# Research on Computer Algorithm and Display Based Research on Network Graph

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**Abstract:** In our daily life, the application of network has been inseparable. Whether it is fiber optic network, communication network, transportation network, or power network, it is the network system that is often contacted in life. Although these networks are very different and different, their structure, components, parameters and other information can be Topology (Topology: a structure on the set). Become the signal that the computer can recognize, the form that forms after Topology, is network graph. This paper will analyze and study the computer algorithm and display of network graph, and discuss many different ways and paths.

**Keywords:** graph theory; multiple tables next to each other; graph display; connectivity algorithm; shortest path algorithm

## 1. Introduction

Network graphs are widely used in daily life, especially in circuit networks. Because the structure of the circuit network has become more complex with the increasing scope of use, the difficulty of circuit analysis has also increased to a certain extent. Therefore, the use of modern analysis methods, through the computer to analyze the circuit network diagram has become and display of network diagram are not only applied to the analysis of circuit network, but also to the streamline diagram of communication network, transportation network and process [1]. In this paper, we mainly discuss and study the computer algorithm and display method according to the network diagram. This paper discusses how to get more relevant information about circuit network and communication network topology, how to understand the information of branch current or voltage, how to judge the connectivity and shortest path of the graph, and how to display the network graph on the computer in the analysis.

## 2. Basic Concept and Structure of Network Diagram

Network planning is the abbreviation of graphical model. A network diagram gets its name because its shape is similar to a network. There are three components of the network diagram, one is the job, also known as the arrow line [2,3]; one is an event, also known as a phase; another is the route. In the process of application, a graph is a complex containing vertices and lines. Circuits, communication networks, gas networks, geographical networks, computer networks and so on, which are involved in life, can be displayed by network diagrams. Network diagrams can visualize these networks and display graphics through graph theory and theoretical analysis, and provide effective data analysis. Graph theory takes graph as its research object. Use dots to represent the relationship between each object. Graph theory is divided into directed graphs and undirected graphs, sparse graphs and dense graphs. This kind of graphical analysis can effectively integrate the information of each network and help us better understand the relevant information needed in each network [4]. The storage structure of the graph. In a network diagram application of a computer, the operation and storage of graphs are the key to the analysis of algorithms and data structures. The structure of graph can be divided into six types: incidence matrix, adjacency matrix, adjacency list, orthogonal list, adjacency multiple list and two-array method. Incidence matrix is one of the most commonly used systematic comprehensive evaluation methods. It can make complex system problems easier and more convenient through mathematical transformation, and can make the comparison between indicators through multi-objective analysis, so as to simplify the whole evaluation process. Adjacency matrix is the matrix of vertex pairs and adjacency relations. The symmetry of adjacency matrix is different in undirected graph and directed graph. The adjacency matrix of an undirected graph is absolutely symmetric, while it is not necessarily symmetric in a directed graph. Adjacency list is a storage structure that combines sequential allocation with chained allocation, and it contains information about arcs or changes. The cross linked list is a kind of linked list which is obtained by combining the adjacency list and the reverse adjacency list of the directed graph [5]. Its application can better store directed graphs. And achieve efficient storage results, in addition, the readability of the code has been greatly improved. Adjacency multilist is mainly applied to the storage of undirected graph. The two-array method is a very practical storage form, which can take into account the habits of each user, and the relevant information can be obtained by randomly inputting the edge of the network graph or a symbol of the edge [6]. Among the six storage structures of graphs, incidence matrix, adjacency matrix and two-array method belong to array structure, while adjacency list, cross-linked list and adjacency multi-list belong to linked list structure. Among these storage modes, if you want to shorten the execution time of the program as much as possible, you need to choose the most suitable

storage structure at work. It is also necessary to decide whether to add or delete the number of vertices and edges of the actual input network graph, so that more modifications can be made to the contents of the storage structure. Compared with these storage methods, the undirected network graph of critical multilist is more prominent.

