STABLE MARRIAGE PROBLEM USING GALE-SHAPLEY ALGORITHM

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Abstract*-*This paper proposes the Gale-Shapley algorithm for the stable marriage problem, which is easier and crystal clear than the conventional method. The most important thing about Gale-Shapley algorithm is that if all men propose the women then they will get the best women according to their choice and if all women propose the men first then they will get best men according to their choice. The stable marriage problem algorithm deals with the two sets containing equal number of men and women, so that stable matching can take place.

1. Introduction

Now a days ,many people uses online platform to finding a perfect matching men or women as per their choice for the marriage. That is why it is very important to set a preference order for both men and women so that they can find a perfect match.The stable marriage problem is to find out a set of stable matching pairs for the n men and n women (n is the number of persons).It is based on an ordered preference list that shows each person of male community set a preference order list for all the members of female community as well as each member of female community set the preference order list of male community.

According to Gale-Shapley algorithm either men or women propose the other gender men or women ,after applying this algorithm they will get an ordered pair of men and women as per their best choice. If the men propose the women first then men will get best women according to his choice and if women propose the women propose the men first then they will get the best men according to her choice, the finally every man and

women will get a perfect and stable match.According to this algorithm if the number of men and women is not the same then the stable matching can not be possible.

Let's take m1 and m2 as two men ,w1 and w2 as two women

Let preference list of m1 is {w1, w2}
Let preference list of m2 is {w1, w2}
Let preferences list of w1 is {m1, m2}
Let preferences list of w2 is {m1, m2}

The matching { {m1, w2}, {w1, m2} } is not stable because m1 and w1 would prefer each other over their assigned partners. The matching {m1, w1} and {m2, w2} is stable. Because m1 prefer w1 over w2 and w1 prefer m1 over m2.

2. Problem Statement

Sometimes it becomes very difficult to select the perfect match among the given set of men and women. And it becomes more difficult if men and women have some preference order for the other gender. Nowadays many people prefer online platform to find a perfect match for

marriage so it is very important to take care of those people ,so that they can get a perfect match for themselves that is why Gale-Shapley algorithm is very important.

In the stable marriage problem, each person expresses not only the acceptability but also a preference order of the members of the opposite gender, and an output matching must satisfy the stability condition, which means that there is no women-men pair both of which have to elope.

3. Objectives

To learn how Bipartite Graph is used in stable marriage problem.

How the Gale-Shapley algorithm is used to find a perfect matching in stable marriage problem.

Implementation of this concept on real life problem to match men-women pair with their given preference order list.

4. Literature Survey

The following papers were an inspiration to this project, and have therefore been listed here:

"A Survey of the Stable Marriage Problem and Its Variants
written by Kazuo Iwama,Shuichi Miyazaki

"New fast iteration algorithm for the solution of generalised stable marriage problem."
Written by Tetsuo Hattori,Toshinori Yamasaki and Michio Kumano

The paper explains all the concept of Gale-shapley algorithm.This paper clears the concept of above mentioned algorithm.

5.Methodology

BIPARTITE GRAPH:- let S be a set(graph) containing 2N vertices ,if we divide the set into two sets S1 and S2 ,where S1 have N vertices and S2 have N vertices .if the vertices of S1 is mapped with the vertex of S2 ,set one is mapped with set two only then it is bipartite graph. The bipartite graph for stable marriage problem is given below.

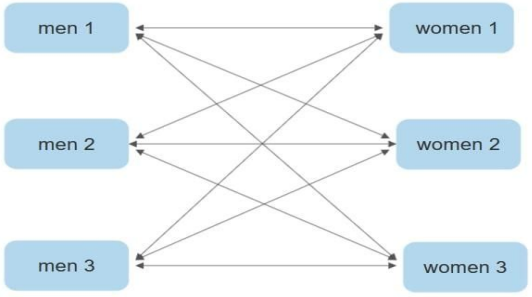

Fig 1.1 BIPARTITE GRAPH

The flow chart for the stable marriage problem is given below. In this graph m stand for men and w stand for women .

