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Санкт-Петербургский политехнический университет Петра Великого
Институт компьютерных наук и кибербезопасности
Высшая школа «Компьютерных технологий и информационных систем»

ОТЧЕТ
по дисциплине «Практикум по программированию»
Лабораторная работа № 3

Выполнил:

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Проверил

Ст. преподаватель

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Санкт-Петербург
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Задание

В соответствии с вариантом **19**:

Считать текст из файла. Распечатать все первые слова предложений. Для первых двух слов посчитать количество вхождений в текст.

Исходные данные: файлы, приложенные к заданию.

Код программы/Листинг программы

CMakeLists.txt:

```
cmake_minimum_required(VERSION 3.0.0)
project(lab3
  DESCRIPTION "Лабораторная работа 3"
  HOMEPAGE_URL "github.com/whs31/education"
  LANGUAGES CXX
)

set(CMAKE_CXX_STANDARD 20)

add_executable(${PROJECT_NAME})
target_sources(${PROJECT_NAME} PRIVATE main.cc)
target_include_directories(${PROJECT_NAME} PRIVATE ${CMAKE_CURRENT_SOURCE_DIR})
```

main.cc:

```

/*
 * Лабораторная работа 3
 * Студент: Рязанцев Дмитрий
 */

#include <cmath>
#include <concepts>
#include <iostream>
#include <format>
#include <regex>
#include <vector>
#include <fstream>
#include <filesystem>

using std::string;
using std::string_view;
using std::vector;
namespace fs = std::filesystem;

namespace
{
    [[nodiscard]] auto first_words_of_sentences(string const& text) -> vector<string>
    {
        using std::sregex_token_iterator;
        using std::sregex_iterator;
        using std::smatch;
        using std::regex;

        auto const pattern = regex(R"([\.\!\?\][\s]*([A-Z][\w]+)*)");
        auto result = vector<string>();
        result.push_back(text.substr(0, text.find_first_of(" \t\n") + 1));
        for(auto it = sregex_iterator(text.begin(), text.end(), pattern); it !=
sregex_iterator(); ++it)
            result.push_back(it->str(1));
        return result;
    }

    [[nodiscard]] auto count_word(string const& text, string_view const word) ->
size_t // NOLINT(*-no-recursion)
    {
        auto const pos = text.find(word.data());
        if(pos == string::npos)
            return 0;
        return 1 + count_word(text.substr(pos + word.size()), word);
    }
}

auto main() -> int
{
    using std::cin;

```

```

using std::cout;
using std::cerr;
using std::endl;

auto const path = []() -> fs::path {
    cout << "Enter path to text file: " << endl;
    auto p = fs::path();
    cin >> p;
    auto joined = fs::current_path() / p;
    if(not exists(joined)) {
        cerr << std::format("File {} doesn't exist", joined.string()) << endl;
        std::exit(1);
    }
    return joined;
}();

auto const text = [](fs::path const& filepath) -> string {
    using std::ifstream;
    using std::istreambuf_iterator;

    auto handle = ifstream(filepath);
    if(handle.fail()) {
        cerr << std::format("Can't open file {}", filepath.string()) << endl;
        std::exit(1);
    }
    return {istreambuf_iterator<char>(handle), istreambuf_iterator<char>()};
}(path);

auto is_all_whitespace = [](string const& word) -> bool { return
word.find_first_not_of(" \t\n") == string::npos; };
if(text.empty() or is_all_whitespace(text)) {
    cerr << "File is empty" << endl;
    std::exit(1);
}

auto join = [=](vector<string> const& words) -> string {
    auto result = string();
    for(auto const& word : words)
        result += word.empty() or is_all_whitespace(word) ? "" : word + " ";
    return result;
};

const auto [first, second] = [](string const& txt) -> std::pair<string, string>
{
    auto const pos = txt.find_first_of(" \t\n");
    auto const second_pos = txt.find_first_of(" \t\n", pos + 1);
    if(pos == string::npos)
        return {"", ""};
    return {txt.substr(0, pos), txt.substr(pos + 1, second_pos - pos - 1)};
}(text.substr(text.find_first_not_of(" \t\n"), text.size() -
text.find_first_not_of(" \t\n")));

