEmpty();
    int getLength();
    T getValue(int i);
    int locate(T x);
    bool insert(T x, int);
    bool erase(int i);

    void print();
};
```

HW2.cpp

```cpp
#include "HWs.h"
#include <iostream>
using namespace std;

//初始化
template<typename T, int maxSize>
HW2_SequenceList<T,maxSize>::HW2_SequenceList(){
    length = 0;
}
template<typename T, int maxSize>
HW2_SequenceList<T, maxSize>::~HW2_SequenceList() {
    delete[] data;
    length = 0;
}

//程序入口
template<typename T, int maxSize>
void HW2_SequenceList<T, maxSize>::process() {
    length = 0;
    createList();

    cout << "1.判空 2.获取长度 3.按位查找数据 4.按值查找数据索引(第一个有相同值) 5.在某位置插入值 6.删除 i 位置的值 7.打印输出表" << endl;
    cout << "按 0 退出" << endl;

    while (true) {
        cout<< endl << "请输入您想执行的操作(仅输入编号): " << endl;

        int option;
        cin >> option;
        if (option == 0) {
            exit(0);
        }

        int index; T x;

        switch (option){
        case 1:
            if (isEmpty()) cout << "表为空" << endl;
            else           cout << "表不为空" << endl;
            break;
```

```
        case 2:
            cout << "表的长度为：" << getLength() << endl;
            break;

        case 3:
            cout << "请输入您想查找第几位的数据(1 开始)：" << endl;
            cin >> index;
            cout <<"您查找的数据是：" << getValue(index) << endl;
            break;

        case 4:
            cout << "请输入您想查找的数据：" << endl;
            cin >> x;
            index = locate(x);
            if (index == -1) cout << "未找到您要找的数据" << endl;
            else        cout << "您想查找的数据在第" << locate(x) << "位" << endl;
            break;

        case 5:
            cout << "请输入您想在第几位插入数据(1 开始)：" << endl;
            cin >> index;
            cout << "请输入您想插入的数据：" << endl;
            cin >> x;
            if (insert(x, index)) cout << "插入成功" << endl;
            else                  cout << "插入失败" << endl;
            break;

        case 6:
            cout << "请输入您想删除第几位的数据(1 开始)：" << endl;
            cin >> index;
            if (erase(index))     cout << "删除成功" << endl;
            else                  cout << "删除失败" << endl;
            break;

        case 7:
            print();

        default:
            break;
        }
    }
}
```

```cpp
//创建顺序表
template<typename T, int maxSize>
void HW2_SequenceList<T, maxSize>::createList() {
    cout << "请输入想要的长度：";
    cin >> length;
    cout << "请输入" << length << "个元素：" << endl;
    for (int i = 0; i < length; i++) {
        cin >> data[i];
    }
}

//判断顺序表是否为空
template<typename T, int maxSize>
bool HW2_SequenceList<T, maxSize>::isEmpty() {
    return length == 0;
}

//获取顺序表长度
template<typename T, int maxSize>
int HW2_SequenceList<T, maxSize>::getLength() {
    return length;
}

//按位查找顺序表
template<typename T, int maxSize>
T HW2_SequenceList<T, maxSize>::getValue(int i) {
    if (i < 1) {
        cout << "索引过小，返回-1" << endl;
        return -1;
    }
    else if (i > length) {
        cout << "索引过大，返回-1" << endl;
        return -1;
    }
    else {
        return data[i - 1];
    }
}
```

```cpp
//按值查找顺序表
template<typename T, int maxSize>
int HW2_SequenceList<T, maxSize>::locate(T x) {
    for (int i = 0; i < length; i++) {
        if (data[i] == x) {
            return i + 1;
        }
    }
    return -1;
}

//在 i 位置插入值
template<typename T, int maxSize>
bool HW2_SequenceList<T, maxSize>::insert(T x, int i) {
    if (length == maxSize) {
        cout << "顺序表已满，无法插入" << endl;
        return false;
    }
    if (i < 1) {
        cout << "位置过小，无法插入" << endl;
        return false;
    }
    else if (i > length + 1) {
        cout << "位置过大，无法插入" << endl;
        return false;
    }

    for (int j = length; j >= i; j--) {
        data[j] = data[j - 1];
    }
    data[i - 1] = x;
    length++;

    return true;
}
```

```
//删除顺序表 i 位置的值
template<typename T, int maxSize>
bool HW2_SequenceList<T, maxSize>::erase(int i) {
    if (i < 1) {
        cout << "位置过小，无法删除" << endl;
        return false;
    }
    else if (i > length) {
        cout << "位置过大，无法删除" << endl;
        return false;
    }

    for (int j = i - 1; j < length - 1; j++) {
        data[j] = data[j + 1];
    }
    length--;

    return true;
}

//打印输出顺序表
template<typename T, int maxSize>
void HW2_SequenceList<T, maxSize>::print() {
    if (length == 0) {
        cout << "顺序表为空" << endl;
    }
    else {
        cout << "顺序表: " << endl;
        for (int i = 0; i < length; i++) {
            cout << data[i] << ", ";
        }
        cout << endl;
    }

}
```

```
int main(int argc, const char* argv) {
    //作业 2: 顺序表
    const int maxSize = 100;
    HW2_SequenceList<int, maxSize> seqlist;
    seqlist.process();
}
```