FEDERAL STATE AUTONOMOUS EDUCATIONAL INSTITUTION OF HIGHER EDUCATION

ITMO UNIVERSITY

Report

MPI. Assignments 9, 10, 11

Parallel algorithms for the analysis and synthesis of data

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1 Assignments

1.1 Assignment 9. MPI_Reduce.

1.1.1 Formulation of the problem

1.1.2 Example of launch parameters and output. Detailed description of solution

Code for **assignment 9** is here.

Compilation example: mpic++ -o ./cpf/8.o Assignment8.c

Launch example: mpirun –oversubscribe -np 2 ./cpf/8.o

Let's move to the the code and explain how it works.

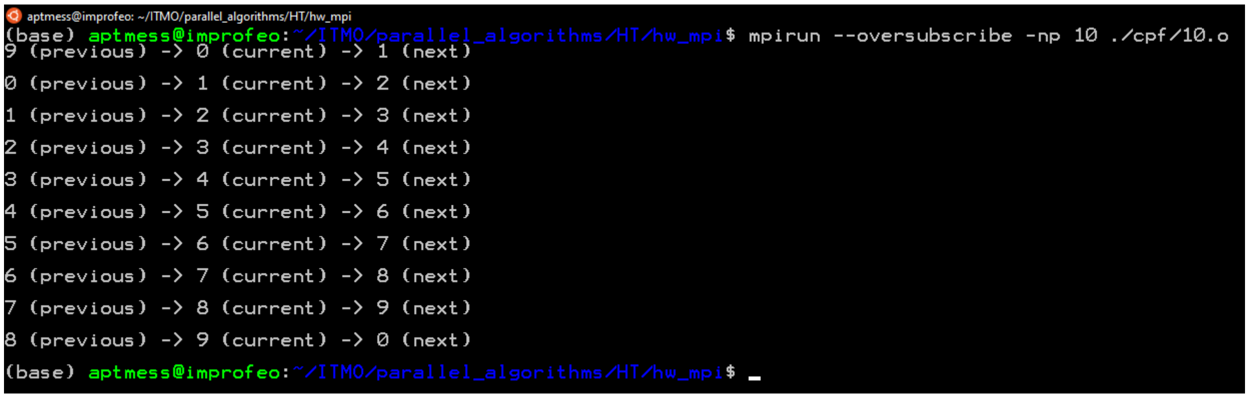
1.2 Assignment 10. MPI. Sending and receiving messages without blocking. Ring exchange using non-blocking operations.

1.2.1 Formulation of the problem

Complete the program Assignment10.c. Compile and run it.
Study the code carefully and explain how it works.

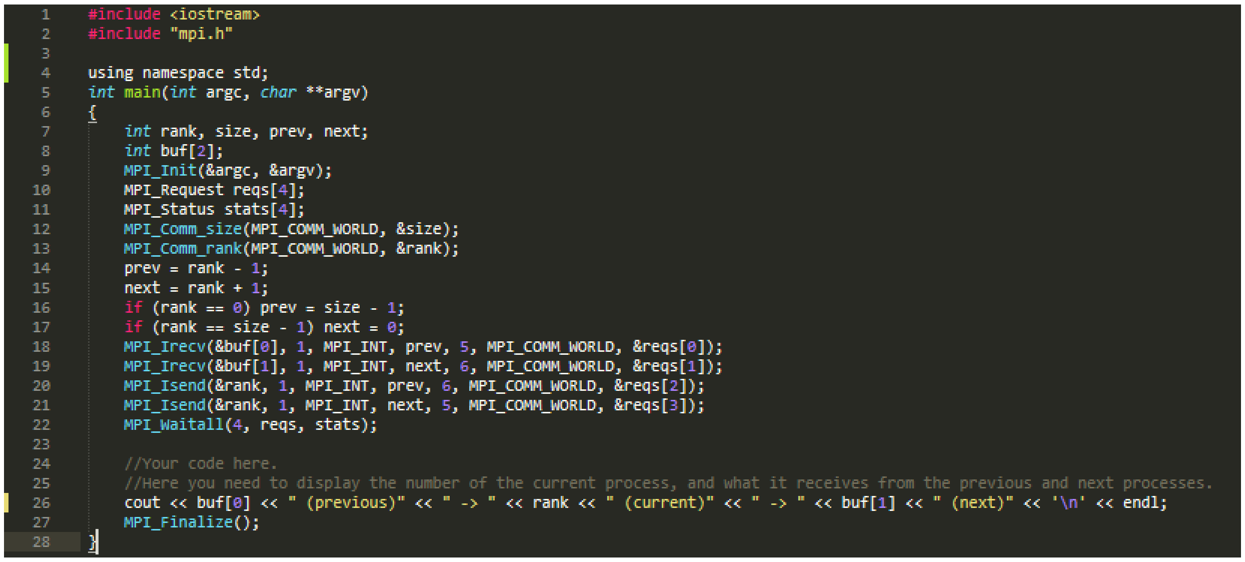
1.2.2 Example of launch parameters and output. Detailed description of solution

Code for **assignment 10** is here.
Compilation example: mpic++ -o ./cpf/10.o Assignment10.c
Launch example: mpirun –oversubscribe -np 10 ./cpf/10.o



```
aptmess@improfeo: ~/ITMO/parallel_algorithms/HT/hw_mpi
(base) aptmess@improfeo:~/ITMO/parallel_algorithms/HT/hw_mpi$ mpirun --oversubscribe -np 10 ./cpf/10.o
9 (previous) -> 0 (current) -> 1 (next)

0 (previous) -> 1 (current) -> 2 (next)

1 (previous) -> 2 (current) -> 3 (next)

2 (previous) -> 3 (current) -> 4 (next)

3 (previous) -> 4 (current) -> 5 (next)

4 (previous) -> 5 (current) -> 6 (next)

5 (previous) -> 6 (current) -> 7 (next)

6 (previous) -> 7 (current) -> 8 (next)

7 (previous) -> 8 (current) -> 9 (next)

8 (previous) -> 9 (current) -> 0 (next)

(base) aptmess@improfeo:~/ITMO/parallel_algorithms/HT/hw_mpi$ _
```

Let's move to the the code and explain how it works.



```cpp
#include <iostream>
#include "mpi.h"

using namespace std;
int main(int argc, char **argv)
{
    int rank, size, prev, next;
    int buf[2];
    MPI_Init(&argc, &argv);
    MPI_Request reqs[4];
    MPI_Status stats[4];
    MPI_Comm_size(MPI_COMM_WORLD, &size);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    prev = rank - 1;
    next = rank + 1;
    if (rank == 0) prev = size - 1;
    if (rank == size - 1) next = 0;
    MPI_Irecv(&buf[0], 1, MPI_INT, prev, 5, MPI_COMM_WORLD, &reqs[0]);
    MPI_Irecv(&buf[1], 1, MPI_INT, next, 6, MPI_COMM_WORLD, &reqs[1]);
    MPI_Isend(&rank, 1, MPI_INT, prev, 6, MPI_COMM_WORLD, &reqs[2]);
    MPI_Isend(&rank, 1, MPI_INT, next, 5, MPI_COMM_WORLD, &reqs[3]);
    MPI_Waitall(4, reqs, stats);

    //Your code here.
    //Here you need to display the number of the current process, and what it receives from the previous and next processes.
    cout << buf[0] << " (previous)" << " -> " << rank << " (current)" << " -> " << buf[1] << " (next)" << '\n' << endl;
    MPI_Finalize();
}
```

Assignment 10

1.3 Appendix

The link to the sourse code which is placed on my github.