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# Efficiency of Graph theory in Morphing technology

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**ABSTRACT** In mathematical research "graph theory" is having a vast development. It is the study of mathematical structures which is used to model pair-wise relation between objects from a group. This paper explains the emerging concepts in Graph theory applied in morphing. Different types of graphs in Graph theory used in morphing technology and animation is discussed .This paper also gives the idea, application of Graph theory in industry to minimize cost and maximize profit. Applications of graphs in especially in computers are also discussed.

**KEYWORDS** : Graph Coloring, Graph network, Graph traversal, Graph space, Morphing, Animation.

## INTRODUCTION

Graphs are extremely useful in modeling systems in animation, morphing and engineering problems, because of their intuitive diagrammatic nature. This paper gives a reasonably deep account of material closely related to engineering applications (morphing & animation).

Topics like undirected-graph, multi-graphs, coloring graphs, graph traversal, planar graphs in morphing, and minimal cost flows are discussed. Animation is a concept that has been used in the areas of motion pictures and computer games used as special effect of morphing is discussed. The motivation in this paper is to know about the morphing technique in terms of its ability to simulate the metaphor, and to know the metaphor in terms of its usefulness for graph interaction. This paper aids in the users understanding of graph theory in morphology which is a special effect of animation.

## BASIC DEFINITIONS

### Graph Vertices and Edges

A graph is an abstract representation of a set of objects where some pairs of the objects are connected by links. The interconnected objects are represented by mathematical abstractions called vertices, and the links that connect some pairs of vertices are called edges. Typically, a graph is depicted in diagrammatic form as a set of dots for the vertices, joined by lines or curves for the edges.

### Graph Coloring

In graph theory, *graph coloring* is an assignment of *"colors"*, almost always taken to be consecutive integers starting from one without loss of generality, to certain objects in a graph.

### Vertex Coloring

When used without any qualification, a coloring of a graph is always assumed to be a *vertex coloring*, namely an assignment of colors to the vertices of the graph.

### Morphing

The gradual transforming of one image into another. Although the conversion may only take a second, all the interim stages are visible. Common morphing sequences are changing an inanimate object into an animal, such as from a car to a tiger. Morphing is also done with similar objects; for example, transforming one car model into another.

## PLANAR GRAPHS IN MORPHING

Developments in the theory of planar morphing run parallel to the developments in planar graph drawing, though they lag behind. [1].Planar graphs are used in many areas of morphing technology which may be used where curves and straight lines in a plane are considered.Planar graphs are used to discuss the optimality of an algorithm for computing a planar graph between two planar straight line drawings [5].

## COLORING GRAPHS

There are studies identifying the impact of a topology on the cost of coloring graphs, of asymmetry on the cost of finding the optimal tour, and of the dimensionality of space on the cost of finding the optimal tour [6].Coloring graphs is used in business area for example, the graph coloring approach is used in layout analysis and document classification. This method is considered as reliable, robust to various constraints and guarantees a real-time answer to the sorting of business documents [Ref].

## PATH COST

Considering each node in the graph, gives an idea of a heuristic, which can estimate how close the state is to the goal. Another important consideration is the cost of getting to start point. In this case a movement cost to each move is to be assigned. When considering a node it is added up the cost of what it took to get there, and this is simply the sum of the cost of this node and all those that are above it in the graph. In minimizing the cost in any mathematical model problem which can be represented as graphical model that includes morphing technology is an added advantage.

## MINIMAL COST FLOW

The idea is that the morphing technology is extendable so it can be used to determine, locate and evaluate paths between source and destination organizational structures. The main concept is to develop and test algorithms for Morphing one important group structure into another. These algorithms are allowed to be transformed into constraints they are subjected to. They also can be extended so that the path of the move minimizes or maximizes some objective function.

## ARITHMETIC PROGRESSION GRAPHS (APG)

DEFINITION: Determine which finite undirected graphs G = (V, E) that can be both vertex and edge labeled (i.e., $L1 : V \rightarrow Z+$ and $L2 : E \rightarrow Z+$) that satisfy the following two conditions for some positive integers a and d: 1 For all $v \in V$, $L1(v) = P\, u \in N(v)\, L2(uv)$, that is, the vertex labels are the sum of its incident edge labels. 2 range (L1) = {a, a + d, . . . , a + (n − 1)d}, where n = |V|. We call such a graph an Arithmetic Progression Graph (APG) with parameters a and d

### An Application of APG:

In a musical toy there are several game modes that builds up a musical do mine with complex structures for example, a melodic progression graph and a melodic interpreter of graphical curves. These can be freely created and modified using morphing.

## GRAPH TRAVERSAL

Graph traversal (also known as graph search) refers to the process of visiting (checking and/or updating) each vertex in a graph. Such traversals are classified by the order in which the vertices are visited. Tree traversal is a special case of graph traversal.

### Application:

Applied in many areas such as structure morphing, Spark testing

etc.,

**UNDIRECTED MULTIGRAPHS**

Undirected and multi-graphs are used in the case of chasing escapers with multi robots, which are connected to each other. In this multi-robots are positioned by using graph theory if the communication range is appropriate to connect each other. These graphs are also used many other applications especially in computer science related models. The above discussed is a simple application of undirected multi-graphs.

**NETWORK OF GRAPHS**

In order to construct a structure to a particular task or a team work inter connected graphs may be used as its model. This structure which is efficiently represented as a series of interconnected graphs of networks where the nodes in the network are personnel, resources, tasks, and knowledge makes possible to compare and contrast the command and structure of different units. It also makes it possible to find an optimal organizational design.

There is a need for automated tools that can locate cost effective and minimally disruptive paths of change. These tools should provide the basis for its understanding and predicting. The methodology that are used to develop such tools a constraint based morphing technology is used.

**GRAPH SPACE**

In a particular model in which the features from each data (image) are designed in such a way forming a graph space. This space forms the basis for the study of any model. For example, an age model is learned for each individual and a graph space is built using the set of feature descriptors extracted from each face image [Ref ].

**ANIMATION:**

Image morphing technique is used for digital image processing and as animation tool [2]. It is known that Morphing is a special technique which transforms one graphical object into some other object and it animates over some period of time [1].

**CONCLUSION**

Graph theory plays a vital role in morphing technology which used in medical imaging field gaming industry, films (movie animations), multimedia projects, education and computer based training. Usefulness of different types of graphs in morphing is discussed in this paper which highlights the importance of application of graph theory in morphing technology.

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