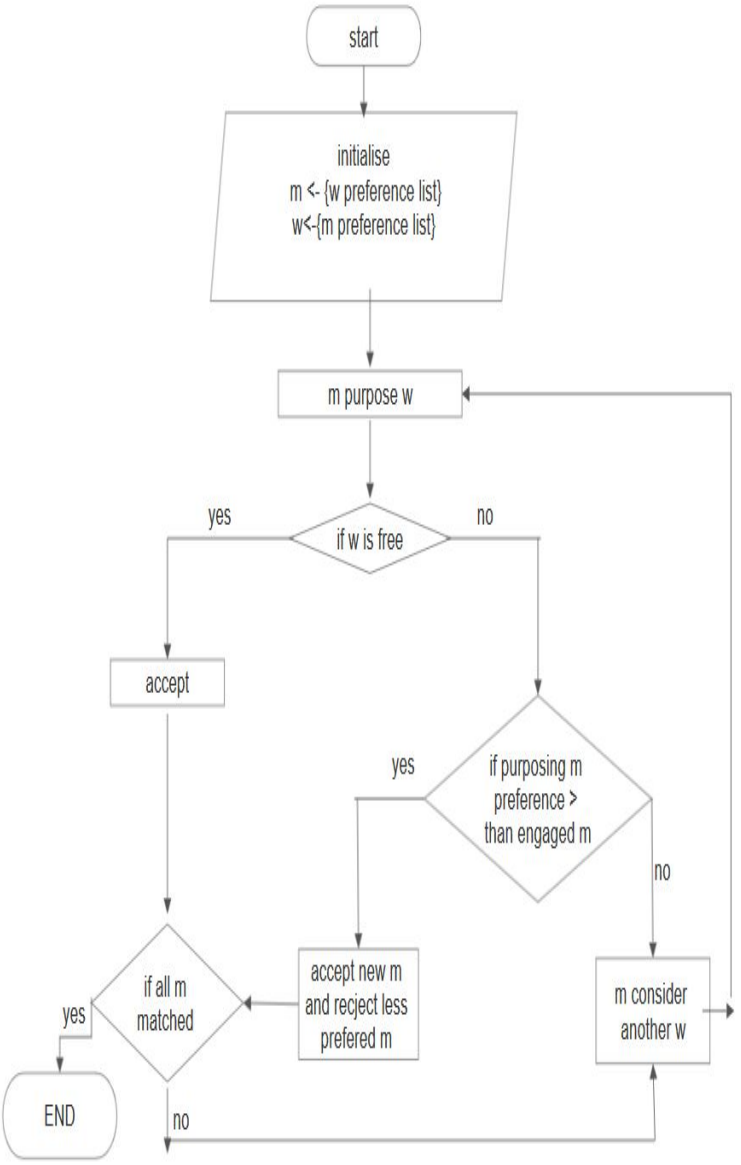

FIG. FLOWCHART

ALGORITHM

Initialize all men and women to free

while there exist a free man m who still has a woman w to propose to

{

w = m's highest ranked such woman to whom he has not yet proposed

if w is free

(m, w) become engaged

else some pair (m', w) already exists

if w prefers m to m'

(m, w) become engaged

m' becomes free

else

(m', w) remain engaged

}

7.Conclusion

In this paper we have proposed Gale -Shapley algorithm to find the perfect stable matching for the available equal no. Of men and women. Men and women both have a preference list for opposite gender. On the basis of that preference list men and women get their perfect matching pair .The result after using this algorithm is that everyone will get their perfect partner as per their preference order list .

8. ACKNOWLEDGEMENT

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9.Authors and Affiliations

This report is a part of mini-project for Computer Communications and Networking. Following are the members who contributed:

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