```

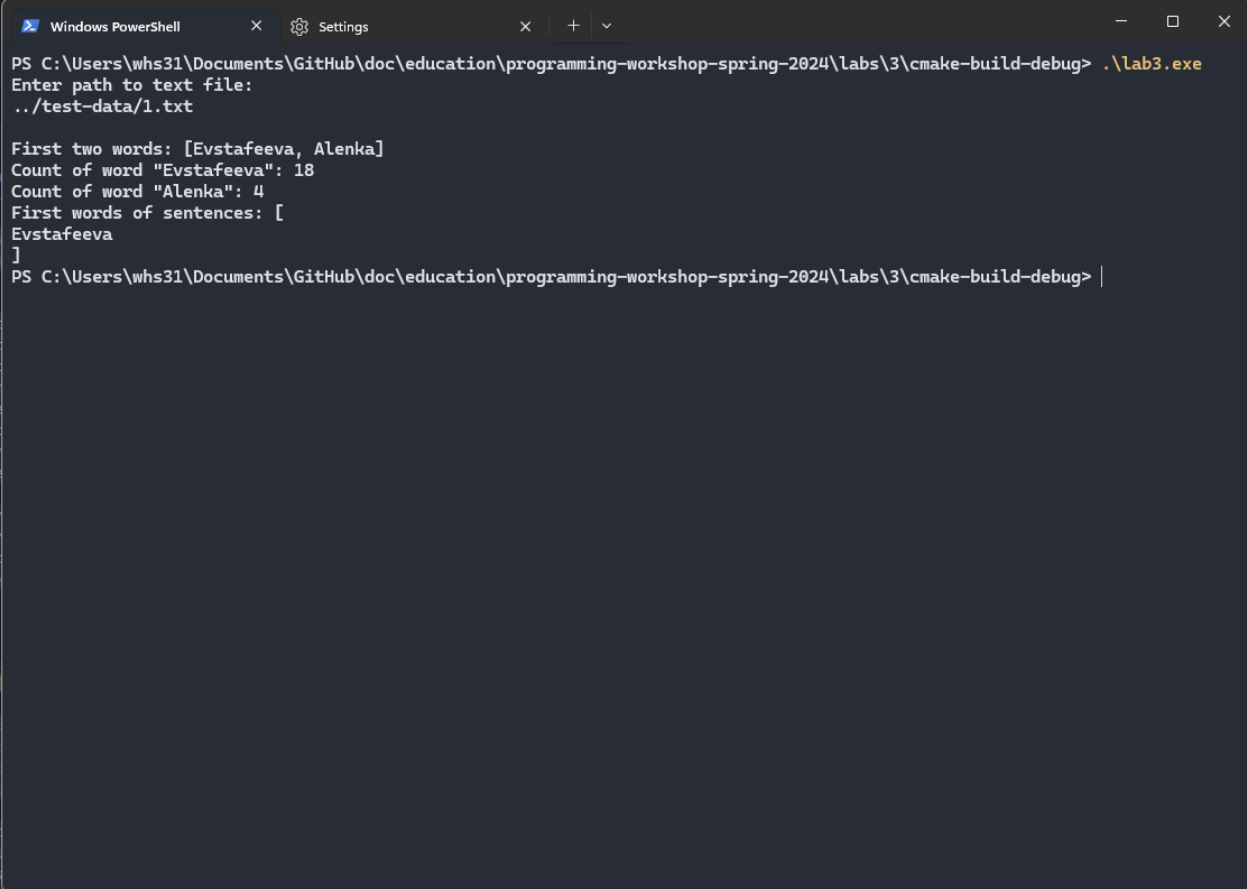
```

if(first.empty() or second.empty()) {
    cerr << "File doesn't contain two words" << endl;
    std::exit(1);
}

cout << endl;
cout << std::format("First two words: [{}, {}]\n", first, second);
cout << std::format("Count of word \"{}\": {}\n", first, count_word(text,
first));
cout << std::format("Count of word \"{}\": {}\n", second, count_word(text,
second));
cout << std::format("First words of sentences: [\n{}\n]\n",
join(first_words_of_sentences(text)));
return 0;
}

