CS 590 Report
Assignment 1
Prithiv Dev (10453922)

Input	Naive Insertion Sort	Improved Insertion Sort	Merge Sort
10000 5 0			
1st Run	973ms	1ms	4ms
2nd Run	989ms	1ms	4ms
3rd Run	992ms	1ms	4ms
4th Run	976ms	1ms	4ms
5th Run	1006ms	1ms	4ms
6th Run	980ms	1ms	4ms
7th Run	1006ms	1ms	4ms
8th Run	989ms	1ms	4ms
9th Run	970ms	1ms	4ms
10th Run	980ms	1ms	4ms
Total	9930ms	10ms	40ms
Average	997ms	1ms	4ms

Legend: ■ Naive Insertion Sort ■ Improved Insertion Sort ■ Merge Sort
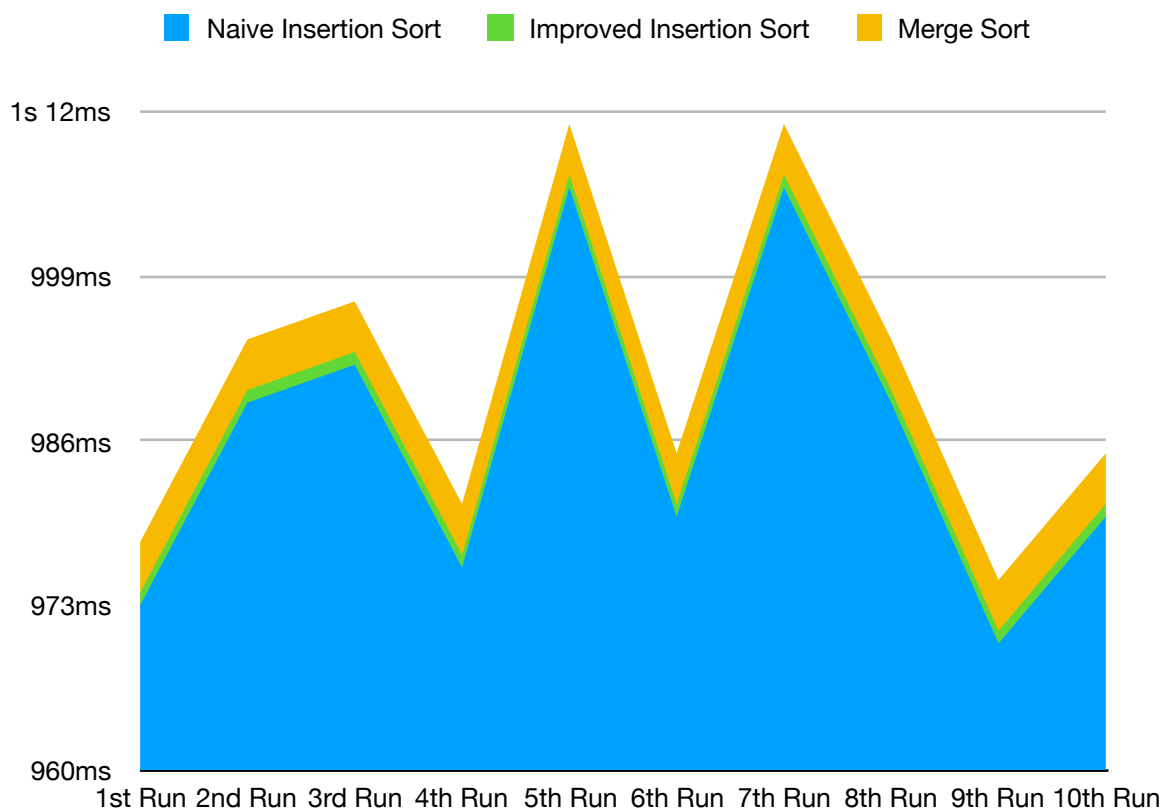
Input	Naive Insertion Sort	Improved Insertion Sort	Merge Sort
25000 25 0			
1st Run	15682ms	8ms	35ms
2nd Run	15382ms	4ms	39ms
3rd Run	15928ms	5ms	24ms
