#define \_CRT\_SECURE\_NO\_DEPRECATE

#include <stdio.h>

#include <stdlib.h>

#include <string.h>

#define N 37

#define M 73

typedef struct htnode { // 结点型

double weight; // 权值

char ch;

int lchild; // 左孩子链

int rchild; // 右孩子链

int parent; // 双亲链

} HTM;/\*哈夫曼树\*/

typedef struct codenoye {

char ch; //存储被编码的字符

char bits[10]; //字符编码位串

} HTMcode;/\*哈夫曼编码\*/

void Init\_HT(HTM ht[]) {

FILE \*fp;

int q[N] = { 0 };

int sum = 0;

double r[N] = { 0 };

char ch;

char a[10];

char p[N];

p[0] = 'a'; p[1] = 'b'; p[2] = 'c'; p[3] = 'd'; p[4] = 'e'; p[5] = 'f'; p[7] = 'h';

p[8] = 'i'; p[9] = 'j'; p[10] = 'k'; p[11] = 'l'; p[12] = 'm'; p[13] = 'n'; p[14] = 'o';

p[15] = 'p'; p[16] = 'q'; p[17] = 'r'; p[18] = 's'; p[19] = 't'; p[20] = 'u'; p[21] = 'v';

p[22] = 'w'; p[23] = 'x'; p[24] = 'y'; p[25] = 'z'; p[26] = ','; p[27] = '.'; p[28] = '!';

p[29] = '?'; p[30] = '"'; p[31] = ':'; p[32] = ';'; p[33] = '('; p[34] = ')'; p[35] = '`'; p[36] = ' ';

printf("Please enter the name of the read file:");

scanf("%s", a);

if ((fp = fopen(a, "rb")) == NULL) {

printf("cannot open this file.\n");

}

while (feof(fp) == 0) {

fscanf(fp, "%c", &ch);

if (ch >= 'a' && ch <= 'z') {

q[ch - 'a']++;

}

else if (ch >= 'A' && ch <= 'Z') {

q[ch - 'A']++;

}

else {

switch (ch) {

case ',':q[26]++; break;

case '.':q[27]++; break;

case '!':q[28]++; break;

case '?':q[29]++; break;

case '"':q[30]++; break;

case ':':q[31]++; break;

case ';':q[32]++; break;

case '(':q[33]++; break;

case ')':q[34]++; break;

case '`':q[35]++; break;

case ' ':q[36]++; break;

}

}

sum++;

}

fclose(fp);

int i;

for (i = 0; i < N; i++) {

r[i] = (double)q[i] / sum;

}

for (i = 0; i < N; i++) {

ht[i].lchild = -1;

ht[i].parent = -1;

ht[i].rchild = -1;

ht[i].weight = r[i];

ht[i].ch = p[i];

}

for (i = N; i < M; i++) {

ht[i].lchild = -1;

ht[i].parent = -1;

ht[i].rchild = -1;

ht[i].weight = 0;

ht[i].ch = ' ';

}

}

void Select\_Min(HTM ht[], int n, int \*p1, int \*p2) {

int i, j;

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

if (ht[i].parent == -1) {

\*p1 = i;

break;

}

}

for (j = i + 1; j <= n; j++) {

if (ht[j].parent == -1) {

\*p2 = j;

break;

}

}

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

if ((ht[\*p1].weight > ht[i].weight) && (ht[i].parent == -1) && (\*p2 != i)) {

\*p1 = i;

}

}

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

if ((ht[\*p2].weight > ht[j].weight) && (ht[j].parent == -1) && (\*p1 != j)) {

\*p2 = j;

}

}

}

void Creat\_HT(HTM ht[])//构造huffam树,t[m-1]为其根

{

int i, p1, p2;

Init\_HT(ht); //初始化并输入权值

for (i = N; i < M; i++) { //n-1次合并

Select\_Min(ht, i - 1, &p1, &p2);

ht[p1].parent = i;

ht[p2].parent = i;

ht[i].lchild = p1;

ht[i].rchild = p2;

ht[i].weight = ht[p1].weight + ht[p2].weight;

