

# Assignment - 7

## Quicksort and Mergesort

### 1) Quicksort

- Show, in the style of the trace given with partition(), how that method partitions the array I, L, O, V, E, A, L, G, O, R, I, T, H, M, S
- Show, in the style of the quicksort trace discussed in the book, how quicksort sorts the array I, L, O, V, E, A, L, G, O, R, I, T, H, M, S (for the purpose of this exercise, ignore the initial shuffle.) Compare the best, worst, and average case scenarios for the quicksort algorithm.

### 2) Mergesort

Implement a natural merge sort for linked lists. (This is the method of choice for sorting linked lists because it uses no extra space and is guaranteed to be linearithmic.)

During each iteration, natural merge sort works by scanning the list from the left to right identifying naturally sorted sub-lists and merging the sub-lists, and continue scanning further identifying and merging the sub-lists until the end of the list. Repeats the process until the entire list is sorted.

Example:

Unsorted list

M -> E -> R -> G -> E -> S -> O -> R -> T -> E -> X -> A -> M -> P -> L -> E

After first iteration:

E -> M -> R -> E -> G -> S -> E -> O -> R -> T -> X -> A -> L -> M -> P -> E

After second iteration:

E -> E -> G -> M -> R -> S -> A -> E -> L -> M -> O -> P -> R -> T -> X -> E

After third iteration:

A -> E -> E -> E -> G -> L -> M -> M -> O -> P -> R -> R -> S -> T -> X -> E

After fourth iteration:

A -> E -> E -> E -> E -> G -> L -> M -> M -> O -> P -> R -> R -> S -> T -> X