Московский Авиационный Институт

(Национальный Исследовательский Университет)

Кафедра 806 «Вычислительная информатика и программирование»

Факультет: «Информационные технологии и прикладная математика»

Курсовая работа

Дисциплина: «Практикум на ЭВМ»

II семестр

Задание 9: «Сортировка и поиск»

|  |  |
| --- | --- |
| Группа: | М8О-108Б-18, №12 |
| Студент: | Коростелев Дмитрий Васильевич |
| Преподаватель: | Поповкин Александр Викторович |
| Оценка: |  |
| Дата: | 16.05.2019 |

Москва, 2019

**Содержание**

1. Задание..............................................................................................................2
2. Алгоритм...........................................................................................................2
3. Переменные ......................................................................................................3
4. Тестирование.....................................................................................................4
5. Листинг программы........................................................................................11
6. Протокол..........................................................................................................15
7. Заключение......................................................................................................24
8. Список использованной литературы.............................................................25

**Задание**

Составить программу на языке СИ с использованием процедур и функций для сортировки таблицы заданным методом и двоичного поиска по ключу в таблице. Программа должна вводить значения элементов неупорядоченной Таблицы и проверять работу процедуры сортировки в трех случаях: элементы таблицы с самого начала упорядочены, элементы таблицы расставлены в обратном порядке, элементы таблицы не упорядочены. Для каждого вызова процедуры сортировки необходимо печатать исходное состояние таблицы и для каждого из них выполнять поиск в упорядоченной таблице с помощью процедуры двоичного поиска и печатать данные элементы, если они присутствуют в таблице.

Структура таблицы: тип ключа – целый, длина ключа в байтах – 8, хранение данных и ключей – вместе, число элементов таблицы – 8-12. Метод сортировки: линейная вставка с обменом.

**Алгоритм**

Так как данные хранятся вместе будем хранить ключ и ячейку таблицы в структуре tab\_el, тип ключа целый 8 байт, значит тип ключа long long. Ввод данных производится из текстового файла через командную строку с проверкой ввода аргументов. По заданию требуется вывести таблицу, значит создадим отдельную функцию для этой цели. Функция вывода принимает указатель на таблицу, и размер таблицы. Печать таблицы будем производить итерационно через цикл, далее требуется отсортировать таблицу методом линейной вставки с обменом, суть данной сортировки заключается, что мы начиная с первого элемента, идем по таблице, находим минимальный элемент, находящийся после первого элемента, потом, переставляем первый и найденный элемент местами, переходим на второй и повторяем действие, повторяем до того пока не дойдем до концы массива.

Далее требуется реализовать функцию бинарного поиска, суть бинарного поиска заключается в том, что, мы делим массив на два равных отрезка, и проверяем, в какой интервал входит ключ, переходим в соответствующий интервал, повторяем действие, пока левая граница меньше правой границы, если ключ совпал, то заранее выходим из цикла и выводим нужный элемент, в ином случае выводим сообщение об отсутствии соответствующего ключа.

**Переменные**

Таблица 1

|  |  |  |
| --- | --- | --- |
| **Имя** | **Тип** | **Назначение** |
| argc | int | Кол-во аргументов командной строки |
| value | Элемент структуры table\_element, значение ячейки таблицы |
| max\_k | Буферная переменная, в которой хранится максимальное значение ключа на данной итерации |
| max\_n | Буферная переменная, в которой хранится индекс максимального ключа на данной итерации |
| iterator | Счетчик прочитанных из файла элементов таблицы |
| input | FILE\* | Указатель на входной файл |
| output | Указатель на выходной файл |
| table | typedef struct table\_element {} tab\_el\* | Указатель на структуру table\_element, массив, таблица в которую записываются данные |
| temp | typedef struct table\_element {} tab\_el | Временная переменная, нужна для процедуры перестановки элементов |
| key | long long | Ключ ячейки таблицы, часть структуры table\_element |
| argv[v] | char\* | Символьный указатель на строку аргументов |

