Linked Representation of Graph

Why Linked Representation?

- In sequential representation, there are two major drawbacks:

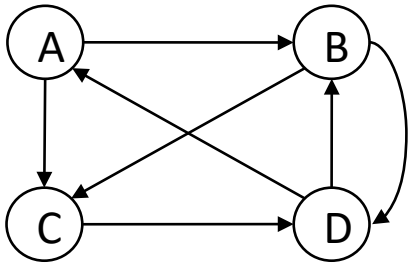
1. Adding new nodes or deleting existing nodes is a difficult task, as the size of the matrix needs to be changed and existing nodes may have to be reordered.

2. Graphs which have small-to-moderate number of edges are called sparse. Representing these types of graphs by adjacency matrix will contain many zeros; hence a great deal of space will be wasted.

- Linked Representation have a great advantage over these limitations.

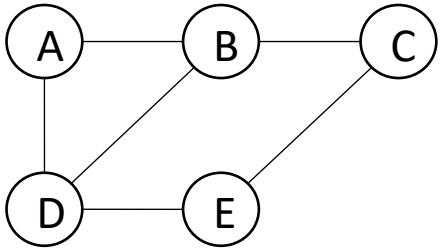
Linked Representation Continue…

In linked representation, each node in G is followed by its adjacency list, which is its list of adjacent nodes, also called its neighbors.



Node	Adjacency List
A	B, C
B	C, D
C	D
D	A, B

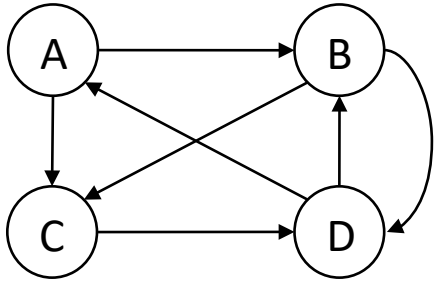
For a directed graph, the sum of the lengths of all adjacency lists is equal to the number of edges in G.



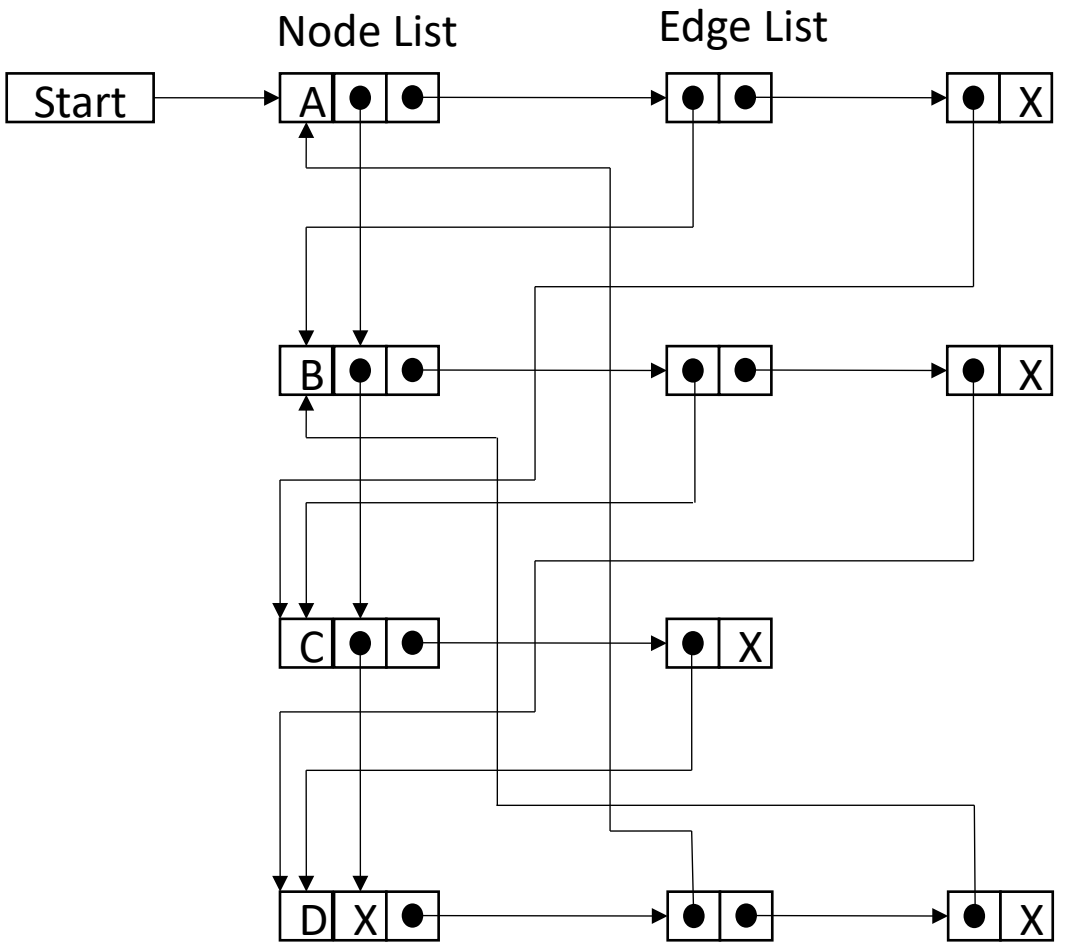
Node	Adjacency List
A	B, D
B	A, C, D
C	B, E
D	A, B, E
E	C, D

For an undirected graph, the sum of the lengths of all adjacency lists is equal to twice the number of edges in G.

Figure of G and Adjacency List



Node	Adjacency List
A	B, C
B	C, D
C	D
D	A, B



Linked Representation Continue…

- Linked representation will contain two list:
  1. NODE list
  2. EDGE list
- Node List: Each element in the list NODE will correspond to a node in G and will be a record of the form.

- Where
  - NODE will be the name or key value of the node.
  - NEXT will be a pointer to the next node.
  - ADJ will be a pointer to the first element in the adjacency list of the node, which is maintained in the list EDGE.
  - The shaded area indicates that there might be other information in the record, such as the INDEG of the node, the OUTDEG of the node.

Linked Representation Continue…

- Edge list: Each element in the list EDGE will correspond to an edge of G and will be a record of the form.

- Where
  - DEST will point to the location in the list NODE of the destination or terminal node of the edge.
  - LINK will link together the edges with the same initial node, that is, the nodes in the same adjacency list.
  - The shaded area indicates other fields if any(such as edge weight)