(One, Two) Tri Vertex Domination in Fuzzy Graphs

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Abstract: Sarala.N and Kavitha.T has established the concept of triple connected domination in fuzzy graph. In this paper we introduce the (One, two) tri-vertex domination number in fuzzy graph and present several intriguing findings regarding this new parameter domination in fuzzy graphs.

1 INTRODUCTION

Mahadevan G and Selvam A created the notion of triple-connected domination in graphs. In this study, we investigate the limitations on the (One, two) tri-vertex domination number in fuzzy graph and provide various interesting insights about this innovative parameter domination in fuzzy graphs.

2 PRELIMINARIES

Definition 2.1: Let G (a, b) be a fuzzy graph, then is said to be a fuzzy dominating set of G, if for each v ± V(G), where $v \in$ V-D, There is an u in D such that b(u,v) = a (u) □□a (v). There exists a u in D with b(u,v) = a (u) a (v). The dominant fuzzy number is representing by γ(G) is the minimum scalar order of D.

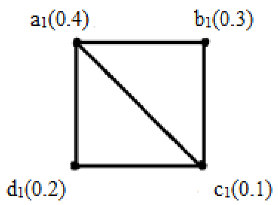

Figure 1: $D = \{a1\}, \Upsilon(G) = 4$.

Definition 2.2: A subset D of V of a non-trivial connected fuzzy graph G is referred to be triple connected dominating set. If D is the dominating set and the induced fuzzy sub graph <D> is triple connected. The minimum cardinality of all tri connected dominating set of G is called the triple connected dominating number of G and is denoted by Υ_{tc}(G).

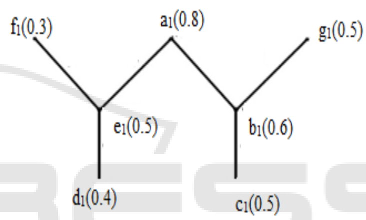

Figure 2: $\Upsilon_{tc} = \{a1, b1, e1\}, \Upsilon_{tc}(G) = 0.8 + 0.5 + 0.6 = 1.9$

Definition 2.3: A (1,2) dominant set in a fuzzy graph G (V, E) is a set S with the characteristic that for every vertex v in V - S. There is at least one vertex in S that is one distance from v, and another that is nearly two distances away. (1,2). The minimum cardinality of a dominating set in a fuzzy graph G is known as the (1,2) dominance number, denoted by ϒ(1,2).

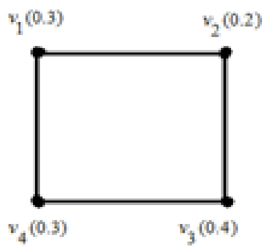

Figure 3: (1,2) dominant set ϒ(1,2)=0.7

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3 (ONE, TWO) TRI VERTEX DOMINATION IN FUZZY GRAPHS

In this section, we introduce several basic limits on (One, two) tri vertex domination within fuzzy graphs. The concept of (One, two) tri vertex domination revolves around tri vertices. It is represented by Υ_t (One, two) along with related findings.

Definition 3.1: A (One, two) tri vertex dominant set in a fuzzy graph G (V, E) is defined as a set S such that for every vertex v in V - S, there are at least three vertices in S that are one distance away from v, as well as a second vertex in S that is almost two distances away from v. The smallest size of a (One, two) tri vertex dominating set in a fuzzy graph G is known as the (One, two) tri vertex dominance number, denoted by Υ_t (One, two).

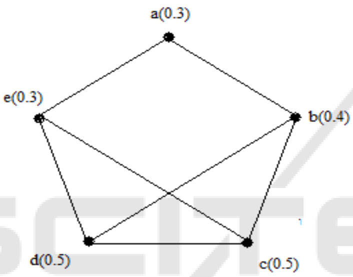


Figure 3.

Here (One, two) tri vertex dominating set is {b,c,d}, Υ_t (One, two)=1.4

Theorem 3.2: (One, two) tri-connected dominating set for fuzzy graphs does not exist for all cases.

Proof: According to definition 3.1, if there are fewer than three dominating vertices, the connected graph cannot be considered tri-connected. We will focus only on connected fuzzy graphs that have a dominating set consisting of one or two vertices.

Theorem 3.3: The complement of a (One, two) tri vertex dominating set is not necessarily a (One, two) tri vertex dominating set.

Proof: For the fuzzy graph G, the set D serves as a (One, two) tri vertex dominating set of G, while the complement V-D does not qualify as a (One, two) tri vertex dominating set.

Example 3.4: For the fuzzy graph G in Fig:4, (One, two) tri vertex dominating set D= {1,3,4} and V-D= {2,5} is not (One, two) tri vertex dominating set

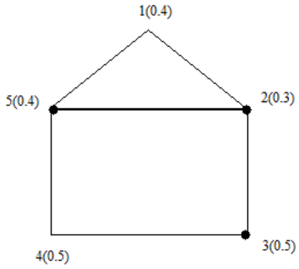


Figure 4.

Theorem: 3.5: Every (One, two) tri vertex dominating set qualifies as a dominating set, but the reverse is not necessarily true.

Proof: According to the definition of a (One, two) tri vertex dominating set, if D is a subset of V, then D constitutes a tri vertex dominating set of G, which means it is also a dominating set. However, it is important to note that not every dominating set must be a (One, two) tri vertex dominating set.

Example 3.6: For the fuzzy graph G in Fig:5, (One, two) tri vertex dominating set = {v_1, v_4, v_6} and dominating set D= {v_1, v_4 } but dominating set is need not to be a (One, two) tri vertex dominating set.

