

ПРАВИТЕЛЬСТВО РОССИЙСКОЙ ФЕДЕРАЦИИ

**Федеральное государственное автономное образовательное
учреждение
высшего образования
«Национальный исследовательский университет
«Высшая школа экономики»**

Московский институт электроники и математики им. А.Н. Тихонова

Департамент прикладной математики

**Отчёт
по лабораторной работе №8
по курсу «Алгоритмизация и программирование»
Задание № 13**

ФИО студента	Номер группы	Дата
Кейер Александр Петрович	БПМ-231	3 марта 2024 г.

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Задание (вариант № 13)

1. Данные должны храниться в бинарном файле.
2. Каждая операция с данными базы должна быть реализована как функция или набор функций.
3. Выбор и запуск требуемого режима (действия) осуществляется через меню.
4. Реализовать следующие функции обработки данных:
 - добавление записи в файл;
 - удаление заданной записи из файла по порядковому номеру записи;
 - поиск записей по заданному пользователем (любому) полю структуры;
 - редактирование (изменение) заданной записи;
 - вывод на экран содержимого файла в табличном виде.
5. Структуру (в соответствии с вариантом) определять в отдельном заголовочном файле. С помощью директив условной компиляции определить два способа ввода исходных данных в файл: пользователем с потока ввода и из заранее заполненного массива.

Структура заголовочного файла

```
1  #define fieldLength 64
2  #define fieldSize fieldLength * sizeof(char)
3  #define entryLength 6
4
5  struct footballerType {
6      char fullName[fieldLength];
7      char clubName[fieldLength];
8      char role[fieldLength];
9      int age;
10     int numberOfGames;
11     int numberOfGoals;
12 };
13
```

Решение

```
1  #pragma once
2
3  #include "football.h" // Headers file.
4
5  #include <stdio.h> // Input/output library.
6  #include <string.h> // String library.
7  #include <stdlib.h> // Memory allocation library.
8  #include <io.h> // File managing library.
9
10 #define FILE_NAME "footballer.bin"
11 #define INPUT_TYPE 'a'
12
13 // Function printing horizontal line.
14 void printHr(int length) {
15     for (int j = 0; j < length; j++) {
16         printf("- ");
17     }
18     printf("\n");
19 }
20
21 // Function printing table header.
22 void printTableHeader() {
23     printHr(65);
24     printf("%2s|%30s|%30s|%30s|%10s|%10s|%10s|\n", "ID", "
FULL NAME", "CLUB NAME", "ROLE", "AGE", "GAMES", "GOALS");
}
```

```

25     printHr(65);
26 }
27
28 // Function printing footballer entry.
29 void printFootballer(struct footballerType entry, int id)
30 {
31     printf("%2d|%30s|%30s|%30s|%10d|%10d|%10d|\n", id,
32     entry.fullName, entry.clubName, entry.role, entry.age,
33     entry.numberOfGames, entry.numberOfGoals);
34     printHr(65);
35 }
36
37 // Function getting footballer id by user.
38 void getEntryIdByUser(int *entryId) {
39     printf("Enter footballer id: ");
40
41     fflush(stdin);
42     scanf("%d", entryId);
43 }
44
45 // Function getting footballer full name by user.
46 void getFootballerFullNameByUser(char fullName[
47     fieldLength]) {
48     printf("Enter full name: ");
49
50     fflush(stdin);
51     fgets(fullName, fieldLength, stdin);
52     fullName[strcspn(fullName, "\n")] = 0;
53 }
54
55 // Function getting footballer club name by user.
56 void getFootballerClubNameByUser(char clubName[
57     fieldLength]) {
58     printf("Enter club name: ");
59
60     fflush(stdin);
61     fgets(clubName, fieldLength, stdin);
62     clubName[strcspn(clubName, "\n")] = 0;
63 }
64
65 // Function getting footballer role by user.
66 void getFootballerRoleByUser(char role[fieldLength]) {
67     printf("Enter role: ");
68
69     fflush(stdin);