### 3. Display and Algorithm of Network Diagram

Graphic display, because the C language is more powerful, but also because the C language programming occupies less memory, execution efficiency is relatively high, for users who require higher display speed, C language is the most appropriate method of drawing network diagrams. In our concept of a network diagram, the points and lines make up the entire network diagram, and the structure of these points and changes is very complex. If we want to draw the whole network diagram more clearly, we need to draw the vertices first, and then add each line to form the whole network diagram. In the process of drawing, we can establish a coordinate system, determine each point on the coordinate, and then use C language to edit. Assuming the coordinates are (X, y), by setting the horizontal to the x-axis, the vertical to the y-axis, and the bottom to the positive direction, we can specify the position of the point in the coordinate system. Note that both X and y here are represented as certificates and have a fixed range of values. We can express the relation as:

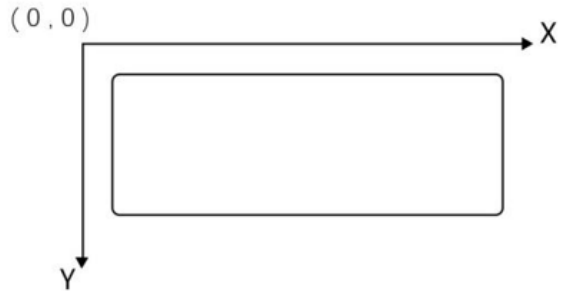


**Figure 1.** The whole network diagram.

X-axis direction: the data curve is x1-x2, and the screen point interval is X1-X2, so the X corresponding to the value is X = X2-X1/x2-X1 ·(X + x2 ·X1-x1 ·X2)/x2-x1; Where X1 ≤ X ≤ X2 and X1 ≤ X ≤ X2. In the Y-axis direction, the value interval is Y1 — Y2, and the screen point interval is Y1 — Y2, then the value y for y is: y = Y2-Y1/y2-y1 ·(y + Y2 ·y2-Y1 ·Y1)/y2-y1; Where Y1 ≤ y ≤ Y2 and Y1 ≤ y ≤ Y2. Wherein if the calculation result of X and Y has decimal places, the integer bit should be taken when the value is taken. After getting the result, we need to draw the sideline on the screen. Because each edge corresponds to two vertices, after finding the position of the vertex, it is necessary to connect the line segments between the two fixed points [7,8]. Aft that network diagram is drawn, if the position is far away from the screen, then we need to manually adjust the entire network graph. The adjustment methods in the screen can be zoom-in or zoom-out, overall translation, rotation, etc., as long as the network graph can be in the appropriate position on the screen. 2. Algorithms for network and graphical display. In the process of drawing the graph, the display of the whole graph should be completed. It is necessary to draw the corresponding diagram on the screen according to the information entered by the user, and to draw the newly added edge line on the screen [9,10]. In order to distinguish them, we need to use lines of different colors to represent them. In addition to adding edges, we also need to add fixed points, so that the fixed points can be connected into a graph. In the process of drawing, it is inevitable to delete the fixed point and line. When deleting, it is also necessary to ensure that the deleted line is consistent with the vertex according to the information entered by the user [11]. It is not allowed to delete only the line without deleting the vertex. In the display of the figure, there are also historical records and time recording functions. These also need to be displayed one by one according to the user's operation. In the history display, many users delete a number of vertices or lines at one time, in order to facilitate the comparison before and after, they need the help of historical records. Including drawing graphs, adding or deleting vertices and edges, diachronic query, recording time and other functions. All the items are integrated, which is the system structure composed of network graphics reality and query system. If we want to draw a network diagram on the computer screen, we need to let the user input some information of the network diagram first [12,13]. First, we need to input the commands needed by the network diagram, so that the computer can start to operate the input of the network diagram. Again, draw the number of vertices, the number of edges, the number, the left side, etc [14]. Then to start creating adjacency multitables, Input every relevant data in the table, so that the whole table can be improved. Finally, the subroutine should be mobilized to start the network diagram making. When an edge is added, the user inputs an adding instruction, the information such as the quantity, the starting point, the key point and the like is carried out one-to-one correspondence, and the newly added vertex is also marked. We can add a new edge node first, the corresponding position is P, at the two fixed points where the newly added edge is found, let be u and V, the position inserted in the adjacency multiple table, when inserting the edge linked list of two vertices, it can be expressed as:

$$\begin{aligned} &q->ilink = p; \\ &p->jlink = r->jlink; \\ &r->jlink = p; \end{aligned} \tag{1}$$