}

}

void HTM\_coding(HTM ht[], HTMcode h[]) { //根据Huffman树T 求Huffman编码表 H

int c, p, i, j, k; // c 和p 分别指示T 中孩子和双亲的位置

char cd[100]; // 临时存放编码

int start; // 指示编码在cd 中的位置

cd[99] = '\0'; // 编码结束符

for (i = 0; i < N; i++) { // 依次求叶子T[i]的编码

h[i].ch = ht[i].ch; // 读入叶子T[i]对应的字符

start = 99; // 编码起始位置的初值

c = i; // 从叶子T[i]开始上溯

p = ht[c].parent;

while (ht[c].parent >= 0) {// 直到上溯到T[c]是树根位置

start--;

if (ht[p].lchild == c) {

cd[start] = '0';

}

else cd[start] = '1';

// 若T[c]是T[p]的左孩子，则生成代码0，否则生成代码1

c = p; // 继续上溯

p = ht[c].parent;

}

for (j = 0, k = start; k <= 99; k++, j++) {

h[i].bits[j] = cd[k];

}

}

}

void Write\_File(HTMcode h[]) {

FILE \*fp1, \*fp2;

char a[10], b[10];

char c;

int i;

printf("Please enter the name of the read file:");

scanf("%s", a);

if ((fp1 = fopen(a, "rb")) == NULL) {

printf("cannot open this file.\n");

}

printf("Please enter a write file name:");

scanf("%s", b);

if ((fp2 = fopen(b, "wb+")) == NULL) {

printf("cannot open this file.\n");

}

while (feof(fp1) == 0) {

fscanf(fp1, "%c", &c);

if (c >= 'A' && c <= 'Z') c = c + 32;

for (i = 0; i < N; i++) {

if (h[i].ch == c) {

fprintf(fp2, "%s", h[i].bits);

printf("%s\n", h[i].bits);

break;

}

}

}

fclose(fp1);

fclose(fp2);

}

void Read\_File(HTM ht[], HTMcode h[]) {

FILE \*fp1, \*fp2;

char a[10], b[10];

int p;

char x;

printf("Please enter the name of the read file:");

scanf("%s", a);

if ((fp1 = fopen(a, "rb")) == NULL) {

printf("cannot open this file.\n");

}

printf("Please enter a write file name:");

scanf("%s", b);

if ((fp2 = fopen(b, "wb+")) == NULL) {

printf("cannot open this file.\n");

}

while (feof(fp1) == 0) {

p = M - 1;

while (1) {

if (ht[p].lchild == -1 && ht[p].rchild == -1) {

fprintf(fp2, "%c", ht[p].ch);

break;

}

fscanf(fp1, "%c", &x);

if (x == '0') {

p = ht[p].lchild;

}

else p = ht[p].rchild;

}

}

fclose(fp1);

fclose(fp2);

}

int main() {

HTM ht[M];

HTMcode h[N];/\*哈夫曼编码库\*/

Creat\_HT(ht);

HTM\_coding(ht, h);

for (int i = 0; i < N; i++) {

printf("%c ", h[i].ch);

printf("%s\n", h[i].bits);

}

for (int i = 0; i < M; i++) {

printf("%c ", ht[i].ch);

printf("%d ", ht[i].lchild);

printf("%d ", ht[i].parent);

printf("%d\n", ht[i].rchild);

}

Write\_File(h);

Read\_File(ht, h);

getchar();

return 0;

