

№1

Generated matrix:

```
1.000000 4.000000 2.000000
4.000000 2.000000 5.000000
```

Average values in rows:

```
Row 0: 2.333333
Row 1: 3.666667
```

Average values in columns:

```
Column 0: 2.500000
Column 1: 3.000000
Column 2: 3.500000
```

Очевидно, программа работоспособна.

№2

Введем параллелизацию:

```
void FindAverageValues( eprocess_type proc_type, double** matrix, const size_t
{
    switch ( proc_type )
    {
        case eprocess_type::by_rows:
        {
            cilk_for ( size_t i = 0; i < numb_rows; ++i )
            {
                cilk::reducer_opadd<double> sum(0.0);
                cilk_for ( size_t j = 0; j < numb_cols; ++j )
                {
                    sum += matrix[i][j];
                }
                average_vals[i] = sum.get_value() / numb_cols;
            }
            break;
        }
        case eprocess_type::by_cols:
        {
            cilk_for ( size_t j = 0; j < numb_cols; ++j )
            {
                cilk::reducer_opadd<double> sum(0.0);
```

```

        cilk_for( size_t i = 0; i < numb_rows; ++i )
        {
            sum += matrix[i][j];
        }
        average_vals[j] = sum.get_value() / numb_rows;
    }
    break;
}
default:
{
    throw("Incorrect value for parameter 'proc_type' in function FindA
}
}
}

```

Корректность результата не нарушилась:

Generated matrix:

```

1.000000 3.000000 3.000000
1.000000 2.000000 4.000000

```

Average values in rows:

```

Row 0: 2.333333
Row 1: 2.333333

```

Average values in columns:

```

Column 0: 1.000000
Column 1: 2.500000
Column 2: 3.500000

```

№3

Intel Parallel Inspector > Detect leaks:

Intel Parallel Inspector > Detect Leaks

Target Analysis Type Collection Log Summary

ID	Type	Sources	Modules	Object Size	State
P1	Mismatched allocation/deallocation	[Unknown]	ucrtbase.dll; vcruntime140.dll		New
P2	Memory leak	task_for_lecture5.cpp	lab3.exe	8	New
P3	Memory leak	task_for_lecture5.cpp	lab3.exe	48	New
P4	Memory leak	task_for_lecture5.cpp	lab3.exe	16	New
P5	Memory leak	task_for_lecture5.cpp	lab3.exe	24	New
P6	Memory not deallocated	stdio.h	lab3.exe	4096	New

Filters

Severity

- Error: 5 item(s)
- Warning: 1 item(s)

Type

- Memory leak: 4 item(s)
- Memory not deallocated: 1 item(s)
- Mismatched allocation/deallocation: 1 item(s)

Source

- [Unknown]: 1 item(s)
- stdio.h: 1 item(s)
- task_for_lecture5.cpp: 4 item(s)

Code Locations: Mismatched allocation/deallocation

Description	Source	Function	Module	Object Size	Variable
Mismatched deallocation site	vcruntime140.dll!0x2f9b2	set_se_translator	vcruntime140.dll		block
Symbol information not found. Suggestion: Specify locations in a Project Properties dialog box search tab, then re-resolve the result.					
Allocation site	ucrtbase.dll!0x2f9c6	calloc_base	ucrtbase.dll		block
Symbol information not found. Suggestion: Specify locations in a Project Properties dialog box search tab, then re-resolve the result.					

Timeline

o_Clpow (120668)

Intel Parallel Inspector > Detect memory problems:

Intel Parallel Inspector > Locate Memory Problems

Target Analysis Type Collection Log Summary

ID	Type	Sources	Modules	Object Size	State
P1	Memory leak	task_for_lecture5.cpp	lab3.exe	8	New
P2	Memory leak	task_for_lecture5.cpp	lab3.exe	48	New
P3	Memory leak	task_for_lecture5.cpp	lab3.exe	16	New
P4	Memory leak	task_for_lecture5.cpp	lab3.exe	24	New
P5	Memory not deallocated	stdio.h	lab3.exe	4096	New

Filters

Severity

- Error: 4 item(s)
- Warning: 1 item(s)

Type

- Memory leak: 4 item(s)
- Memory not deallocated: 1 item(s)

Source

- stdio.h: 1 item(s)
- task_for_lecture5.cpp: 4 item(s)

Module

- lab3.exe: 5 item(s)

Code Locations: Memory leak

Description	Source	Function	Module	Object Size	Offset	Variable
Allocation site	task_for_lecture5.cpp:141	main	lab3.exe	8		block allocated at task_for_lecture5.cpp:141
<pre> 139 const size_t numb_cols = 3; 140 141 double** matrix = new double*[numb_rows]; 142 for (size_t i = 0; i < numb_rows; ++i) 143 { </pre>						

Timeline

RtlQueryEnvironmentVariable (119872)

Intel Parallel Inspector > Locate memory problems:

INTEL INSPECTOR

Detect Memory Problems

Target Analysis Type Collection Log Summary

ID	Type	Sources	Modules	Object Size	State
P1	Memory leak	task_for_lecture5.cpp	lab3.exe	8	New
P2	Memory leak	task_for_lecture5.cpp	lab3.exe	48	New
P3	Memory leak	task_for_lecture5.cpp	lab3.exe	16	New
P4	Memory leak	task_for_lecture5.cpp	lab3.exe	24	New
P5	Memory not deallocated	stdio.h	lab3.exe	4096	New

Filters **Sort**

Severity

- Error 4 item(s)
- Warning 1 item(s)

Type

- Memory leak 4 item(s)
- Memory not deallocated 1 item(s)

Source

- stdio.h 1 item(s)
- task_for_lecture5.cpp 4 item(s)

Module

- lab3.exe 5 item(s)

Code Locations: Memory leak

Description	Source	Function	Module	Object Size	Offset	Variable
Allocation site	task_for_lecture5.cpp:141	main	lab3.exe	8		block allocated at task_for_lecture5.cpp:141

```

139     const size_t numb_cols = 3;
140
141     double** matrix = new double*[numb_rows];
142     for ( size_t i = 0; i < numb_rows; ++i )
143     {

```

Timeline

RtlQueryEnvironmentVariable (121840)

Обнаружена утечка памяти: не освобождается память, выделенная для тестовой матрицы. Хотя в реальности это не приведет к проблемам, т.к. матрица создается однократно и ОС автоматически очистит пространство процесса при его завершении.

Intel Parallel Inspector > Detect deadlocks:

INTEL INSPECTOR

Detect Deadlocks

Target Analysis Type Collection Log Summary

Problems

No Problems Detected

Intel Inspector detected no problems at this analysis scope. If this result is unexpected, try rerunning the target using an analysis type with a wider scope. Press F1 for more information.

Filters **Sort**

Severity

Type

Source

Module

State

Suppressed

Investigated

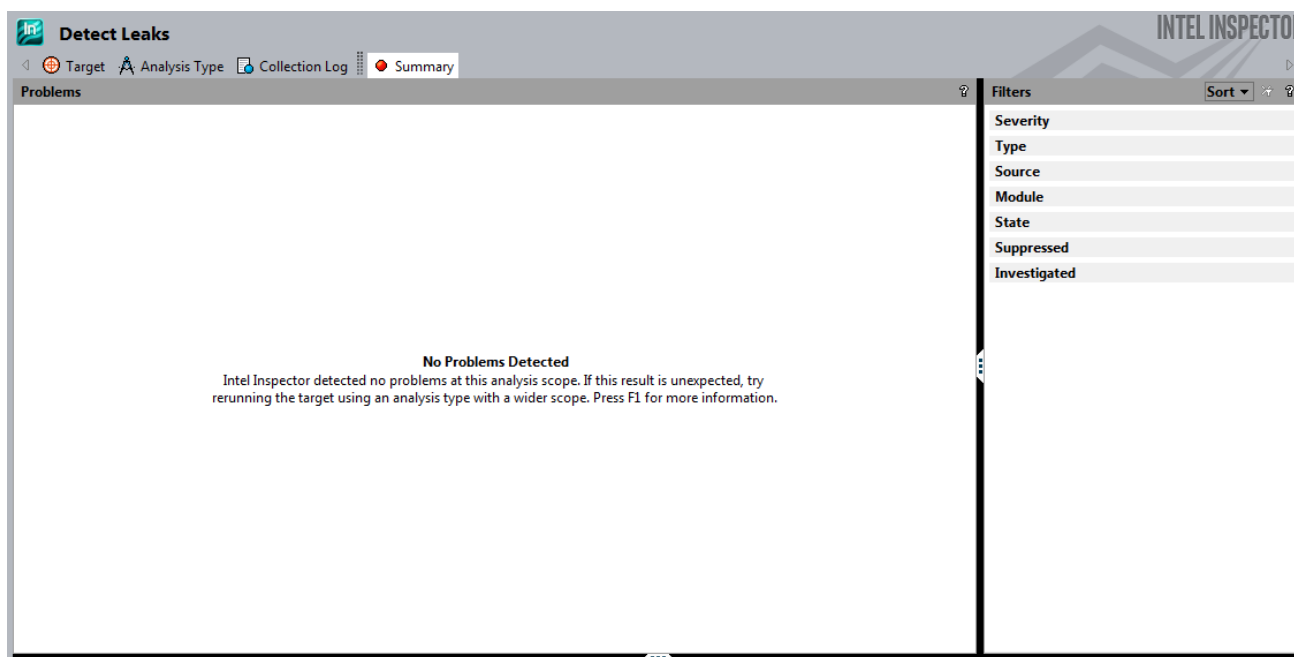
Проблем с конфликтами потоков не обнаружено.

№4

Исправим утечку памяти:

```
delete[] average_vals_in_cols;
delete[] average_vals_in_rows;

for (size_t i = 0; i < numb_rows; ++i)
    delete[] matrix[i];
delete[] matrix;
```



Больше проблем ни в одном из режимов нет.