Федеральное государственное бюджетное образовательное учреждение высшего образования «Национальный исследовательский университет «МЭИ»

Институт информационных и вычислительных технологий

Кафедра Управления и интеллектуальных технологий

**Отчёт по лабораторной работе № 4**

**По курсу «Разработка программного обеспечения систем управления»**

# «Низкоуровневые операции»

Выполнил студент группы А-03-20

Коротков Егор Дмитриевич

Проверил

Мохов А.С.

Козлюк Д.А.

Василькова П.Д.

Москва 2021

**Цель работы**

1. Уметь применять побитовые операции для типовых сценариев.
2. Уметь работать с API, принимающими указатели, в том числе строки C.
3. Знать характерные особенности документации на API библиотек.

Код файла main.cpp:

#include <iostream>

#include <vector>

#include <iomanip>

#include "histogram.h"

#include <curl/curl.h>

#include <sstream>

#include <string>

#include <windows.h>

#include <stdio.h>

#include <math.h>

using namespace std;

vector<double> input\_numbers(istream& in, size\_t count)

{

vector<double> result(count);

for (size\_t i = 0; i < count; i++)

{

in >> result[i];

}

return result;

}

Input read\_input(istream& in, bool F)

{

Input data;

if (F) cerr << "Enter number count: ";

size\_t number\_count;

in >> number\_count;

if (F) cerr << "Enter numbers: ";

data.numbers = input\_numbers(in, number\_count);

if (F) cerr << "Enter bin count: ";

in >> data.bin\_count;

return data;

}

void show\_histogram\_text(const vector<size\_t>& bins)

{

const size\_t SCREEN\_WIDTH = 80;

const size\_t MAX\_ASTERISK = SCREEN\_WIDTH - 4 - 1;

size\_t max\_count = 0;

for (size\_t count : bins)

{

if (count > max\_count)

{

max\_count = count;

}

}

const bool scaling\_needed = max\_count > MAX\_ASTERISK;

for (size\_t bin : bins)

{

if (bin < 100)

{

cout << ' ';

}

if (bin < 10)

{

cout << ' ';

}

cout << bin << "|";

size\_t height = bin;

if (scaling\_needed)

{

const double scaling\_factor = (double)MAX\_ASTERISK / max\_count;

height = (size\_t)(bin \* scaling\_factor);

}

for (size\_t i = 0; i < height; i++)

{

cout << '\*';

}

cout << '\n';

}

}

vector<size\_t> make\_histogram(Input data)

{

size\_t number\_count=data.numbers.size();

vector<size\_t> bins(data.bin\_count);

cerr<< "cerr "<<data.bin\_count;

double min, max;

find\_minmax(data.numbers, min, max);

double bin\_size = (max - min) / data.bin\_count;

for (size\_t i = 0; i < number\_count; i++)

{

bool found = false;

for (size\_t j = 0; (j < data.bin\_count - 1) && !found; j++)

{

auto lo = min + j \* bin\_size;

auto hi = min + (j + 1) \* bin\_size;

if ((lo <= data.numbers[i]) && (data.numbers[i] < hi))

{

bins[j]++;

found = true;

}

}

// цикл по numbers не закончился!

if (!found)

{

bins[data.bin\_count - 1]++;

}

} // конец цикла по numbers

return bins;

}

size\_t write\_data(void\* items, size\_t item\_size, size\_t item\_count, void\* ctx)

{

auto data\_size = item\_size \* item\_count;

stringstream\* buffer = reinterpret\_cast<stringstream\*>(ctx);

buffer->write(reinterpret\_cast<const char\*>(items), data\_size);

return data\_size;

}

Input

download(const string& address)

{

stringstream buffer;

CURL\* curl = curl\_easy\_init();

if(curl)

{

CURLcode res;

curl\_easy\_setopt(curl, CURLOPT\_URL, address.c\_str());

curl\_easy\_setopt(curl, CURLOPT\_WRITEFUNCTION, write\_data);

curl\_easy\_setopt(curl, CURLOPT\_WRITEDATA, &buffer);

curl\_version\_info\_data \*d = curl\_version\_info(CURLVERSION\_NOW);

/\* compare with the 24 bit hex number in 8 bit fields \*/

if(d->version\_num >= 0x072100)

{

/\* this is libcurl 7.33.0 or later \*/

cerr << "VersionCurl "<< d->version\_num<<endl;

cerr << "SSLVersion "<< d->ssl\_version<<endl;

}

else

{

cerr << "A too old version\n";

}

res = curl\_easy\_perform(curl);

if (res != 0)

{

cerr<< "curl\_easy\_perform() failed: %s\n"<< curl\_easy\_strerror(res);

//curl\_version\_info\_data\* ssl\_version = curl\_version\_info(CURL\_VERSION\_SSL);

exit(1);

}

curl\_easy\_cleanup(curl);

}

return read\_input(buffer, false);

}

BOOL GetComputerNameA(

LPSTR lpBuffer,

LPDWORD lpnSize

);

Inputp

make\_info\_text()

{

Inputp i;

// TODO: получить версию системы, записать в буфер.