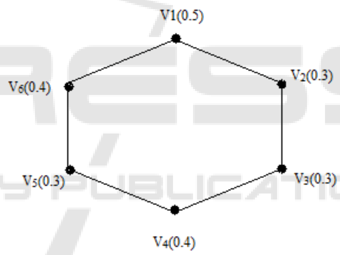
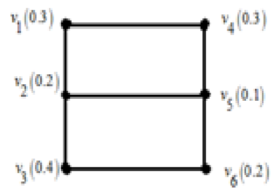


Figure 5.

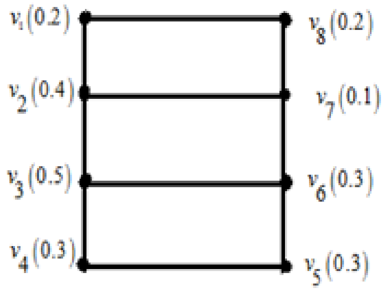
We look at ladder fuzzy graphs of orders 3 to 5 and find their domination number as well as the domination number of (One, two) tri vertex. The ladder fuzzy graph (Ln) is harmonious. This fuzzy graph resembles a ladder, with two rails and n rungs connecting them.

For n are three



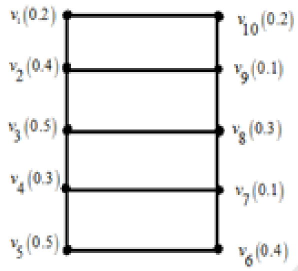
{v1,v2,v3} is a (one, two) tri vertex dominating set.{v2,v5} is a dominating set, Υ_t (one, two) = 0.9

For n are four



{ v1,v2,v3,v4} is a (one, two) tri vertex dominating set.{ v1,v3,v5,v7} is a dominating set. Υ_t (one, two) =1. 4

For n are five



{ v1,v2,v3,v4,v5} is a (one, two) tri vertex dominating set. Υ_t (one, two) = 1.9

From the cases above, we obtain the following theorems:

Theorem 3.7: (One, two) tri vertex dominating vertices is n for a ladder fuzzy graph.

Proof: In ladder fuzzy graph, twice of n vertices and thrice of n vertices minus two edges also both rails have n vertices. Assume that the right hand vertex in the first rail is adjacent to left hand vertex in the second rail. The other vertices in the first rail will be at a distance greater than one from first left hand vertex to build a (One, two) tri vertex dominating set; we must include all of the vertices in a single rail and connect at least three vertices. So the (One, two) tri vertex dominating vertices are n

Theorem 3.8: (One, two) tri vertex dominating vertices is n for a ladder fuzzy graph with n even

Proof: In ladder fuzzy graph, twice of n vertices and thrice of n vertices minus two edges**.** If n is even, the vertex in the inner rungs (n/2 rungs) can form a dominant set. As each rung contains two vertices, the dominating set will have n vertices.

4 (ONE, TWO) NEIGHBOURHOOD TRI VERTEX DOMINATION IN FUZZY GRAPHS

In this part, we discuss fundamental constraints on (One, two) Neighbourhood tri vertex domination in fuzzy graphs. The idea behind (One, two) Neighbourhood tri vertex domination revolves around three Neighbourhood vertices. It is symbolized as Υ_{nt} (One, two) together with related findings.

Definition 4.1: A subset S of V of a fuzzy graph G is called to be a Neighbourhood triple Connected dominating set, if S is a dominating set and the induced sub graph < N(S) > is triple connected. The minimum cardinality of all Neighbourhood triple connected dominating sets is known as the Neighbourhood triple connected dominance number.

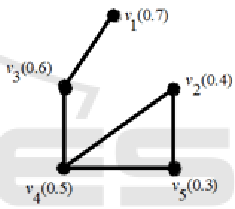


fig.6. S ={v1, v2} Υ_{nt} set { v3, v4 ,v5}. Υ_{nt} (G) = 1.1.

Definition 4.2: A (One, two) Neighbourhood tri vertex dominant set in a fuzzy graph G (V, E) is defined as a set N(S) such that for every vertex v in V - N(S), there are at least three vertices in N(S) that are one distance away from v, as well as a second vertex in N(S) that is almost two distances away from v. The smallest size of a (One, two) Neighbourhood tri vertex dominating set in a fuzzy graph G is known as the (One, two) Neighbourhood tri vertex dominance number, denoted by Υ_{nt} (One, two).

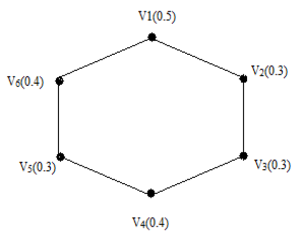


Figure 6: (One, Two) Tri Vertex Dominating Set ={V1, V4,V6} ,Dominating Set D= {V1,V4 } and (One, Two) Neighbourhood Tri Vertex Dominating Set ={ V2,V3,V5}.

Observation 4.3: (One, two) neighbourhood tri dominating set for fuzzy graph does not exist for all cases

Observation 4.4: The complement of a (One, two) neighbourhood tri dominating set is not necessarily a (One, two) neighbourhood tri dominating set.

Observation 4.5: Every (One, two) neighborhood tri dominating set qualifies as a dominating set, but the reverse is not necessarily true.

5 CONCLUSIONS

(One, two) tri vertex dominance in a fuzzy graph is defined, as is (One, two) neighbourhood tri vertex dominating set. Theorems and observations about this notion are derived, and the relationship between dominance number in a fuzzy graph and (one, two) and neighborhood tri vertex domination in fuzzy graphs is established.

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