```

Пример работы программы



```

Windows PowerShell
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> .\lab3.exe
Enter path to text file:
../test-data/1.txt

First two words: [Evstafeeva, Alenka]
Count of word "Evstafeeva": 18
Count of word "Alenka": 4
First words of sentences: [
Evstafeeva
]
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug>

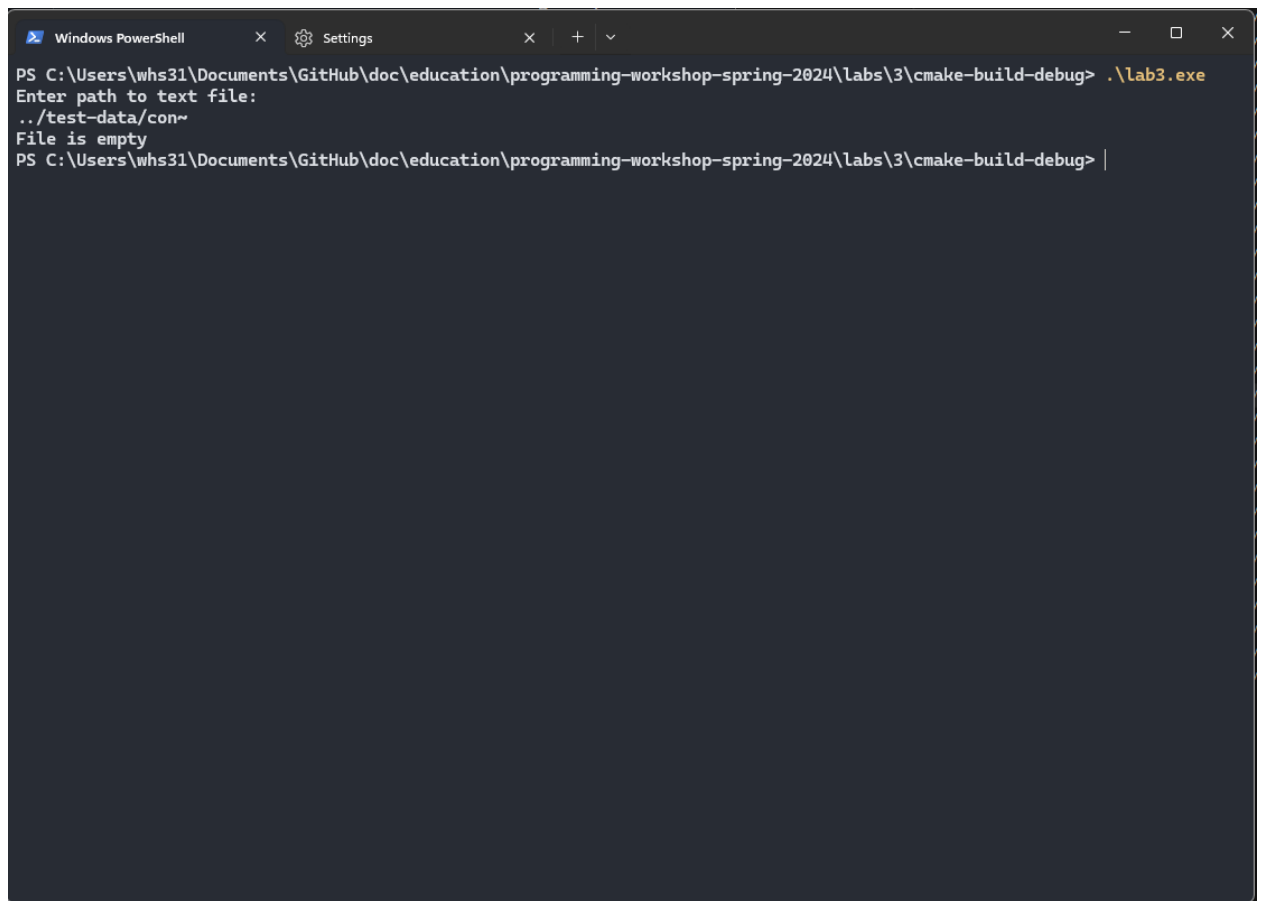
```

Рисунок 1 – Правильная работа программы на малом объеме текста

```
Windows PowerShell  Settings
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> .\Lab3.exe
Enter path to text file:
../test-data/con_.txt

First two words: [Clients, can]
Count of word "Clients": 44
Count of word "can": 44
First words of sentences: [
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]
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> |
```

Рисунок 2 – Правильная работа программы на большом объеме текста



```
Windows PowerShell
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> .\lab3.exe
Enter path to text file:
../test-data/con~
File is empty
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> |
```