```

```

65     fgets(role, fieldLength, stdin);
66     role[strcspn(role, "\n")] = 0;
67 }
68
69 // Function getting footballer age by user.
70 void getFootballerAgeByUser(int *age) {
71     printf("Enter age: ");
72
73     fflush(stdin);
74     scanf("%d", age);
75 }
76
77 // Function getting footballer games by user.
78 void getFootballerNumberOfGamesByUser(int *numberOfGames)
79 {
80     printf("Enter number of games: ");
81
82     fflush(stdin);
83     scanf("%d", numberOfGames);
84 }
85
86 // Function getting footballer goals by user.
87 void getFootballerNumberOfGoalsByUser(int *numberOfGoals)
88 {
89     printf("Enter count of goals: ");
90
91     fflush(stdin);
92     scanf("%d", numberOfGoals);
93 }
94
95 // Function getting footballer by user.
96 void getFootballerByUser(struct footballerType *
97 footballer) {
98     getFootballerFullNameByUser(footballer->fullName);
99     getFootballerClubNameByUser(footballer->clubName);
100    getFootballerRoleByUser(footballer->role);
101    getFootballerAgeByUser(&(footballer->age));
102    getFootballerNumberOfGamesByUser(&(footballer->
103    numberOfGames));
104    getFootballerNumberOfGoalsByUser(&(footballer->
105    numberOfGoals));
106 }
107
108 // Function getting file length.
109 int getFileLength(FILE *f) {

```

```

105     fseek(f, 0, SEEK_END);
106     int fileLength = ftell(f) / sizeof(struct
footballerType);
107     fseek(f, 0, SEEK_SET);
108
109     return fileLength;
110 }
111
112 // Function creating binary file.
113 void createBinaryFile(char *fileName, struct
footballerType entry) {
114     FILE *f = fopen(fileName, "wb");
115
116     if (!f) {
117         printf("File with name %s could not be open for write
.\n", fileName);
118         return;
119     }
120
121     fwrite(&entry, sizeof(struct footballerType), 1, f);
122     fclose(f);
123 }
124
125 // Function appendind entry in binary file.
126 void appendEntry(char *fileName, struct footballerType
entry) {
127     FILE *f = fopen(fileName, "ab");
128
129     if (!f) {
130         printf("File with name %s could not be open for write
.\n", fileName);
131         return;
132     }
133
134     fwrite(&entry, sizeof(struct footballerType), 1, f);
135     fclose(f);
136 }
137
138 // Function deleting entry by id from binary file.
139 void deleteEntryById(char *fileName, int entryId) {
140     FILE *f = fopen(fileName, "r+b");
141
142     if (!f) {
143         printf("File with name %s could not be open for
changes.\n", fileName);

```

```

144     return;
145 }
146
147 int fileLength = getFileLength(f);
148
149 struct footballerType tmpEntry;
150 struct footballerType deletedEntry;
151
152 if (entryId >= fileLength || entryId < 0) {
153     printf("Couldn't delete entry.\n");
154     return;
155 }
156
157 fseek(f, entryId * sizeof(struct footballerType),
158 SEEK_SET); // Move pointer on correct position.
159 fread(&deletedEntry, sizeof(struct footballerType), 1,
160 f); // Saving deleted entry.
161
162 // Making a shift.
163 for (int i = entryId + 1; i < fileLength; i++) {
164     fread(&tmpEntry, sizeof(struct footballerType), 1, f)
165 ;
166     fseek(f, (i - 1) * sizeof(struct footballerType),
167 SEEK_SET);
168     fwrite(&tmpEntry, sizeof(struct footballerType), 1, f
169 );
170     fseek(f, (i + 1) * sizeof(struct footballerType),
171 SEEK_SET);
172 }
173
174 _chsize(_fileno(f), (fileLength - 1) * sizeof(struct
175 footballerType)); // Clip file.
176 fclose(f);
177 printf("Successfully deleted '%s' from binary file.\n",
178 deletedEntry.fullName);
179 }
180
181 // Find all entries by full name function.
182 void findAllEntriesByFullName(char *fileName, char
183 fieldValue[fieldLength]) {
184     FILE *f = fopen(fileName, "rb");
185
186     if (!f) {
187         printf("File with name %s could not be open for
188 reading.\n", fileName);