}

测试样例：

I say to you today, my friends, so even though we face the difficulties of today and tomorrow, I still have a dream. It is a dream deeply rooted in the American dream. I have a dream that one day this nation will rise up and live out the true meaning of its creed, "We hold these truths to be self evident, that all men are created equal." I have a dream that one day on the red hills of Georgia, sons of former slaves and the sons of former slaveowners will be able to sit down together at the table of brotherhood. I have a dream that one day even the state of Mississippi, a state sweltering with the heat of injustice, sweltering with the heat of oppression, will be transformed into an oasis of freedom and justice. I have a dream that my four little children will one day live in a nation where they will not be judged by the color of their skin but by the content of their character.I HAVE A DREAM TODAY!I have a dream that one day down in Alabama with its vicious racists, with its Governor having his lips dripping with the words of interposition and nullification one day right there in Alabama, little black boys and black girls will be able to join hands with little white boys and white girls as sisters and brothers.I HAVE A DREAM TODAY!I have a dream that one day every valley shall be exalted, and every hill and mountain shall be made low. The rough places will be plain and the crooked places will be made straight, "and the glory of the Lord shall be revealed, and all flesh shall see it together."This is our hope. This is the faith that I go back to the South with. With this faith we will be able to hew out of the mountain of despair a stone of hope. With this faith we will be able to transform the jangling discords of our nation into a beautiful symphony of brother hood. With this faith we will be able to work together, to pray together, to struggle together, to go to jail together, to stand up for freedom together, knowing that we will be free one day. And this will be the day. This will be the day when all of God`s children will be able to sing with new meaning, "My country `tis of thee, sweet land of liberty, of thee I sing. Land where my father died, land of the pilgrim`s pride, from every mountainside, let freedom ring." And if America is to be a great nation, this must become true.So let freedom ring from the prodigious hilltops of New Hampshire; let freedom ring from the mighty mountains of New York; let freedom ring from the heightening Alleghenies of Pennsylvania; let freedom ring from the snow capped Rockies of Colorado; let freedom ring from the curvaceous slopes of California. But not only that. Let freedom ring from Stone Mountain of Georgia; let freedom ring from Lookout Mountain of Tennessee; let freedom ring from every hill and mole hill of Mississippi. "From every mountainside, let freedom ring."And when this happens, and when we allow freedom to ring, when we let it ring from every village and every hamlet, from every state and every city, we will be able to speed up that day when all of God`s children, black men and white men, Jews and Gentiles, Protestants and Catholics, will be able to join hands and sing in the words of the old Negro spiritual:"Free at last. Free at last. Thank God Almighty, we are free at last.