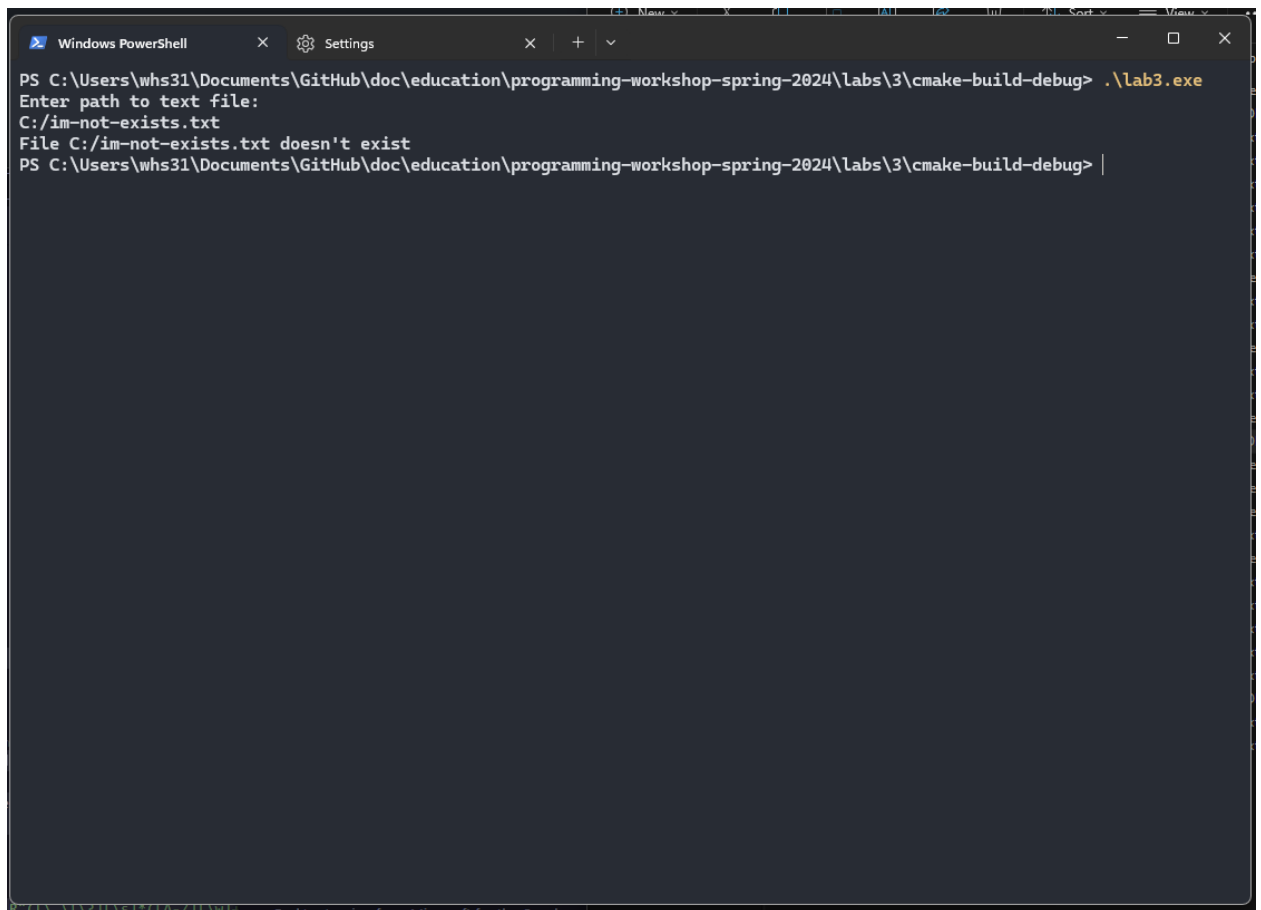
Рисунок 3 – Сообщение об ошибке при попытке открыть пустой файл

```
Windows PowerShell  Settings  x  +  v
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> .\lab3.exe
Enter path to text file:
../test-data/file.con

First two words: [Clients, can]
Count of word "Clients": 44
Count of word "can": 44
First words of sentences: [
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]
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> .\lab3.exe
Enter path to text file:
../test-data/file.txt.con

First two words: [Clients, can]
Count of word "Clients": 44
Count of word "can": 44
First words of sentences: [
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]
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> |
```

Рисунок 4 – Правильная работа программы при попытке открыть файл с расширением .con или .txt.con

A screenshot of a Windows PowerShell terminal window. The title bar shows 'Windows PowerShell' and 'Settings'. The command prompt shows the current directory as 'C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug'. The user has entered the command '.\lab3.exe'. The prompt then asks 'Enter path to text file:', and the user has entered 'C:/im-not-exists.txt'. The terminal displays the error message 'File C:/im-not-exists.txt doesn't exist'. The prompt is now ready for the next command.

```
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> .\lab3.exe
Enter path to text file:
C:/im-not-exists.txt
File C:/im-not-exists.txt doesn't exist
PS C:\Users\whs31\Documents\GitHub\doc\education\programming-workshop-spring-2024\labs\3\cmake-build-debug> |
```

Рисунок 4 – Сообщение об ошибке при попытке открыть несуществующий файл

Вывод

В ходе выполнения лабораторной работы я выполнил поставленную задачу по работе с файлами на языке C++. Получены навыки работы с модулем `std::filesystem`, позволяющим работать с файловой системой ОС, файловыми потоками (`std::ifstream`), регулярными выражениями (`std::regex`), базовыми строковыми алгоритмами; навыки форматирования вывода с использованием `std::format`, ввод и вывод в окне терминала с использованием потоковых классов стандартной библиотеки.