```

```

179         return;
180     }
181
182     printf("\nFound all entries by full name '%s':\n",
fieldValue);
183     printTableHeader();
184
185     struct footballerType entry;
186     int fileLength = getFileLength(f);
187     int entriesCount = 0;
188
189     for (int i = 0; i < fileLength; i++) {
190         fread(&entry, sizeof(struct footballerType), 1, f);
191
192         if (!strcmp(entry.fullName, fieldValue)) {
193             printFootballer(entry, i);
194             entriesCount++;
195         }
196     }
197
198     if (entriesCount == 0) {
199         printf("No entries were found.\n");
200     }
201
202     printf("\n");
203     fclose(f);
204 }
205
206 // Find all entries by club name function.
207 void findAllEntriesByClubName(char *fileName, char
fieldValue[fieldLength]) {
208     FILE *f = fopen(fileName, "rb");
209
210     if (!f) {
211         printf("File with name %s could not be open for
reading.\n", fileName);
212         return;
213     }
214
215     printf("\nFound all entries by club name '%s':\n",
fieldValue);
216     printTableHeader();
217
218     struct footballerType entry;
219     int fileLength = getFileLength(f);

```



```

220     int entriesCount = 0;
221
222     for (int i = 0; i < fileLength; i++) {
223         fread(&entry, sizeof(struct footballerType), 1, f);
224
225         if (!strcmp(entry.clubName, fieldValue)) {
226             printFootballer(entry, i);
227             entriesCount++;
228         }
229     }
230
231     if (entriesCount == 0) {
232         printf("No entries were found.\n");
233     }
234
235     printf("\n");
236     fclose(f);
237 }
238
239 // Find all entries by role function.
240 void findAllEntriesByRole(char *fileName, char fieldValue
[fieldLength]) {
241     FILE *f = fopen(fileName, "rb");
242
243     if (!f) {
244         printf("File with name %s could not be open for
reading.\n", fileName);
245         return;
246     }
247
248     printf("\nFound all entries by role '%s':\n",
fieldValue);
249     printTableHeader();
250
251     struct footballerType entry;
252     int fileLength = getFileLength(f);
253     int entriesCount = 0;
254
255     for (int i = 0; i < fileLength; i++) {
256         fread(&entry, sizeof(struct footballerType), 1, f);
257
258         if (!strcmp(entry.role, fieldValue)) {
259             printFootballer(entry, i);
260             entriesCount++;
261         }

```

```

262     }
263
264     if (entriesCount == 0) {
265         printf("No entries were found.\n");
266     }
267
268     printf("\n");
269     fclose(f);
270 }
271
272 // Find all entries by age function.
273 void findAllEntriesByAge(char *fileName, int fieldValue)
274 {
275     FILE *f = fopen(fileName, "rb");
276
277     if (!f) {
278         printf("File with name %s could not be open for
279 reading.\n", fileName);
280         return;
281     }
282
283     printf("\nFound all entries by age '%d':\n", fieldValue);
284     printTableHeader();
285
286     struct footballerType entry;
287     int fileLength = getFileLength(f);
288     int entriesCount = 0;
289
290     for (int i = 0; i < fileLength; i++) {
291         fread(&entry, sizeof(struct footballerType), 1, f);
292
293         if (entry.age == fieldValue) {
294             printFootballer(entry, i);
295             entriesCount++;
296         }
297     }
298
299     if (entriesCount == 0) {
300         printf("No entries were found.\n");
301     }
302
303     printf("\n");
304     fclose(f);
305 }

