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31 CSE-C

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PPLAB 4

2/5/21

1. **Sum of factorials**

```
#include "mpi.h"
#include <stdio.h>
#include <string.h>
void ErrorHandler(int error_code)
{
	if(error_code!=MPI_SUCCESS)
	{
		char error_string[BUFSIZ];
		int reslen, error_class;
		MPI_Error_class(error_code, &error_class);
		MPI_Error_string(error_code, error_string, &reslen);
		printf("%d %s\n", error_code, error_string);
		MPI_Error_string(error_class, error_string, &reslen);
		printf("%d %s\n", error_class, error_string);
	}
}
int main(int argc, char *argv[])
{
	int rank, size;
	MPI_Init(&argc, &argv);
	MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);
	MPI_Comm_rank(MPI_COMM_WORLD, &rank);
	int c = 3;
```

```
        int error_code = MPI_Comm_size(c, &size);
        // MPI_Comm_size(MPI_COMM_WORLD, &size);
        ErrorHandler(error_code);
        MPI_Status status;
        int fact = 1;
        int factsum = 0;
        for(int i = 1; i<=rank+1; i++)
                fact*=i;
        MPI_Scan(&fact, &factsum, 1, MPI_INT, MPI_SUM,
        MPI_COMM_WORLD);
        printf("Rank %d: Factorial = %d, Factsum = %d\n", rank, fact, factsum);
        MPI_Finalize();
        return 0;
}
```

OUTPUT:

```
470375685 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffe95c21f1c) failed
PMPI_Comm_size(71).: Invalid communicator
805920005 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7fffa91dd8dc) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
604593413 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7fffc3c9c1fc) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
5 Invalid communicator
470375685 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffe06b80efc) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
Rank 0: Factorial = 1, Factsum = 1
Rank 1: Factorial = 2, Factsum = 3
Rank 2: Factorial = 6, Factsum = 9
Rank 3: Factorial = 24, Factsum = 33
```

2. **Calculate PI**

```
#include "mpi.h"
```

```
#include <stdio.h>
#include <string.h>
void ErrorHandler(int error_code)
{
	if(error_code!=MPI_SUCCESS)
	{
		char error_string[BUFSIZ];
		int reslen, error_class;
		MPI_Error_class(error_code, &error_class);
		MPI_Error_string(error_code, error_string, &reslen);
		printf("%d %s\n", error_code, error_string);
		MPI_Error_string(error_class, error_string, &reslen);
		printf("%d %s\n", error_class, error_string);
	}
}
int main(int argc, char *argv[])
{
	int rank, size;
	MPI_Init(&argc, &argv);
	MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);
	MPI_Comm_rank(MPI_COMM_WORLD, &rank);
	int c = 3;
	int error_code = MPI_Comm_size(c, &size);
	ErrorHandler(error_code);
	MPI_Comm_size(MPI_COMM_WORLD, &size);
	MPI_Status status;
	float val =0, pi=0;
	val = (4.0/(1+((rank+0.5)/size)*((rank+0.5)/size)))*(1.0/size);
	MPI_Reduce(&val, &pi, 1, MPI_FLOAT, MPI_SUM,
	0,MPI_COMM_WORLD);
	if(rank==0)
		printf("Rank %d: PI = %f\n", rank, pi);
	MPI_Finalize();
	return 0;
}
```

OUTPUT:

```
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffc3d34de70) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
1007246597 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7fffb7767ec0) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
403266821 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffd8ed70060) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
940137733 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffef41c0f10) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
Rank 0: PI = 3.146801
```