**Тестирование**

*Файл input1.txt*

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

1 ######################%%%%%%%%%%%%%%%%######################

*Файл input.txt*

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

*Файл input2.txt*

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

**Листинг программы**

*Файл main.c*

#include<stdio.h>

#include<stdlib.h>

#include"header.h"

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

if(argc == 1){

printf("Error: file not entered as argumant\n");

return 0;

}

FILE\* input;

char temp;

input = fopen(argv[1], "r");

printf("file: %s is opened\n",argv[1]);

tab\_el\* table;

table = malloc(sizeof(tab\_el));

int iterator = 0;//размер таблицы

while(!feof(input)){

table = realloc(table, (iterator+1)\*sizeof(tab\_el));

fscanf(input,"%llu", &table[iterator].key);

temp = fgetc(input);

fgets(table[iterator].value,MAX\_LEN,input);

iterator++;

}

table = realloc(table, iterator\*sizeof(tab\_el));

iterator--;

printf("Opening file...\n");

print\_tab(table, iterator);

table = sorting(table, iterator);

printf("Sorted table:\n");

print\_tab(table, iterator);

FILE\* output;

fclose(input);

output = fopen("output.txt", "w");

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

fprintf(output, "%llu %s", table[i].key, table[i].value);

}

return 0;

}

*Файл header.h*

typedef struct table\_element {

int value;

long long key;

} tab\_el;

void bin\_search(long long key, tab\_el\* tabe, int size);

void print\_tab(tab\_el\* table, int size);

tab\_el\* sorting(tab\_el\* table,int size);

*Файл function.c*

#include<stdio.h>

#include"header.h"

void print\_tab(tab\_el\* table, int size){

printf(" Key Value\n");

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

printf("%8llu %s", table[i].key, table[i].value);

}

}

tab\_el\* sorting(tab\_el\* table,int size){

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

int max\_k = table[i].key;

int max\_n = i;

for(int j = i; j < size ;j++){

if(max\_k > table[j].key){max\_k = table[j].key; max\_n = j;}

}

tab\_el temp = table[i];

table[i] = table[max\_n];

table[max\_n] = temp;

}

return (table);

}

void bin\_search(long long key, tab\_el\* table, int size){

long long left = 0;

long long right = size-1;

int flag = -1;

long long mid;

while(left <= right){

mid = (left + right)/2;

if(key == table[mid].key){flag = mid; break;}

if(key < table[mid].key){right = mid - 1;}

else{left = mid + 1;}

}

printf("%llu %s", table[mid].key, table[mid].value);

}

*Файл sort.c*

#include<stdio.h>

#include<malloc.h>

#include"header.h"

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

if(argc == 1){

printf("Error: file is not entered as argument\n");

return 0;

}

FILE\* input;

input = fopen(argv[1],"r");

tab\_el\* table;

table = malloc(sizeof(tab\_el));

int iterator = 0;

char temp;

while(!feof(input)){

table = realloc(table, (iterator+1)\*sizeof(tab\_el));

fscanf(input,"%llu", &table[iterator].key);

temp = fgetc(input);

fgets(table[iterator].value, MAX\_LEN, input);

iterator++;

}

table = realloc(table, iterator\*sizeof(tab\_el));

iterator--;

long long key;

print\_tab(table, iterator);

printf("Enter the key: ");

scanf("%llu", &key);

bin\_search(key, table, iterator);

return 0;

}

*MakeFile*

CC = cc #имя компилятора

CCFLAGS = -c -Wall #ключи компилятора

RESULT\_NAME = kp9.out

all: $(RESULT\_NAME) clean

$(RESULT\_NAME): main.o function.o

$(CC) main.o function.o -o $(RESULT\_NAME)

main.o: main.c

$(CC) $(CCFLAGS) header.h main.c

function.o: function.c

$(CC) $(CCFLAGS) header.h function.c

clean:

rm \*.o \*.gch

**Протокол**

dmitry@dmitry-VirtualBox:~/lubs/KP9$ make -f MakeFileKP9

cc -c -Wall header.h main.c

cc -c -Wall header.h function.c

cc main.o function.o -o kp9.out

rm \*.o \*.gch

dmitry@dmitry-VirtualBox:~/lubs/KP9$ ./kp9.out

Error: file not entered as argumant

dmitry@dmitry-VirtualBox:~/lubs/KP9$ ./kp9.out input.txt

file: input.txt is opened

Opening file...