编码结果（txt格式）：

101011011110101101111011010001001110011110100101100111010001001111011011011110111110111011111101111011001101001010100100011111011111011111011101111010011100100111111010001111010000000100101100111100000001101110010101100110110110110000101101000000001011011101101001101011011010011000011001000110001010010111101101001011011101000100111101101101111011010110011111011101000100111111110010010001010011110011111101110101011011110100010100001000111000001011011111101011010111101110100100101011111111011100111010101000110101011110110101111011101001001010111111111101110101001011111000001011110110001010011001100001011101110101000111101000000001011010111111110100010101001100010110011110111010010010101111111101110011101010110000010110111111010110101111011101001001010111111111101000000010111000110100100110101101110110110111101101000000010101111011000111011100010101001001111011100110100001000111000101010111100101100110011111100110101100111110111000011010011111101011010010110011000110100000000101101000001001100101011011111101010110011101000111110001101001011011101010100011110110011000001001001011101111110111001110000111001010110000010010001111011101000000001011110010110100000100110011000000011110110100010011100111010101101111001000010110111001001111111010111010100011100011111011101000000010111000110101100010001110111111010001111010110010010110011000001001010111000010111011100100111000111r001001100110110001011100101110000110101011000001011011111101011010111101110100100101011111111110100000001011100011010010011010110111011011011110110100100111101000000001011000100101110111000001010000100011111011010010110111011100001010010010111000101010111111101110111101001001111110110100101101110011011001001011111101000101101111000011011011111101011110110101100111110111010000000010110111101001001111110110100101101110011011001001011111101000101101111000011011011111101010011110010011010001011110110111001101000010001110011101010110101101110100010101101000100111011110101010001101110110011110010011110100010011110000101000000001000101101011100011010000000010110100010110111010001010110100101101110011101001010011000000001000100000100110011110101110011101010110000010110111111010110101111011101001001010111111111101000000010111000110100100110101101110110110111101100100111111010001111010000000010110111101000101110000101101001011011101111111010111101111010101111011110101011111001111100101011111011101011110111101000101110000101101111011100101000011000010001010100011111000110111001101010000000110100000000101100000010101110001101001011011101010001101111101101100111110100010100110000101111101110111101110010100001100001000101010001111100011011100110101000000011010000000010110000001010111000110100101101110100111111001111100001001011110111101010100100111111101110111001101000010001110011101010110100000101011001111110011011001001011111101011101110101000111000100111010110011110100110111111010101111011010010110111001101001001001011101100111111111010110011111011100111110110110011111010001010011000010011100111010101100000101101111110101101011110111010010010101111111111010000000101110001101111110111101100110110010110010010110000110101000100000010101100110000000101000011110100100100011110111001101000010001110100100110101101110110110111101100001101001111110101101010001111010111100011101110001010100100111101110010000010001001011010000000010011110110111001101000010001110001110011000110011101010110011111011011001111011110000101110111001110101111011010000000010110011000100100011001001011010010110111010000000010101000101101111001111100101000111100111010110011000110011101011110110100000000101100110001001001110000100011100011010010110111010000000010101000101100110000000101100101011011000100001000100111001101011000001011011111101011010111101110100100101011111111110100010011110110110111100111000111?0111000111"011100001010110000010110111111010110101111011101001001010111111111101000000010111000110100100110101101110110110111101101110110011110010011110101000111101011000110110111011011111111101111011100110101000000011010101000111101100111111101001100010101001011001111101100010101101100010101111010001111011111011101110011010100000001101010100011110110111000100101111110100010001110010010110000010110111111101000111110001100000101011110110000110101111100111101101110100101010111110011111001010001111100011011100110101000000011010000000010110111001100100101110111110110100101101110101000111000010001011111001001111101010100010101001001111010110011111011100011011001000100011010011011010011000101110001010100100111101001001101011011101101101111011000101010111000000010001101000000001000100101101010001111010110001101101110110111111111011111110111000011010100010000001010110011101000110110110000111110011001110110010111101111011010110011111011100111010001101101100001111100110111000101000100001111101101110011010000100011100111010101101011011101000101011010001001110011111011100110100011110000010110011111011111011011100110101000000011000011010100010000001010110111001000010101000010110011101100101111011110110101100111110111011100100001010100001011011100010100010000111110110101111110110111101010111101000010001011110110101100111110111001110100101001100000000100010111100111001101011000001011011111101011010111101110100100101011111111110100010011110110110111100111000111?0111000111"011100001010110000010110111111010110101111011101001001010111111111101000000010111000110100100110101101110110110111101100100111111010001001111011001111111011000100010100111101101111000001011000100011100111010101100100111000110y01111010110001100001011101111110111010110011111011100100111111010001001111011000001010000100011101011001111101110111111100101100100111000101110100011110111100000101100010001110011101010110111111101111101010110000110011110010111001110100000000101100010100101100111100000001101111100000110110110000101111011011100110100001000111001110101011011111000001101110100011110101100111110111010000000010110011000001010011001011111000101110111011111000001101101100001011110110111001101000010001110011101010110111111101111101010110111101000001010111010111000000010001111101110011100001011001111101110100000000101101110000001100100100111101101001011011101000000001011000011001001011101110111100000101100010001110011101010110001001001111110101011000101011101111110111010110011111011101011000100011100110100010101111000001101111000001011000100011101111001001011010101000110100010011110000101000000001000100111001011100001000000010101111011010101111011010010110010010110000010011111100010011100111010000000101011110110101011110110100000000101100110110111010100000001101000000010111000110101011011100010011100111011011011000011111001101000100111010000000010110111101001011001100000001101110011010100000000111001110111001101010000000110100000001010111101100110110111010100000001101110010101101110011010000100011100111010101101011011101000101011010001001110000001011100111010010110011000110100101101110100000000101101111111001011001001110001011101000111101001011011101110101011110111110010111010001011010111101111010001001001101011010010110111000001001111110001001110011101101110011010100000001101000000010101111011001101101110101000000011011100101011011100110100001000111001110101011010110111010001010110100010011101000001010110011111100110110010010111111110100000000101100111110111011001111100000011010001111100011011101101011110011000100100101110111110110100101101110100101100100101100011101110001010100100111101010001110001001110101111001110101010110110011000101001101011001000111011110011110111111111110000001001001101111011010010110111001110100101001100000000100010110000010011001111010111001110111001101010000000110100000001010111101100110110111010100000001101110010101101110011010000100011100111010101101011011101000101011010001001110111001100100100111110011010001001111000010100000000100010111110111010001001110111110000101011011110110100010011110000101000000001000101111101110100010011101111010000010011001111000111000000101011010001001111000010100000000100010111110111010001001110111000100111010001001110011111011101110100001110100010011110000101000000001000101111101110100010011101111010001011001111101110011001111110011001101100100101100110100100100101110110011111111101000100111100001010000000010001011111011100111110000111001111001101000111110001101000000010111000110111001010110111001101000010001110011101010110011010010010010110100100110101101110110110111100111001110110101100111110111010000000101011110110111001101000010001110011101010110100000000101101110110110111100111001110100000001010111101101110011010000100011100111010101101000000001011011101101101111011011100100000100011110101100010001110100101101110111000100111101011100010111101100110000000101000011110100100100011110111001101000010001110011101010110101101110100010101101000100111011110101000111110001101110011010100000001100011010111001110111111010101100111010001111100011111011100111000011111101111011001100010010110010011100000100111101100111000101000101011110110100101101110100000000100101111101110111101110010100101000110000110110011111011101001011011100001101001110101000101000011110111110111010010110111010000000010010110101011011110101000111110000111001110000110110011111011101110010000010001001011011111101111011001101101110000000010001011011101101001011101111110111000011011001111101110100101101110100000000101101111100101000011110000010101011111101110001011110110111110000101010111010101111101110011010010100111111111001001111110100010011110110111111100101100100111000101110100011111101010111010101111101110000101010001100110100100100101110110011111111100010101000111110000111001011100001101011001111101110101001101110101111111101000101010011000101111010101111011010001001110011101010110101111011100000100101011100011000111011100010101001001111111011101000000010101111011011111101100111110100011001110101001100010011111110101101000001001100101001110011111010011100001010100011001101001001001011101100111111111000101010001111100011001101001010011111111101000000001011011111000010100111101101011100010101001011001111101100000101000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译码结果：