3. **Find value in 3x3 matrix**

```
#include "mpi.h"
#include <stdio.h>
#include <string.h>
void ErrorHandler(int error_code)
{
	if(error_code!=MPI_SUCCESS)
	{
		char error_string[BUFSIZ];
		int reslen, error_class;
		MPI_Error_class(error_code, &error_class);
		MPI_Error_string(error_code, error_string, &reslen);
		printf("%d %s\n", error_code, error_string);
		MPI_Error_string(error_class, error_string, &reslen);
		printf("%d %s\n", error_class, error_string);
	}
}
int main(int argc, char *argv[])
{
	int rank, size;
	MPI_Init(&argc, &argv);
	MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);
	MPI_Comm_rank(MPI_COMM_WORLD, &rank);
	int c = 3;
	int error_code = MPI_Comm_size(c, &size);
	ErrorHandler(error_code);
	MPI_Comm_size(MPI_COMM_WORLD, &size);
	MPI_Status status;
	int count = 0;
	int total_count = 0;
	int matrix[3][3];
	int recvbuf[3];
	int val;
```

```
        if(rank==0)
        {
                printf("Enter 3x3 values below:\n");
                for(int i = 0; i<3; i++)
                        for(int j=0; j<3; j++)
                                scanf(" %d", &matrix[i][j]);
                printf("\nEnter value to search for below:\n");
                scanf(" %d", &val);
        }
        MPI_Bcast(&val, 1, MPI_INT, 0, MPI_COMM_WORLD);
        MPI_Scatter(matrix, 3, MPI_INT, recvbuf, 3, MPI_INT, 0,
        MPI_COMM_WORLD);
        for(int i = 0; i<3; i++)
                if(recvbuf[i]==val)
                        count++;
        MPI_Reduce(&count, &total_count, 1, MPI_INT, MPI_SUM,
        0,MPI_COMM_WORLD);
        if(rank==0)
                printf("Rank %d: Total count of %d in the matrix = %d\n", rank, val,
                total_count);
        MPI_Finalize();
        return 0;
}
```

OUTPUT:

```
470375685 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7fff25e87a10) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
Enter 3x3 values below:
738811141 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7fff7cc52760) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
269049093 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffea6c45f20) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
269049093 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7fffddc900f0) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
1 2 3 4 5 6 7 7 7

Enter value to search for below:
7
Rank 0: Total count of 7 in the matrix = 3
```

4. Prev row sum 4x4 matrix

```
#include "mpi.h"
```

```
#include <stdio.h>
#include <string.h>
void ErrorHandler(int error_code)
{
    if(error_code!=MPI_SUCCESS)
    {
        char error_string[BUFSIZ];
        int reslen, error_class;
        MPI_Error_class(error_code, &error_class);
        MPI_Error_string(error_code, error_string, &reslen);
        printf("%d %s\n", error_code, error_string);
        MPI_Error_string(error_class, error_string, &reslen);
        printf("%d %s\n", error_class, error_string);
    }
}
int main(int argc, char *argv[])
{
    int rank, size;
    MPI_Init(&argc, &argv);
    MPI_Errhandler_set(MPI_COMM_WORLD, MPI_ERRORS_RETURN);
    MPI_Comm_rank(MPI_COMM_WORLD, &rank);
    int c = 3;
    int error_code = MPI_Comm_size(c, &size);
    ErrorHandler(error_code);
    MPI_Comm_size(MPI_COMM_WORLD, &size);
    MPI_Status status;
    int count = 0;
    int total_count = 0;
    int matrix[4][4];
    int recvbuf[4];
    int val;
```

```
    int sum[4];
    if(rank==0)
    {
            printf("Enter 4x4 values below:\n");
            for(int i = 0; i<4; i++)
                    for(int j=0; j<4; j++)
                            scanf(" %d", &matrix[i][j]);
    }
    MPI_Scatter(matrix, 4, MPI_INT, recvbuf, 4, MPI_INT, 0,
    MPI_COMM_WORLD);
    MPI_Scan(recvbuf, sum, 4, MPI_INT, MPI_SUM,MPI_COMM_WORLD);
    for(int i =0; i<4; i++)
            printf("%d ", sum[i]);
    printf("\n");
    MPI_Finalize();
    return 0;
}
```

OUTPUT:

```
873028869 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffeaa0faf50) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
Enter 4x4 values below:
67722501 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffc701ac950) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
201940229 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffc353d7240) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
613637 Invalid communicator, error stack:
PMPI_Comm_size(112): MPI_Comm_size(comm=0x3, size=0x7ffc52cf3bd0) failed
PMPI_Comm_size(71).: Invalid communicator
5 Invalid communicator
1 2 3 4 1 2 3 1 1 1 1 1 2 1 2 1
1 2 3 4
2 4 6 5
3 5 7 6
5 6 9 7
```