# 上机题第五题实验报告

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1. **题目要求及分析**

**第五章上机题1**： 用幂法求下列矩阵按模最大的特征值及其对应的特征向量，使。

（1）***A*** = [5, -4, 1; -4, 6, -4; 1, -4, 7]

（2）***B*** = [25, -41, 10, -6; -41, 68, -17, 10; 10, -17, 5, -3; -6, 10, -3, 2]

1. **实验结果及分析**

对两个矩阵的求解结果分别为：

***A***矩阵的最大特征值为 = 12.2543111057，

对应的特征向量 = [-0.6740214065, 1.0000000000, -0.8895570705]；

***B***矩阵的最大特征值为 = 98.5216977084，

对应的特征向量 = [-0.6039723423, 1.0000000000, -0.2511351305, 0.1489534456]。

结果分别储存在out1.txt和out2.txt中。

1. **实验代码**

采用C++语言实现。

**#include <cstdio>**

**#include <cmath>**

**void multiply(int n, double\*\* A, double\* bl, double\* ans){**

**for (int i = 0; i < n; i++){**

**ans[i] = 0;**

**for (int j = 0; j < n; j++)**

**ans[i] += A[i][j] \* bl[j];**

**}**

**}**

**double mmax(int n, double\* v){**

**double ans = 0;**

**double nmax = 0;**

**for (int i = 0; i < n; i++)**

**if (fabs(v[i]) > nmax){**

**ans = v[i];**

**nmax = fabs(v[i]);**

**}**

**return ans;**

**}**

**int main(int argc, char\*\* argv){**

**FILE\* fp = fopen(argv[1], "r");**

**int n;**

**fscanf(fp, "%d", &n);**

**fgetc(fp);**

**double\*\* array = new double\*[n];**

**for (int i = 0; i < n; i++){**

**array[i] = new double[n];**

**for (int j = 0; j < n; j++){**

**fscanf(fp, "%lf", &array[i][j]);**

**fgetc(fp);**

**}**

**}**

**fclose(fp);**

**double\* v = new double[n];**

**double\* u = new double[n];**

**v[0] = u[0] = 1.0;**

**for (int i = 1; i < n; i++)**

**v[i] = u[i] = 0.0;**

**double l1, l2;**

**l1 = 0;**

**do{**

**l2 = l1;**

**multiply(n, array, u, v);**

**l1 = mmax(n, v);**

**for (int i = 0; i < n; i++)**

**u[i] = v[i] / l1;**

**} while(fabs(l1 - l2) >= 0.00001);**

**fp = fopen(argv[2], "w");**

**fprintf(fp, "l = %.10f\n", l1);**

**fprintf(fp, "x = [");**

**for (int i = 0; i < n - 1; i++)**

**fprintf(fp, "%.10f\t", u[i]);**

**fprintf(fp, "%.10f]\n", u[n - 1]);**

**fclose(fp);**

**for (int i = 0; i < n; i++)**

**delete[] array[i];**

**delete[] array;**

**delete[] u;**

**delete[] v;**

**return 0;**

**}**