4th Run	15930ms	4ms	30ms
5th Run	15389ms	4ms	32ms
6th Run	15980ms	3ms	39ms
7th Run	15920ms	4ms	32ms
8th Run	15992ms	4ms	38ms
9th Run	15890ms	4ms	37ms
10th Run	15892ms	4ms	32ms
Total	15829ms	47ms	260ms
Average	15799ms	4.6ms	27.3ms
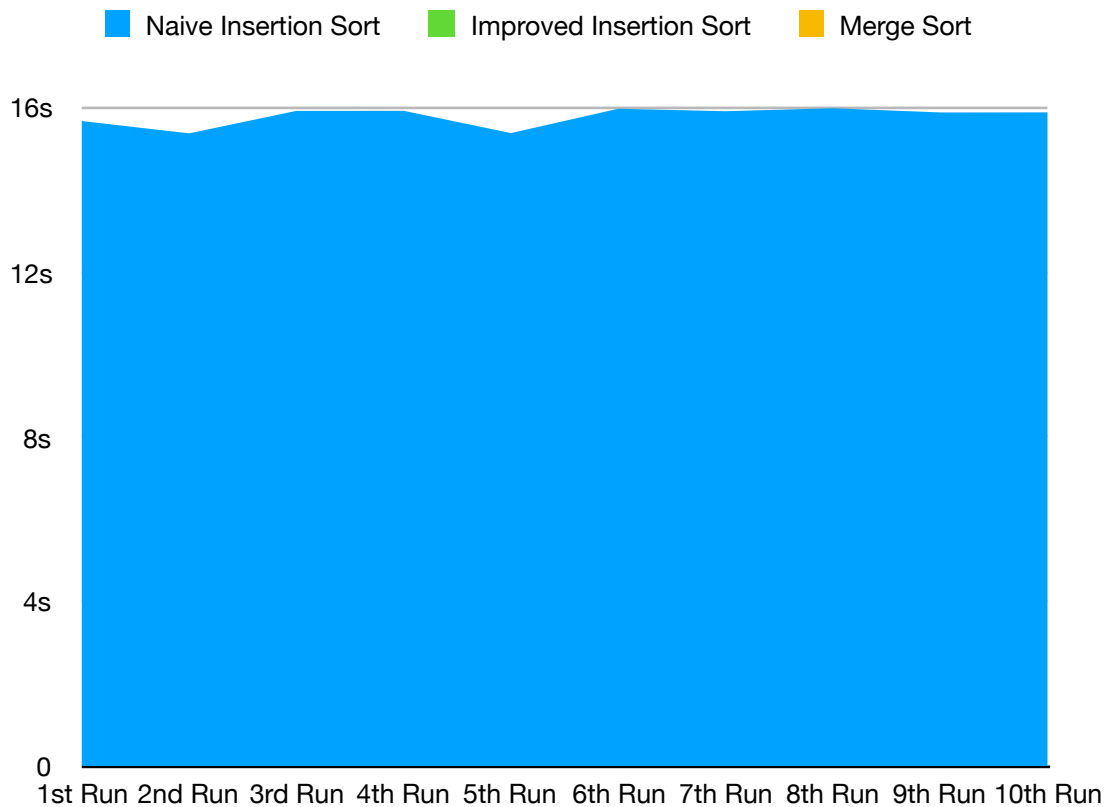
Input	Naive Insertion Sort	Improved Insertion Sort	Merge Sort
50000 50 0			
1st Run	67570ms	11ms	55ms
2nd Run	66314ms	9ms	49ms
3rd Run	66824ms	8ms	51ms
4th Run	69374ms	10ms	57ms
5th Run	66877ms	12ms	58ms
6th Run	67680ms	8ms	49ms
7th Run	66449ms	11ms	51ms
8th Run	66303ms	9ms	57ms
9th Run	67634ms	7ms	59ms
10th Run	69685ms	10ms	52ms
Total	674710ms	100ms	553ms
Average	67471ms	9.5ms	53.1ms