When adding points, it should be noted that each vertex should be connected to each other, and there should be no isolated vertices, otherwise there will be empty points in the network, which can not be effectively connected. When deleting an edge, the operation is also carried out according to the input of the user, and the symbol of the edge is input, and the corresponding point is deleted in the adjacency multiple table to avoid isolated points.

### 4. Graph Connectivity Algorithm

When we make a network graph, the problem we need to consider is whether the connectivity of the whole graph is feasible. If the network graph can not be connected, then there are several branches. If there are branches, how do we judge the relationship between connectivity and branches? When we look at the connectivity of the graph, we can express it through incidence matrix and adjacency matrix. In fact, connectivity can not be directly displayed by computer, it needs to be connected with connected components, and can not be solved only by the algorithm itself. There are many connectivity algorithms for graphs. The most commonly used are adjacency matrix column permutation method, adjacency matrix formula method, depth-first search method, breadth-first search method, top sorting method and adjacency point merging method. The column permutation method of adjacent matrix type involves many permutations, which leads to its low efficiency. The adjacency matrix formula method also needs to use a large number of formulas and operations, and its efficiency is delayed to a certain extent. Depth first search is the first method to be used, and its efficiency is higher than the first two methods. The application of breadth-first search is also earlier, which is a layer-by-layer scanning method. Relevant requirements of priority traversal can be realized; Top sorting is also a relatively complex algorithm, which is different from the sorting of ordinary linear tables. Topological sorting selects vertices without predecessors from a directed graph for output, and deletes vertices and connecting lines from the graph. We can think of this sort as a way of ordering the graph and its vertices along horizontal lines. Adjacent vertex merging method is to merge all adjacent vertices from the vertex, and proceed in accordance with this method. When we choose the appropriate vertex of the adjacent point, we can effectively improve the efficiency.

## 5. Shortest Route Problem

The shortest path has a very wide range of applications, the static shortest path can be divided into five forms, each shortest path capable of appearing other different paths. Limit the number of arc segments the shortest path, loop path, etc., The single source point shortest path (SSSP), as the basis, solves the problem for the shortest path of the single source point, and also gives a reference method to solve it. There are many different algorithms for the shortest path, Such as the Dixstra algorithm (Dijkstra), Is the algorithm for the shortest path from the vertex to the other vertex, Can solve the shortest path problem in the directed graph, It extends to the end point in layers of outward expansion; Ford-Fox algorithm (Ford-Fulkerson), It is to solve the network graph problem with negative edge length, Capable to reduce the vertex mark by checking each arc, Reverse was performed from each vertex, The shortest path from vertex to demand point; In both algorithms, The Dixstra algorithm is more efficient, But this algorithm has a problem not able to find all the shortest paths. Only one shortest path can be found in the Dixstra algorithm, and all the shortest paths in the whole network map cannot be found completely at one time. In the later stage, in order to solve the shortest path problem, many scholars also proposed the double cleaning algorithm, Floyd and dantzing algorithms. Each algorithm is basically the same way, starting from the loop linked by the source point and connecting to the end point. In each different algorithm, we need to find the shortest path in the undirected graph with the same edge length, and find the best suitable algorithm in the different algorithms.

## 6. Sum Up

The application of network diagram has become more and more widely, in this paper, we can get the network diagram through the short circuit topology, and can do a brief description of its display and analysis methods, for the storage structure we still need to study, and the shortest path is described comprehensively. In the application of network diagram, we still have many shortcomings to be corrected. At the same time, the system function of the network diagram should be further strengthened and improved, so that data processing can be fast and convenient.

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