2021

Assignment 3

PARALLEL SORTING USING MPI

COL 730

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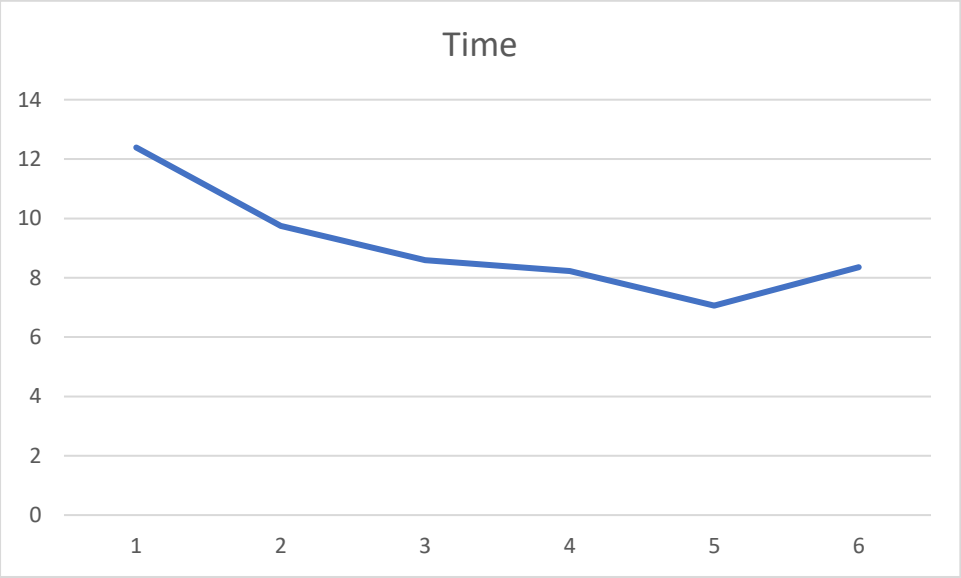
Processor count vs Execution time graph

problem size	nproc	Time
10000000	1	12.389
10000000	2	9.743
10000000	3	8.592
10000000	4	8.227
10000000	5	7.06
10000000	6	8.354



Approach/ Algorithm used

- Designed parallelized version of quick sort
- **Why not merge sort**? Started with merge sort but thought it would require a lot of message passing and a lot of auxiliary memory creation required
- Parallelized quick sort:
    - Step 1: Message passing (all gather) between processors how many elements each has.
    - Step 2: Processor 1 sends pivot element to each processor(MPI_Isend, MPI_recv)
    - Step 3: Each processor divides itself into 2 parts left(containing items < pivot) and right(containing items >=pivot)

- Step 4: Message passing to other processors that how many elements smaller than pivot are present with itself
- Step 5: Processors compute whether they are left, right or pivot processors themselves; and start sending elements between each other swapping elements to get to a state where there are first all elements less than pivot then all with values more than pivot.
- Step 6: pace pivot at the correct place by message passing to correct processor
- Step 7: do recursive call on left and right arrays of pivot.