Key Value

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

Sorted table:

Key Value

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

dmitry@dmitry-VirtualBox:~/lubs/KP9$ ./kp9.out input1.txt

file: input1.txt is opened

Opening file...

Key Value

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

1 ######################%%%%%%%%%%%%%%%%######################

Sorted table:

Key Value

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

dmitry@dmitry-VirtualBox:~/lubs/KP9$ ./kp9.out input2.txt

file: input2.txt is opened

Opening file...

Key Value

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

Sorted table:

Key Value

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

dmitry@dmitry-VirtualBox:~/lubs/KP9$ cat output.txt

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

dmitry@dmitry-VirtualBox:~/lubs/KP9$ ./sort.out output.txt

Key Value

1 ######################%%%%%%%%%%%%%%%%######################

2 #################%%%%%%%%%%%%%%%%%%%%%%%%%%#################

3 #############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%#############

4 ##########=%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%=##########

5 ########%%%%%%%%%%%%%%%%%%%%%=\*-..........=%%%%%%%%%########

6 ######=%%%%%%%%%%%%%%%%%%%%=..............=%%%%%%%%%%=######

7 #####%%%%%%%%%%%%%%%%%%%%%:...............=%%%%%%%%%%%%#####

8 ####%%%%%%%%%%%%%%%%%%%%%+................=%%%%%%%%%%%%%####

9 ###%%%%%%%%%%%%%%%%%%%%%%:........:%%%%%%%%%%%%%%%%%%%%%%###

10 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

11 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

13 %%%%%%%%%%%%%%%%%=.......................-%%%%%%%%%%%%%%%%%%

14 %%%%%%%%%%%%%%%%%=.......................\*%%%%%%%%%%%%%%%%%%

15 %%%%%%%%%%%%%%%%%=.......................+%%%%%%%%%%%%%%%%%%

16 %%%%%%%%%%%%%%%%%=.......................%%%%%%%%%%%%%%%%%%%

17 %%%%%%%%%%%%%%%%%%+\*\*\*\*\*\*.........\*\*\*\*\*\*=%%%%%%%%%%%%%%%%%%%

18 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

19 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

20 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

21 #%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%#

22 ##%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%##

23 ###%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%###

24 ####%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%####

25 ######%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%######

26 #######=%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%=#######

27 #########=%%%%%%%%%%%%%%%\*:::::::\*%%%%%%%%%%%%%%%%=#########

28 ############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%############

29 ###############%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%###############

30 ###################%%%%%%%%%%%%%%%%%%%%%%###################

Enter the key: 12

12 %%%%%%%%%%%%%%%%%%%%%%%%%-........%%%%%%%%%%%%%%%%%%%%%%%%%%

dmitry@dmitry-VirtualBox:~/lubs/KP9$

**Заключение**

В заключении, стоит отметить, что существует целое множество способов и вариантов хранения и обработки таблиц, каждый из которых удобен в использовании в определённых ситуациях, благодаря данной курсовой работе студент может ознакомится с различными видами таблиц, а также функциями поиска и сортировки ячеек этих таблиц.

**Список использованной литературы**

1. Методические материалы: “Практикум по циклу дисциплин «Информатика» часть 2. 8 факультет, 1 Курс, 2 семестр 2012/13. 13стр. Зайцев В.Е.
2. Динамическое выделение памяти, динамические массивы [Эдектронный ресурс]// <https://prog-cpp.ru/>URL: https://prog-cpp.ru/c-alloc//