

# **Правительство Российской Федерации**

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**Федеральное государственное автономное образовательное учреждение  
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«Высшая школа экономики»**

Факультет компьютерных наук

Департамент программной инженерии

## **Отчёт к домашнему заданию по дисциплине «Архитектура вычислительных систем»**

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## **Постановка задачи**

(Вариант 17) Задача об инвентаризации по книгам. После нового года в библиотеке университета обнаружилась пропажа каталога. После поиска и наказания, виноватых ректор дал указание восстановить каталог силами студентов. Фонд библиотека представляет собой прямоугольное помещение, в котором находится М рядов по N шкафов по К книг в каждом шкафу. Требуется создать многопоточное приложение, составляющее каталог. При решении задачи использовать метод «портфель задач», причем в качестве отдельной задачи задается внесение в каталог записи об отдельной книге.

## **Алгоритм решения**

В основе решения лежит паттерн “портфель задач”. Сначала генерируется портфель задач(структура данных – стек). Константой задается количество потоков(3). Создается пулл потоков и из каждого вызывается метод, который решает задачу из портфеля задач(а именно – добавляет книгу в библиотеку). В конце происходит вывод библиотеки в консоль.

## **Входные и выходные данные**

На вход программе подается 3 числа: m - количество рядов, n - количество шкафов в каждом ряду и k - количество книг в каждом шкафу. Выходные данные – строковое описание библиотеки выводится в консоль.

# Тестирование

```
10 #include <iostream>
11 #include <stack>
12 #include <mutex>
13 #include <vector>
14 #include <thread>
15
16 // мьютекс для ограничения доступа к стеку
17 mutex mtx;
18 // стек задач
19 stack<int> st;
20 //количество рядов
21 int m;
```

```
Enter count of rows in the library:3
Enter count of bookshelves at row in the library:3
Enter count of books at bookshelves in the library:3
It's a book with coordinates (0, 0, 0), stream id: 2
It's a book with coordinates (0, 0, 1), stream id: 1
It's a book with coordinates (0, 0, 2), stream id: 2
It's a book with coordinates (0, 1, 0), stream id: 0
It's a book with coordinates (0, 1, 1), stream id: 1
It's a book with coordinates (0, 1, 2), stream id: 2
It's a book with coordinates (0, 2, 0), stream id: 0
It's a book with coordinates (0, 2, 1), stream id: 2
It's a book with coordinates (0, 2, 2), stream id: 1
It's a book with coordinates (1, 0, 0), stream id: 2
It's a book with coordinates (1, 0, 1), stream id: 0
It's a book with coordinates (1, 0, 2), stream id: 2
It's a book with coordinates (1, 1, 0), stream id: 0
It's a book with coordinates (1, 1, 1), stream id: 2
It's a book with coordinates (1, 1, 2), stream id: 2
It's a book with coordinates (1, 2, 0), stream id: 0
It's a book with coordinates (1, 2, 1), stream id: 1
It's a book with coordinates (1, 2, 2), stream id: 0
It's a book with coordinates (2, 0, 0), stream id: 1
It's a book with coordinates (2, 0, 1), stream id: 0
It's a book with coordinates (2, 0, 2), stream id: 1
It's a book with coordinates (2, 1, 0), stream id: 0
It's a book with coordinates (2, 1, 1), stream id: 1
It's a book with coordinates (2, 1, 2), stream id: 0
It's a book with coordinates (2, 2, 0), stream id: 0
It's a book with coordinates (2, 2, 1), stream id: 1
It's a book with coordinates (2, 2, 2), stream id: 0
Program ended with exit code: 0
```

```
86 // записываем информацию о книге в библиотеку
87 string bookDecsr = getBookName(row, bookshelve, book, threadId);
88 library.setBook(row, bookshelve, book, bookDecsr);
89 }
90 }
91
92 int main(int argc, const char * argv[]) {
93     //количество потоков
94     const int THREAD_COUNT = 3;
```

```
Enter count of rows in the library:3
Enter count of bookshelves at row in the library:4
Enter count of books at bookshelves in the library:3
It's a book with coordinates (0, 0, 0), stream id: 0
It's a book with coordinates (0, 0, 1), stream id: 2
It's a book with coordinates (0, 0, 2), stream id: 1
It's a book with coordinates (0, 1, 0), stream id: 0
It's a book with coordinates (0, 1, 1), stream id: 2
It's a book with coordinates (0, 1, 2), stream id: 1
It's a book with coordinates (0, 2, 0), stream id: 0
It's a book with coordinates (0, 2, 1), stream id: 2
It's a book with coordinates (0, 2, 2), stream id: 1
It's a book with coordinates (0, 3, 0), stream id: 1
It's a book with coordinates (0, 3, 1), stream id: 0
It's a book with coordinates (0, 3, 2), stream id: 1
It's a book with coordinates (1, 0, 0), stream id: 2
It's a book with coordinates (1, 0, 1), stream id: 1
It's a book with coordinates (1, 0, 2), stream id: 2
It's a book with coordinates (1, 1, 0), stream id: 2
It's a book with coordinates (1, 1, 1), stream id: 1
It's a book with coordinates (1, 1, 2), stream id: 2
It's a book with coordinates (1, 2, 0), stream id: 2
It's a book with coordinates (1, 2, 1), stream id: 0
It's a book with coordinates (1, 2, 2), stream id: 2
It's a book with coordinates (1, 3, 0), stream id: 0
It's a book with coordinates (1, 3, 1), stream id: 2
It's a book with coordinates (1, 3, 2), stream id: 0
It's a book with coordinates (2, 0, 0), stream id: 2
It's a book with coordinates (2, 0, 1), stream id: 0
It's a book with coordinates (2, 0, 2), stream id: 0
It's a book with coordinates (2, 1, 0), stream id: 0
It's a book with coordinates (2, 1, 1), stream id: 1
It's a book with coordinates (2, 1, 2), stream id: 0
It's a book with coordinates (2, 2, 0), stream id: 1
It's a book with coordinates (2, 2, 1), stream id: 1
It's a book with coordinates (2, 2, 2), stream id: 1
It's a book with coordinates (2, 3, 0), stream id: 2
It's a book with coordinates (2, 3, 1), stream id: 0
It's a book with coordinates (2, 3, 2), stream id: 1
Program ended with exit code: 0
```

```
19 stack<int> st;
20 //количество рядов
21 int m;
```