```

```

304
305 // Find all entries by games function.
306 void findAllEntriesByNumberOfGames(char *fileName, int
fieldValue) {
307     FILE *f = fopen(fileName, "rb");
308
309     if (!f) {
310         printf("File with name %s could not be open for
reading.\n", fileName);
311         return;
312     }
313
314     printf("\nFound all entries by number of games '%d':\n"
, fieldValue);
315     printTableHeader();
316
317     struct footballerType entry;
318     int fileLength = getFileLength(f);
319     int entriesCount = 0;
320
321     for (int i = 0; i < fileLength; i++) {
322         fread(&entry, sizeof(struct footballerType), 1, f);
323
324         if (entry.numberOfGames == fieldValue) {
325             printFootballer(entry, i);
326             entriesCount++;
327         }
328     }
329
330     if (entriesCount == 0) {
331         printf("No entries were found.\n");
332     }
333
334     printf("\n");
335     fclose(f);
336 }
337
338 // Find all entries by goals function.
339 void findAllEntriesByNumberOfGoals(char *fileName, int
fieldValue) {
340     FILE *f = fopen(fileName, "rb");
341
342     if (!f) {
343         printf("File with name %s could not be open for
reading.\n", fileName);

```

```

344     return;
345 }
346
347     printf("\nFound all entries by number of goals '%d':\n",
, fieldValue);
348     printTableHeader();
349
350     struct footballerType entry;
351     int fileLength = getFileLength(f);
352     int entriesCount = 0;
353
354     for (int i = 0; i < fileLength; i++) {
355         fread(&entry, sizeof(struct footballerType), 1, f);
356
357         if (entry.numberOfGoals == fieldValue) {
358             printFootballer(entry, i);
359             entriesCount++;
360         }
361     }
362
363     if (entriesCount == 0) {
364         printf("No entries were found.\n");
365     }
366
367     fclose(f);
368     printf("\n");
369 }
370
371 // Function updating entry by id.
372 void updateEntryById(char *fileName, int entryId, struct
footballerType newEntry) {
373     FILE *f = fopen(fileName, "r+b");
374
375     if (!f) {
376         printf("File with name %s could not be open for
changes.\n", fileName);
377         return;
378     }
379
380     if (entryId < 0 || entryId >= getFileLength(f)) {
381         printf("Footballer with id '%d' doesn't exist.",
entryId);
382         return;
383     }
384

```

```

385     // Move pointer on correct position.
386     fseek(f, entryId * sizeof(struct footballerType),
SEEK_SET);
387     fwrite(&newEntry, sizeof(struct footballerType), 1, f);
388
389     fclose(f);
390     printf("\nSuccessfully updated entry '%d'.\n", entryId)
;
391 }
392
393 // Function printing binary file.
394 void printBinaryFile(char *fileName) {
395     FILE *f = fopen(fileName, "rb");
396
397     if (!f) {
398         printf("File isn't valid for printing.\n");
399         return;
400     }
401
402     printTableHeader();
403
404     struct footballerType entry;
405
406     fread(&entry, sizeof(struct footballerType), 1, f);
407
408     int i = 0;
409
410     while (!feof(f)) {
411         printFootballer(entry, i++);
412
413         fread(&entry, sizeof(struct footballerType), 1, f);
414     }
415
416     fclose(f);
417 }
418
419 // Function finding very old footballer with a lot of
goals.
420 void findVeryOldWithALotOfGoals(char *fileName) {
421     FILE *f = fopen(fileName, "rb");
422
423     if (!f) {
424         printf("File with name %s could not be open for
reading.\n", fileName);
425         return;

```

```

426     }
427
428     printf("\nFound old guy with a lot of goals.\n");
429     printTableHeader();
430
431     struct footballerType entry;
432     struct footballerType outEntry;
433
434     int fileLength = getFileLength(f);
435     int entriesCount = 0;
436     int maximumGoals = 0;
437     int maximumAge = 0;
438
439     // Finding maximum goals number.
440     for (int i = 0; i < fileLength; i++) {
441         fread(&entry, sizeof(struct footballerType), 1, f);
442
443         if (entry.numberOfGoals > maximumGoals) {
444             maximumGoals = entry.numberOfGames;
445             entriesCount++;
446         }
447     }
448
449     fseek(f, 0, SEEK_SET);
450
451     // Finding very old people with maximum goals number.
452     for (int i = 0; i < fileLength; i++) {
453         fread(&entry, sizeof(struct footballerType), 1, f);
454
455         if (entry.numberOfGoals == maximumGoals && entry.age
456 > maximumAge) {
457             maximumAge = entry.age;
458             outEntry = entry;
459             entriesCount++;
460         }
461     }
462
463     if (entriesCount == 0) {
464         printf("No entries were found.\n");
465     }
466
467     printFootballer(outEntry, 0);
468
469     fclose(f);
470     printf("\n");