DWORD WINAPI GetVersion(void);

DWORD info = 0;

info = GetVersion();

printf("n = %08x\n",info); //16

printf("%u \n", info);//10

DWORD mask = 0b00000000'00000000'11111111'11111111;

DWORD version = info & mask;

DWORD mask1 = 0x0000ffff;

DWORD platform = info >> 16;

DWORD maskVision = 0b00000000'11111111;

i.version\_major = version & maskVision;

cout<<"VMaj = "<<i.version\_major;

cout<<"VMajstr = " << to\_string( i.version\_major);

DWORD mask2 = 0x0000ffff;

i.version\_minor = version >> 8;

if ((info & 0x1000ffff) == 0)

{

i.version\_major = 0;

}

i.build = platform;

cout<<" "<<i.build;

//TODO:

char system\_dir[MAX\_PATH];

GetSystemDirectory(system\_dir, MAX\_PATH);

DWORD ssize = sizeof(i.bufferrr) / sizeof(TCHAR);

cout<<"Comp = "<< GetComputerName(i.bufferrr, &ssize);

cout<< "buff "<< i.bufferrr ;

return i;

}

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

{

Input input;

if(argc>1)

{

input = download(argv[1]);

}

else

{

input = read\_input(cin,true);

}

const auto bins = make\_histogram(input);

show\_histogram\_svg(bins);

return 0;

}

Код файла histogram.cpp:

#include "histogram.h"

#include <iomanip>

#include <iostream>

#include <string>

void find\_minmax(const vector<double>& numbers, double& min, double& max) {

min = numbers[0];

max = numbers[0];

for (double number : numbers) {

if (number < min) {

min = number;

}

if (number > max) {

max = number;

}

}

}

void svg\_rect(double x, double y, double width, double height, string stroke, string fill)

{

cout <<"<rect x='"<<x<<"' y='"<<y<<"' width='"<<width<<"' height='"<<height<<"' stroke='"<<stroke<<"' fill='"<<fill<<"' />";

}

void svg\_end()

{

cout << "</svg>\n";

}

void svg\_begin(double width, double height)

{

cout << "<?xml version='1.0' encoding='UTF-8'?>\n";

cout << "<svg ";

cout << "width='" << width << "' ";

cout << "height='" << height << "' ";

cout << "viewBox='0 0 " << width << " " << height << "' ";

cout << "xmlns='http://www.w3.org/2000/svg'>\n";

}

void svg\_text(double left, double baseline, string text)

{

cout << "<text x='" << left <<"' y='"<<baseline<<"' >"<<text<<"</text>";

}

void show\_histogram\_svg(const vector<size\_t>& bins)

{

const auto IMAGE\_WIDTH = 600;

const auto IMAGE\_HEIGHT = 500;

const auto TEXT\_LEFT = 20;

const auto TEXT\_BASELINE = 20;

const auto TEXT\_WIDTH = 50;

const auto BIN\_HEIGHT = 30;

const auto BLOCK\_WIDTH = 10;

double top = 0;

const size\_t MAX\_ASTERISK = IMAGE\_HEIGHT - TEXT\_BASELINE \* 2;

size\_t max\_count = 0;

for (size\_t count : bins)

{

if (count > max\_count)

{

max\_count = count;

}

}

const bool scaling\_needed = max\_count > MAX\_ASTERISK;

svg\_begin( 500, 600);

for (size\_t bin : bins)

{

size\_t height = bin;

if (scaling\_needed)

{

const double scaling\_factor = (double)MAX\_ASTERISK / max\_count;

height = (size\_t)(bin \* scaling\_factor);

}

const double bin\_width = BIN\_HEIGHT \* height;

svg\_text(top + BIN\_HEIGHT, TEXT\_BASELINE , to\_string(bin));

svg\_rect(top + TEXT\_LEFT, TEXT\_BASELINE \*2 , BIN\_HEIGHT, bin\_width, "black", "blue");

top += BIN\_HEIGHT ;

}

string w = "Windows v.";

string p = " .";

string b ="[build ";

string a = " ]";

string c = "Computer name: ";

make\_info\_text();

Inputp i;

svg\_text(top + BIN\_HEIGHT, TEXT\_BASELINE + 75 , w);

svg\_text(top + BIN\_HEIGHT + 80, TEXT\_BASELINE +75 ,to\_string(i.version\_minor));

svg\_text(top + BIN\_HEIGHT + 90, TEXT\_BASELINE +75 , p);

svg\_text(top + BIN\_HEIGHT + 100, TEXT\_BASELINE +75 , to\_string(i.version\_major));

svg\_text(top + BIN\_HEIGHT + 120, TEXT\_BASELINE+75 , b);

svg\_text(top + BIN\_HEIGHT + 160, TEXT\_BASELINE+75 , to\_string(i.build));

svg\_text(top + BIN\_HEIGHT + 230, TEXT\_BASELINE + 75, a);

svg\_text(top + BIN\_HEIGHT, TEXT\_BASELINE +100 , c);

svg\_text(top + BIN\_HEIGHT + 115, TEXT\_BASELINE +100, to\_string(i.bufferrr[MAX\_COMPUTERNAME\_LENGTH + 1]) );

svg\_end();

}

Код файла histogram.h:

#ifndef HISTOGRAM\_H\_INCLUDED

#include <vector>

#include <string>

#include <Windows.h>

#define HISTOGRAM\_H\_INCLUDED

using namespace std;

struct Inputp

{

DWORD build;

DWORD version\_major;

DWORD version\_minor;

TCHAR bufferrr[MAX\_COMPUTERNAME\_LENGTH + 1];

};

struct Input { vector<double> numbers; size\_t bin\_count;};

void find\_minmax(const vector<double>& numbers, double& min, double& max);

Inputp

make\_info\_text();

void show\_histogram\_svg(const vector<size\_t>& bins);

void svg\_end();

void svg\_begin(double width, double height);

void svg\_text(double left, double baseline, string text);

void svg\_rect(double x, double y, double width, double height,string stroke = "black", string fill = "black");

#endif // HISTOGRAM\_H\_INCLUDED