On the Local Adjacency Metric Dimension of Generalized Petersen Graphs

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ABSTRACT

The local adjacency metric dimension is one of graph topic. Suppose there are three neighboring vertex , , in path . Path is called local if where each has representation: a is not equals and may equals to . Let’s say, . For an order set of vertices , the adjacency representation of with respect to is the ordered -tuple , where represents the adjacency distance . The distance defined by 0 if , 1 if adjacent with , and 2 if does not adjacent with . The set is a local adjacency resolving set of if for every two distinct vertices , and adjacent with y then . A minimum local adjacency resolving set in is called local adjacency metric basis. The cardinality of vertices in the basis is a local adjacency metric dimension of , denoted by . Next, we investigate the local adjacency metric dimension of generalized petersen graph.

**Keywords**: Local Resolving Set; Local (Adjacency) Metric Dimension; Adjacency Metric Dimension; Generalized Petersen.

# INTRODUCTION

This section presents about some definitions which are used. A graph is defined by set of and , the set of vertices and the set of edges of , for more details of the definition in [1,2]. The metric dimension is one of an interesting studied graph topic. Local means that every neighbouring vertex or edge has distinct representation. Let’s say, there are three neighboring vertex in a path, , , where each has representation: and a may equals . Then, the path is called local. The local adjacency metric dimension is combination of local metric dimension and adjacency metric dimension [3]. Let be a connected simple finite graph and , in . For an order set of vertices , the adjacency representation of with respect to is the ordered -tuple , . . . , , where represents the adjacency distance . defines by 0 if , 1 if , and 2 if . We called is a local adjacency resolving set of G if for every two distinct vertices , and then . A local adjacency metric basis of G is a minimum local adjacency resolving set in G. The cardinality of vertices in the basis is a local adjacency metric dimension of .

The research is begun with Rodriguez, et al. [3] about local adjacency metric dimension of corona graphs. Marsidi, et. al. Determined the local metric dimension of line graph of special graphs. Then in 2017 Rinurwati, et al. [5] researched about local adjacency metric dimension of some wheel related graphs with pendant points. Recently, Darmaji, et al. [4] studied about Local adjacency metric dimension of sun graph and stacked book graph this year of course they really motivate us to present this research.

# Results and Discussion

In this section, we investigate the local adjacency metric dimension of generalized petersen graph for as follows

**Theorem 2.1**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the local adjacency metric dimension of is =,

for .

**Theorem 2.2**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the local adjacency metric dimension of is =,

for .

**Theorem 2.3**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the local adjacency metric dimension of is =,

for .

**Theorem 2.4**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the

local adjacency metric dimension of is =, for .

**Theorem 2.5**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the local adjacency metric dimension of is = ,

for .

**Theorem 2.6**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the local adjacency metric dimension of is = ,

for .

**Theorem 2.7**. The local adjacency metric dimension of is , for .

**Proof.** Vertex set of is . We choose the local adjacensy resolving set such that we have the vertex representation respect to as follows.

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For representation in vertex follow the representation in vertex such that we have the cardinality of local adjacency resolving set is . Thus, we get the upper bound of local adjacency metric dimension of is . Furthermore, we prove the lower bound of local adjacency metric dimension of is . Assume that , we choose such that we have the same representation for two adjacent vertices in namely . Thus, the local adjacency metric dimension of is = ,

for .

# Conclusions

We have discussed about the local adjacency metric dimension of generalized Petersen graph for . Such that, we have some problem for as follows.

**Open Problem 1.** Find the local adjacency metric dimension of generalized Petersen graph for .

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