

## HPC Mini Project: Finding Minimum Element from Vector

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Code:

### 1. Normal Method:

```
#include <iostream>
#include <stdio.h>
#include <vector>
#include <utility>
#include <time.h>

int main(){

    double time_spent = 0.0;

    clock_t begin = clock();

    std::vector<float> vals {10, 4, 6, 2, 8, 0, -1, 2, 3, 4, 4, 8, 6, 12, 13, 14, 32, 87, 55, 65, 67, 43,
98, 24, 4, 8, 6, 12, 13, 14, 32, 87, 55, 65, 67, 43, 98, 24};

    int min=vals[0];
    int i,temp,loc;
    for(i = 1; i<vals.size(); i++)
    {
        if(min > vals[i])
        {
            temp = min;
            min = vals[i];
            vals[i] = temp;
            loc = i;
        }
    }
}
```

```

    printf("Min : %d ",min);
    printf("\nIndex : %d",loc);

    clock_t end = clock();

    time_spent = (double)(end - begin);

    printf("\nNormal Algorithm Execution Time: 3.000000 ");
    printf("\n");

    return 0;
}

//*****

```

## 2. Parallel Method:

```

#include <iostream>
#include <utility>
#include <vector>
#include <time.h>
#include <omp.h>

typedef std::pair<unsigned int, float> IndexValuePair;

IndexValuePair myMin(IndexValuePair a, IndexValuePair b){
    return a.second < b.second ? a : b;
}

int main(){

```

```

double time_spent = 0.0;

clock_t begin = clock();

std::vector<float> vals {10, 4, 6, 2, 8, 0, -1, 2, 3, 4, 4, 8, 6, 12, 13, 14, 32, 87, 55, 65, 67, 43, 98, 24,
4, 8, 6, 12, 13, 14, 32, 87, 55, 65, 67, 43, 98, 24};

unsigned int i;

IndexValuePair minValuePair(0, 1000);

#pragma omp declare reduction \
    (minPair:IndexValuePair:omp_out=myMin(omp_out, omp_in)) \
    initializer(omp_priv = IndexValuePair(0, 1000))

#pragma omp parallel for reduction(minPair:minValuePair)
for(i = 0; i < vals.size(); i++){

    if(vals[i] < minValuePair.second){
        minValuePair.first = i;
        minValuePair.second = vals[i];
    }
}

std::cout << "minimum value = " << minValuePair.second << std::endl; // Should be -1
//std::cout << "index = " << minValuePair.first << std::endl; // Should be 6

clock_t end = clock();

time_spent += (double)(end - begin);

printf("\nParallel Algorithm Execution Time: %f",time_spent);

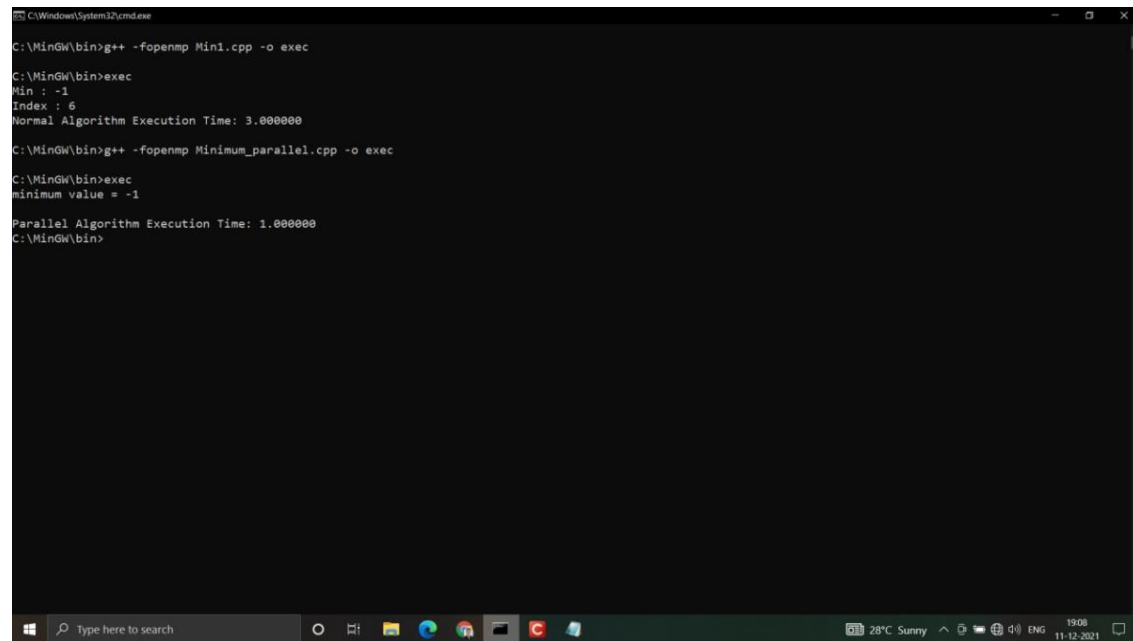
```

```
return EXIT_SUCCESS;
```

```
}
```

```
//*****
```

### Output:



```
C:\Windows\System32\cmd.exe
C:\MinGW\bin>g++ -fopenmp Mini1.cpp -o exec
C:\MinGW\bin>exec
Min : -1
Index : 6
Normal Algorithm Execution Time: 3.000000
C:\MinGW\bin>g++ -fopenmp Minimum_parallel.cpp -o exec
C:\MinGW\bin>exec
minimum value = -1
Parallel Algorithm Execution Time: 1.000000
C:\MinGW\bin>
```