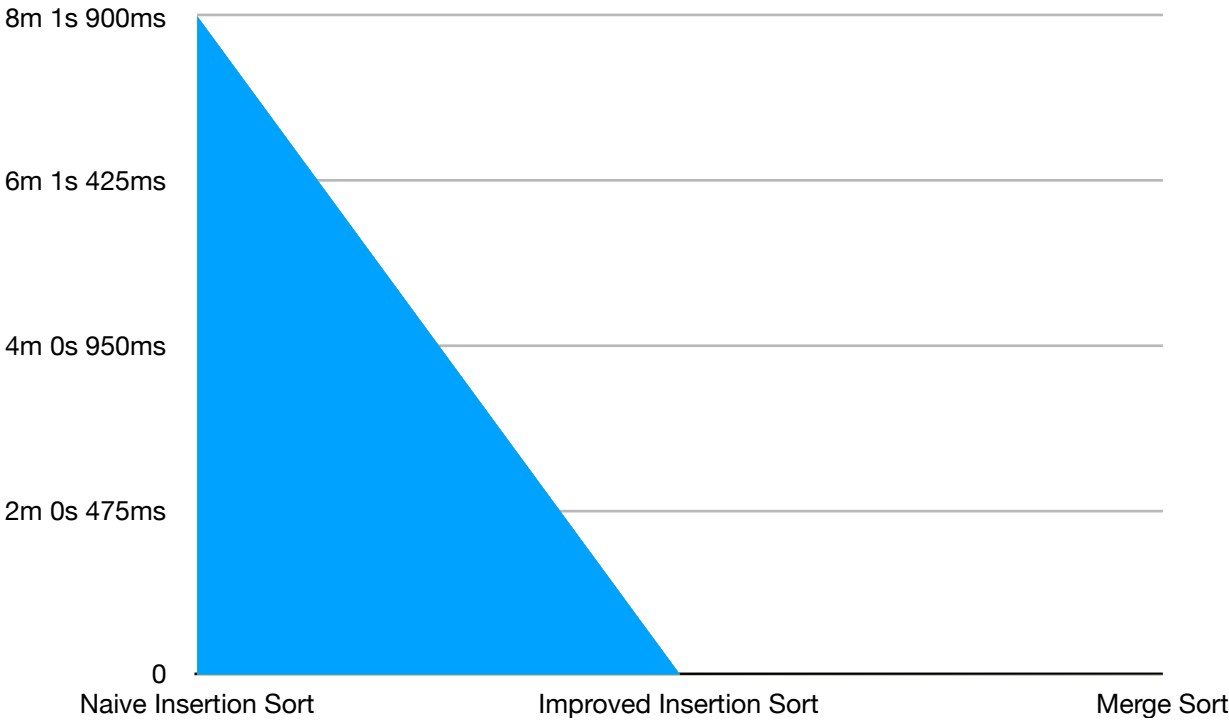■ Naive Insertion Sort   ■ Improved Insertion Sort   ■ Merge Sort
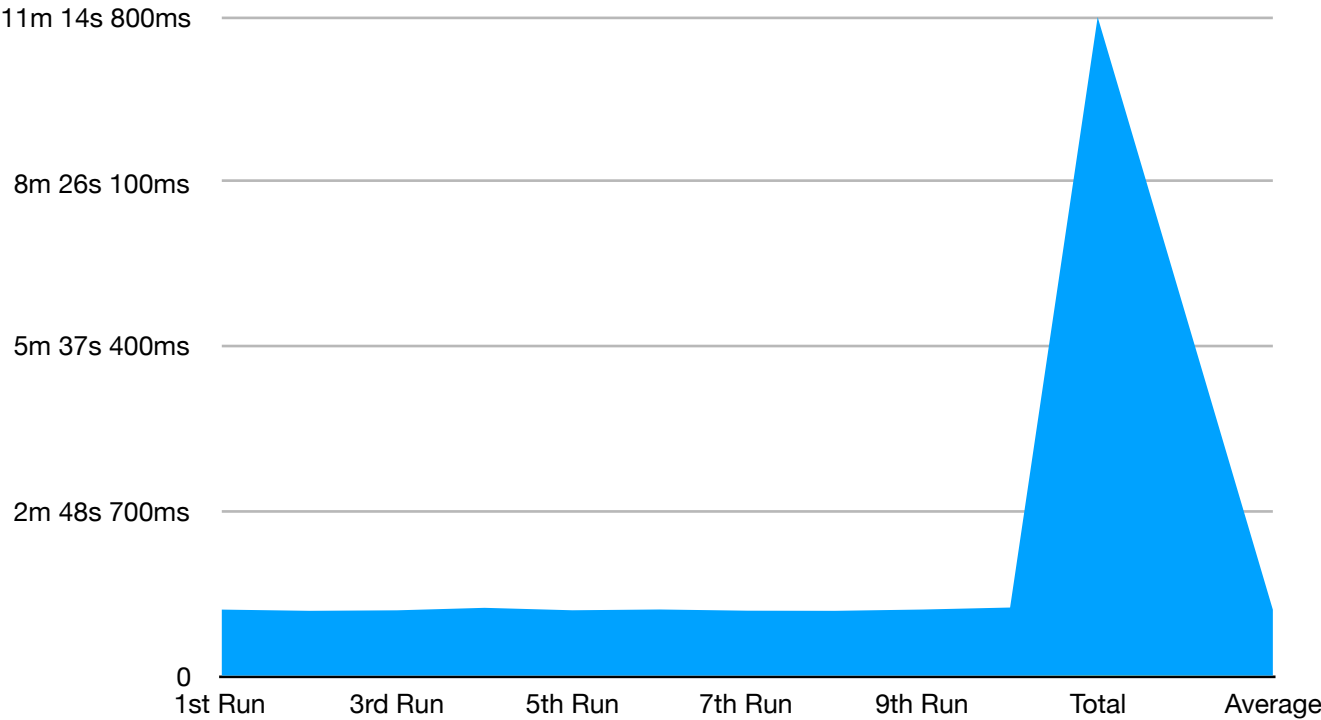
Input	Naive Insertion Sort	Improved Insertion Sort	Merge Sort
100000 50 O			
1st Run	352926ms	24ms	138ms
2nd Run	352978ms	24ms	137ms
3rd Run	352926ms	25ms	132ms

