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# Finding Community Infection Spreading Factor's presence in a Community

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***Abstract* — In all the countries, all the communities consist of people having certain attitudes and interests in common. The whole community can be mapped into a graph network. Every distinct individual can be assumed as a node of the constructed graph for the community. To declare a pandemic situation for any country, we first need to check whether the infection is spread throughout the Community or not. For this purpose we need to calculate the existence of cliques and the nodes of the maximal clique will be the infection spreading factors. In this work, we try to find out the presence of these spreading factors in the community graph network.**

***Index Terms*** **— Graphic sequence, Clique, Maximal Clique, Community Graph, Spreader factor.**

## I. INTRODUCTION

When an infection is spread in a community, first of all somehow (by GPS tracking / any means) we need to represent the community into a Graph and obviously, the generated graph will be a dense mess graph; then there is a probability of having several Cliques in the constructed graph. Hence among all Cliques, there must be at least one Maximal Clique. Now, the Maximal Clique of that graph consists of some vertices, which can be treated as the Community Infection Spreading Factors/elements/subjects.

## II. TECHNICAL EXPLANATION OF THE CONCEPT

A sequence $\xi = d_1, d_2, d_3, \ldots, d_n$ of the grade of graph G if the vertices of G can be designated V1, V2, V3…….Vn, etc., as the grade Vi = di; $\forall$ i [2]. For a graph G, it is easy to determine a grade sequence of G [1, 3].

### A. Preliminaries

In this section, we will define certain words in relation to our article and also some necessary theorems which form the backbone of the suggested method.

A sequence $\xi = d_1, d_2, d_3, \ldots, d_n$ of non-negative integer is called to be a graphical sequence if it is present in a graph G with vertices with the degree of di and G termed the realization of a total number of numerical elements[1,3].

A sequence $\xi$ has property Ap iff there is a graph with a grade sequence $\xi$, in which the first p-vertices constitute a complete subsection[2, 5]. Above related theorem provides a way to determine whether $\xi$ has Ap property since it is straightforward to determine whether $\xi^{p,p}$ or not it is graphical.

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This may be used to build a p-vertices graph (where it exists) which can also easily be determined from a graph with a degree sequence $\xi$[2,3].

***Procedure explanation by using an example***

Consider a sequence,
$\xi^{4,1}$ = 6, 5, 4, 4, 4, 4 ,4, 1
With $p = 4$, $d_1$=6
and since $p-1=3 \le d_1 \le (n-1)$
$\Rightarrow 3 \le 6 \le 7$
$\therefore \xi^{4,2}$ = 4, 3, 3, 3, 3, 3, 1
Now, $d_1$=4 since, $p-1=3 \le d_1 \le (n-1)$
$\Rightarrow 3 \le 4 \le 7$
$\therefore \xi^{4,3}$ = 2, 2, 3, 2, 2, 1
Now, $\xi^{4,4}$ = 1, 2, 2, 2, 1
Now, $\xi^{4,4}$ is graphic.

When working backward, a graph with a degree sequence $\xi$ is easy to design, in which four vertices form a whole sub graph.

$\xi^{5,1}$ = 6, 5, 4, 4, 4, 4 ,4, 1
With $p = 5$, $d_1$=6 and since $p-1=4 \le d_1 \le (n-1)$
$\Rightarrow 4 \le 6 \le 7$
$\therefore \xi^{5,2}$ = 4, 3, 3, 3, 3, 3, 1
Now, $d_1$=4 since, $p-1=4 \le d_1 \le (n-1)$
$\Rightarrow 4 \le 4 \le 7$
$\therefore \xi^{5,3}$ = 2, 2, 2, 3, 2, 1
Now, $\xi^{5,4}$ = 1, 1, 3, 2, 1
Now, $\xi^{5,5}$ = 0, 3, 2, 1
Since, $\xi^{5,5}$ is not graphic We infer that for the given degree sequence $\xi$ ident, a maximum clique number cannot be 5; it must be 4.

