

Assignment #04

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Case 1. Use MPI_Scatter and MPI_Gather

Implementation

1	Width	. . .	(Size-1) * Width +1	Size * Width
partialvec		. . .	partialvec	

- Width = 10000 / (# of processors)
- For use MPI_Scatter, define vector named vec and partialvec
- For use MPI_Gather, define vector named totalvec
- If (Size * Width) != 10000
 - Store that information
 - Compute After gathering all partial sums

Code

```
#include <stdio.h>
#include <stdlib.h>
#include <mpi.h>
#define FINAL 10000
int main(int argc, char **argv)
{
    int rank, size;
    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    MPI_Comm_size(MPI_COMM_WORLD, &size);
    int width = (int)(FINAL/size);
    int partialto = (rank+1)*width;
    int partial_remain = 0;
    int partialsum=0;
    int totalsum=0;
    int i;
    int *vec = NULL;
    int *partialvec = (int*)malloc(width*sizeof(int));
    int *totalvec = NULL;
    if(rank == size -1)
    {
        vec = (int *)malloc(partialto*sizeof(int));
        totalvec = (int *)malloc(size*sizeof(int));
        partial_remain = FINAL-partialto;
        for(i=0;i<partialto;i++)
            vec[i]=i+1;
    }
}
```

Case 1. Use MPI_Scatter and MPI_Gather

```

MPI_Scatter(vec, width, MPI_INT, partialvec, width, MPI_INT, size-1, MPI_COMM_WORLD);
for(i=0;i<width;i++)
    partialsum+=partialvec[i];
MPI_Gather(&partialsum, 1, MPI_INT, totalvec, 1, MPI_INT, size-1, MPI_COMM_WORLD);
if(rank==size-1)
{
    for(i = 0 ; i < size ; i++)
        totalsum += totalvec[i];
    if(partial_remain!=0)
        for(i = partial_remain ; i>0;i--)
            totalsum += i*partialto;
    printf("total sum = %d\n", totalsum);
    free(vec);
    free(totalvec);
}
free(partialvec);
MPI_Finalize();
}

```

- Scatter the vec to partialvec
- Partial Summation
- Gathering result to totalvec
- If (Size * Width) != 10000
 - partial_remain != 0

Case 1. Use MPI_Scatter and MPI_Gather

```

root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpicc 01.c -o 01.o
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 1 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 2 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 3 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 4 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 5 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 6 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 7 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 8 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 9 01.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 10 01.o
total sum = 50005000
  
```

Case 2. Use MPI_Reduce

```
#include <stdio.h>
#include <mpi.h>
#define FINAL 10000
int main(int argc, char **argv)
{
    int rank, size;
    MPI_Init(&argc, &argv);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    MPI_Comm_size(MPI_COMM_WORLD, &size);
    int width = (int)(FINAL/size);
    int partialto = (rank+1)*width;
    int partialfrom = rank*width;
    int partialsum=0;
    int totalsum;
    int i;
    if(rank == size-1)
        partialto = FINAL+1;
    for(i = partialfrom ; i < partialto ; i++)
    {
        partialsum += i;
    }
    MPI_Reduce(&partialsum, &totalsum, 1, MPI_INT, MPI_SUM, 0, MPI_COMM_WORLD);
    if(rank == 0)
    {
        printf("total sum = %d\n", totalsum);
    }
    MPI_Finalize();
}
```

Same as Assignment
#03

Case 1. Use MPI_Scatter and MPI_Gather

```
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpicc 02.c -o 02.o
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 1 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 2 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 3 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 4 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 5 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 6 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 7 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 8 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 9 02.o
total sum = 50005000
root@GAIA:~/workspace/MPIJOBS/WJY/mpi03_sum# mpirun -np 10 02.o
total sum = 50005000
```