IMPLEMENTATION OF THE STABLE MATCHING ALGO

- THE ALGO TERMINATES IN n^2 ITERATIONS

- WE WILL TRY TO IMPLEMENT EACH ITERATION IN CONSTANT TIME.

- Assume the men to be numbered as $1, 2, 3, \ldots, n$
- Assume the women to be numbered as $1, 2, 3, \ldots, n$
- we will refer to them by these numbers.

TASK 1 : Maintain a PL for each man and woman.

Sol : We use two $n \times n$ arrays for this.

Man.Pref[m,i] : ith woman on m's PL

Woman.Pref[w,i] : ith man on w's PL

TASK 2: Identify a free man.

Sol: Set of free men can be maintained as a linked list.

Elements can be added or deleted from the front.

TASK 3 : For a man m, identify the highest ranked woman who has not been proposed by him.

Sol : We maintain an array.

Next[m] : It indicates the next woman to be proposed by m.

Initially $\forall m$ Next[m] = 1

Note : Man m will propose Man.Pref[m, Next[m]] and then Next[m]++

TASK 4: For a woman w, we need to identify her current husband.

Sol: We maintain an array.

$$Current[w] = \begin{cases} \text{NULL (INITIALLY)} \\ \text{HUSBAND} \end{cases}$$

TASK 5: For a woman w, we should be able to decide whether she prefers man m to man m'.

Sol: We maintain an array.

RANK$[w, m]$: Rank assigned by w to m

Note: Rank$[w, m] = r$ iff

Woman.Pref$[w, r] = m$

THEOREM

THE DATA STRUCTURES DESCRIBED ABOVE ALLOW US TO IMPLEMENT THE STABLE MATCHING ALGO IN $O(n^2)$ TIME.