```

```

470     }
471
472     // Function printing find all operations codes list.
473     void printFindAllOperationsList() {
474         printf("\n");
475         printf("%30s %3s", "full name:", "1\n");
476         printf("%30s %3s", "club name:", "2\n");
477         printf("%30s %3s", "role:", "3\n");
478         printf("%30s %3s", "age:", "4\n");
479         printf("%30s %3s", "number of goals:", "5\n");
480         printf("%30s %3s", "number of games:", "6\n");
481         printf("%30s %3s", "very old with maximum goals:", "7\n");
482     };
483     printf("\n\n");
484 }
485
486 // Function starting find all entries menu.
487 void startFindAllEntriesMenu() {
488     printf("\n");
489     printFindAllOperationsList();
490     printf("Enter correct find all code: ");
491
492     int operationCode = 0;
493
494     fflush(stdin);
495     scanf("%d", &operationCode);
496
497     if (operationCode <= 0 || operationCode > 7) {
498         startFindAllEntriesMenu();
499         return;
500     }
501
502     switch (operationCode) {
503     case 1: {
504         char fullName[fieldLength];
505         getFootballerFullNameByUser(fullName);
506         findAllEntriesByFullName(FILE_NAME, fullName);
507         break;
508     }
509
510     case 2: {
511         char clubName[fieldLength];
512         getFootballerClubNameByUser(clubName);
513         findAllEntriesByClubName(FILE_NAME, clubName);
514         break;

```

```

514     }
515
516     case 3: {
517         char role[fieldLength];
518         getFootballerRoleByUser(role);
519         findAllEntriesByRole(FILE_NAME, role);
520         break;
521     }
522
523     case 4: {
524         int age;
525         getFootballerAgeByUser(&age);
526         findAllEntriesByAge(FILE_NAME, age);
527         break;
528     }
529
530     case 5: {
531         int numberOfGoals;
532         getFootballerNumberOfGoalsByUser(&numberOfGoals);
533         findAllEntriesByNumberOfGoals(FILE_NAME,
numberOfGoals);
534         break;
535     }
536
537     case 6: {
538         int numberOfGames;
539         getFootballerNumberOfGamesByUser(&numberOfGames);
540         findAllEntriesByNumberOfGames(FILE_NAME,
numberOfGames);
541         break;
542     }
543
544     case 7: {
545         findVeryOldWithALotOfGoals(FILE_NAME);
546         break;
547     }
548 }
549 }
550
551 // Function printing main operations codes list.
552 void printMainOperationsList() {
553     printf("\n");
554     printf("%30s %3s", "append entry:", "1\n");
555     printf("%30s %3s", "delete entry:", "2\n");
556     printf("%30s %3s", "find all entries by:", "3\n");

```



```

557     printf("%30s %3s", "update entry:", "4\n");
558     printf("%30s %3s", "print database:", "5\n");
559     printf("%30s %3s", "exit program:", "6\n");
560     printf("\n\n");
561 }
562
563 // Function starting main menu.
564 void startMenu() {
565     printf("\n");
566     printMainOperationsList();
567     printf("Enter correct operation code: ");
568
569     int operationCode = 0;
570
571     fflush(stdin);
572     scanf("%d", &operationCode);
573
574     switch (operationCode) {
575         case 1: {
576             struct footballerType footballer;
577
578             getFootballerByUser(&footballer);
579             appendEntry(FILE_NAME, footballer);
580             break;
581         }
582
583         case 2: {
584             int entryId;
585
586             getEntryIdByUser(&entryId);
587
588             deleteEntryById(FILE_NAME, entryId);
589             break;
590         }
591
592         case 3: {
593             startFindAllEntriesMenu();
594             break;
595         }
596
597         case 4: {
598             int entryId;
599             struct footballerType footballer;
600
601             getEntryIdByUser(&entryId);