Enter count of rows in the library:1  
Enter count of bookshelves at row in the library:2  
Enter count of books at bookshelves in the library:5  
It's a book with coordinates (0, 0, 0), stream id: 2  
It's a book with coordinates (0, 0, 1), stream id: 0  
It's a book with coordinates (0, 0, 2), stream id: 2  
It's a book with coordinates (0, 0, 3), stream id: 0  
It's a book with coordinates (0, 0, 4), stream id: 2  
It's a book with coordinates (0, 1, 0), stream id: 0  
It's a book with coordinates (0, 1, 1), stream id: 2  
It's a book with coordinates (0, 1, 2), stream id: 0  
It's a book with coordinates (0, 1, 3), stream id: 2  
It's a book with coordinates (0, 1, 4), stream id: 0  
Program ended with exit code: 0

```
84 int bookshelve = num / k % n;  
85 int book = num % k;  
86 // записываем информацию о книге в библиотеку  
87 string bookDecsr = getBookName(row, bookshelve, book, threadId);  
88 library.setBook(row, bookshelve, book, bookDecsr);  
89 }  
90 }  
91  
92 int main(int argc, const char * argv[]) {  
93     //количество потоков  
94     const int THREAD_COUNT = 3;  
95 }
```

Enter count of rows in the library:1  
Enter count of bookshelves at row in the library:2  
Enter count of books at bookshelves in the library:0  
Enter numbers > 0  
Program ended with exit code: 1

## Использованные источники

- 1) [http://window.edu.ru/catalog/pdf2txt/971/67971/41350?p\\_page=20](http://window.edu.ru/catalog/pdf2txt/971/67971/41350?p_page=20)
- 2) <http://softcraft.ru/edu/comparch/tasks/t03/>