Input	Naive Insertion Sort	Improved Insertion Sort	Merge Sort
100000 50 -1			
1st Run	481834ms	11ms	97ms
2nd Run	481878ms	15ms	95ms
3rd Run	481824ms	16ms	99ms
4th Run	481834ms	14ms	85ms
5th Run	481682ms	12ms	93ms
Total	4818540ms	158ms	930ms
Average	481682ms	15ms	93ms

■ 1st Run   ■ 2nd Run   ■ 3rd Run   ■ 4th Run   ■ 5th Run

Input	Naïve Insertion sort	Improved Insertion sort	Merge Sort
100000 25 0			
1st run	337748ms	20ms	125ms
2nd run	337760ms	20ms	125ms
3rd run	337755ms	20ms	124ms
4th run	337730ms	20ms	125ms
5th run	337746ms	20ms	126ms
6th run	337750ms	21ms	125ms
7th run	337744ms	20ms	123ms
8th run	337731ms	21ms	125ms
9th run	337747ms	21ms	124ms
10th run	337741ms	21ms	125ms
Average	**337765ms**	**20ms**	**125ms**

Comment:-
1. From the above table , it is clear that merge_sort_imp complexity has
Changed by precomputing the length of vector and storing it into the array.
This has drastically changed the time complexity.
2. complexity has changed from n^2 to O(nlogn) for improved insertion sort.