```

```

602         getFootballerByUser(&footballer);
603
604         updateEntryById(FILE_NAME, entryId, footballer);
605         break;
606     }
607
608     case 5: {
609         printBinaryFile(FILE_NAME);
610         break;
611     }
612
613     case 6: {
614         return;
615     }
616 }
617
618 printf("\n");
619 startMenu();
620 }
621
622 int main() {
623     // Use user input.
624     #if INPUT_TYPE == 'u'
625     printf("User input.\n");
626
627     struct footballerType footballer;
628
629     getFootballerByUser(&footballer);
630
631     // Use array input.
632     #else
633     printf("Input from array.\n");
634
635     struct footballerType footballer = {
636         .fullName="Keyer Alexander Petrovich",
637         .clubName="BAM231",
638         .role="Goalkeeper",
639         .age=1,
640         .numberOfGames=2,
641         .numberOfGoals=3,
642     };
643     #endif
644
645     createBinaryFile(FILE_NAME, footballer);
646

```

```

647     struct footballerType alex = {
648         .fullName="Alex",
649         .clubName="Innopolis",
650         .role="Guardian",
651         .age=4,
652         .numberOfGames=5,
653         .numberOfGoals=3,
654     };
655
656     struct footballerType igor = {
657         .fullName="Igor",
658         .clubName="Innopolis",
659         .role="Goalkeeper",
660         .age=1,
661         .numberOfGames=5,
662         .numberOfGoals=3,
663     };
664
665     struct footballerType sasha = {
666         .fullName="Sasha",
667         .clubName="ITMO",
668         .role="Guardian",
669         .age=2,
670         .numberOfGames=5,
671         .numberOfGoals=1,
672     };
673
674     struct footballerType sasha1 = {
675         .fullName="Sasha",
676         .clubName="Innopolis",
677         .role="Forward",
678         .age=5,
679         .numberOfGames=2,
680         .numberOfGoals=3,
681     };
682
683     struct footballerType sasha2 = {
684         .fullName="Sasha",
685         .clubName="BAM234",
686         .role="Forward",
687         .age=1,
688         .numberOfGames=3,
689         .numberOfGoals=2,
690     };
691

```

```

692     struct footballerType alex1 = {
693         .fullName="Alex",
694         .clubName="BAM233",
695         .role="Forward",
696         .age=2,
697         .numberOfGames=4,
698         .numberOfGoals=5,
699     };
700
701     struct footballerType kostya = {
702         .fullName="Kostya",
703         .clubName="BAM234",
704         .role="Goalkeeper",
705         .age=1,
706         .numberOfGames=5,
707         .numberOfGoals=3,
708     };
709
710     struct footballerType kostya1 = {
711         .fullName="Kostya",
712         .clubName="BAM233",
713         .role="Guardian",
714         .age=2,
715         .numberOfGames=2,
716         .numberOfGoals=2,
717     };
718
719     struct footballerType nadya = {
720         .fullName="Nadya",
721         .clubName="BAM231",
722         .role="Guardian",
723         .age=3,
724         .numberOfGames=3,
725         .numberOfGoals=3,
726     };
727
728     struct footballerType sonya = {
729         .fullName="Sonya",
730         .clubName="BAM232",
731         .role="Goalkeeper",
732         .age=1,
733         .numberOfGames=5,
734         .numberOfGoals=4,
735     };
736

```

```
737 // Initializing database.
738 appendEntry(FILE_NAME, sasha2);
739 appendEntry(FILE_NAME, alex);
740 appendEntry(FILE_NAME, sasha);
741 appendEntry(FILE_NAME, kostya1);
742 appendEntry(FILE_NAME, sonya);
743 appendEntry(FILE_NAME, igor);
744 appendEntry(FILE_NAME, sasha1);
745 appendEntry(FILE_NAME, alex1);
746 appendEntry(FILE_NAME, kostya);
747 appendEntry(FILE_NAME, nadya);
748
749 startMenu();
750
751 return 0;
752 }
753
```

Тесты