i say to you today, my friends, so even though we face the difficulties of today and tomorrow, i still have a dream. it is a dream deeply rooted in the american dream. i have a dream that one day this nation will rise up and live out the true meaning of its creed, "we hold these truths to be self evident, that all men are created e!rual." i have a dream that one day on the red hills of georgia, sons of former slaves and the sons of former slaveowners will be able to sit down together at the table of brotherhood. i have a dream that one day even the state of mississippi, a state sweltering with the heat of injustice, sweltering with the heat of oppression, will be transformed into an oasis of freedom and justice. i have a dream that my four little children will one day live in a nation where they will not be judged by the color of their skin but by the content of their character.i have a dream today!!"i have a dream that one day down in alabama with its vicious racists, with its governor having his lips dripping with the words of interposition and nullification one day right there in alabama, little black boys and black girls will be able to join hands with little white boys and white girls as sisters and brothers.i have a dream today!!"i have a dream that one day every valley shall be e:yalted, and every hill and mountain shall be made low. the rough places will be plain and the crooked places will be made straight, "and the glory of the lord shall be revealed, and all flesh shall see it together."this is our hope. this is the faith that i go back to the south with. with this faith we will be able to hew out of the mountain of despair a stone of hope. with this faith we will be able to transform the jangling discords of our nation into a beautiful symphony of brother hood. with this faith we will be able to work together, to pray together, to struggle together, to go to jail together, to stand up for freedom together, knowing that we will be free one day. and this will be the day. this will be the day when all of god`s children will be able to sing with new meaning, "my country `tis of thee, sweet land of liberty, of thee i sing. land where my father died, land of the pilgrim`s pride, from every mountainside, let freedom ring." and if america is to be a great nation, this must become true.so let freedom ring from the prodigious hilltops of new hampshire; let freedom ring from the mighty mountains of new york; let freedom ring from the heightening alleghenies of pennsylvania; let freedom ring from the snow capped rockies of colorado; let freedom ring from the curvaceous slopes of california. but not only that. let freedom ring from stone mountain of georgia; let freedom ring from lookout mountain of tennessee; let freedom ring from every hill and mole hill of mississippi. "from every mountainside, let freedom ring."and when this happens, and when we allow freedom to ring, when we let it ring from every village and every hamlet, from every state and every city, we will be able to speed up that day when all of god`s children, black men and white men, jews and gentiles, protestants and catholics, will be able to join hands and sing in the words of the old negro spiritual:;"free at last. free at last. thank god almighty, we are free at last..m