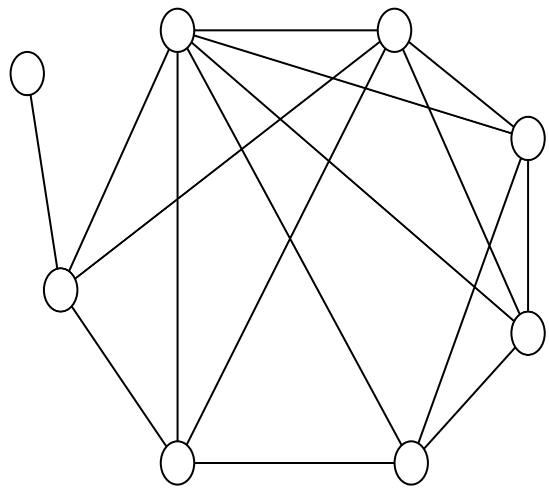

**Fig-1.General Graph**

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## III. BASICS OF THE PROPOSED ALGORITHM

The theorem on which the algorithm is based is presented below.

**Theorem 2:** Let $\xi = d_1, d_2, d_3, \ldots, d_n$ are the Grade sequence of *G*. Graph G comprises a maximum number of clicks k iff $d_1 \geq k-1$, $k \leq n$ and graphic sequence after droop-m ($d_{k+1}, d_{k+2}, \ldots., d_n$).

### *A. Proposed algorithm*

**Input:** Non-negative integer sequence.
**Output:** K maximal number of the clique.
**Step 1:**

$\xi = d_1 \geq d_2 \geq d_3 \geq \ldots \geq d_n$. $k = d_1$;

**Step 2:**

If ($d_1 \geq d_2 \geq d_3 \geq \ldots \geq d_k \geq (k-1)$) go on;
Else
Move to Step 4.
End If

**Step 3:**

If (($d_{k+1}, d_{k+2}, \ldots., d_n$) is graphical after *drop-m*) Then
Move to Step 5.
Else
Go on.
End If

**Step 4:**

k = k–1

**Step 5:**

Print "The maximum clique number of the sequence ξ is *k*"

**Step 6:**

Quit.

### *B. Description of the used technique with an example*

Let us consider a Grade sequence ξ = 6, 6, 4, 4, 4, 4, 2, 2 and identify the maximal click number, indicating chart G. Now,

Since $d_1$=6 therefore $k = d_1 = 6$.

Now, $d_2 \geq 5$, but $d_3 < 5$.

$\therefore k = k-1 = 5$

Now, $d_2 \geq d_3 \geq \ldots \geq d_5 \geq 4$

$\therefore\ m = \Sigma\,(d_i - k+1)\ \forall\ i=1,2,..5.$

$\therefore\ m = 4$

$\therefore$ *drop-m* from ($d_6, d_7, d_8$) we have

$\xi' = (2, 1, 1)$

Which is graphic.

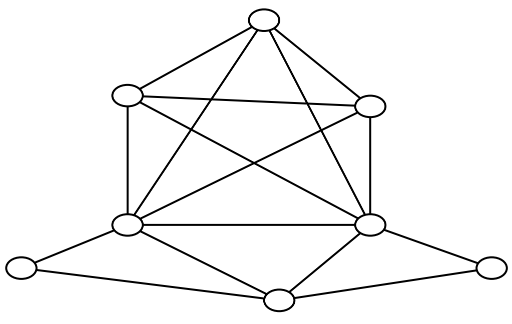

**Fig.2 .The corresponding Clique of the sub-graph.**

## IV. CONCLUSION

Identifying Maximal Clique from a Graph it can be identified required Community Infection Spreading Factors/elements/subjects and obviously it can be found in polynomial time and Govt. can take decision that whether Locked Down is required at that province or not.

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