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MODIFIED EFFICIENT ROUTE IDENTIFICATION ALGORITHM IN NETWORKS

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ABSTRACT

The route identification in today's networks becoming more difficult. If route was not chosen properly, the performance of the network decreases. If enough measures are not taken, this will lead to severe problems in future generation networks. Many parameters are involved in increasing the efficiency of the network. The proposed algorithm identifies the shortest route faster than Dijkstra's algorithm. The New algorithm provides efficient route identification from source-to-destination and also provides the alternate path under link failures which leads to much better performance compared to existing method. Ultimately, the outcome of this paper increases the efficiency of the network.

KEYWORDS: Dijkstras Algorithm, Link Failure, Network Efficiency

INTRODUCTION

In the fields of networking and communications, there is a continual concern over poor bandwidth utilization. It is some times the case that host computers can employ applications or processes that are very bandwidth intensive, limit the amount of bandwidth that other hosts have at their disposal [1]. Nowadays the data to be sent through the network has different types. They are text, audio, video, animation, images, pictures, etc. Though the networking speed increases, the range of traffic rates which the network has to deal with widens. This mixture of different types of data makes the traffic pattern less predictable and its distribution more uneven. The host employing applications or processes having high bandwidth requirement limit the bandwidth available to other hosts. Shortest route is a route with minimal length from source to destination. Some of these routes have higher bandwidth than others, some have lower propagation delay, and others see less congestion. These factors are responsible for the end-to-end performance achievable along any given route [2]. The existing routing algorithms have served remarkably well in the network environment where traffic load is light and network conditions change slowly. They are able to respond to topological changes automatically and adjust routing decisions when traffic changes. In the presence of congestion, shortest routing algorithms[5] can reduce the traffic from the overloaded routes.

In a network environment where traffic approaches the capacity of routes and changes dynamically, shortest-path routing algorithms, particularly those that attempt to adapt to traffic changes, frequently exhibit instability, derive poor-quality routes and result in performance degradation [6,7]. Our algorithm helps the network to be stable, to find quality route and to upgrade the performance. The above characteristics are possible when the routes are selected in minimum number of computations. This paper is organized as follows. Section 2 highlights the motivations for the existing routing techniques. Section 3 contributes to the proposed algorithm. Section 4 analyzes Dijkstra's algorithm and the proposed algorithm. Section 5 gives the conclusion and future enhancements. Section 6 lists the references.

LITERATURE SURVEY

The network layer is concerned with getting packets from the source all the way to the destination. The packets may require to make many hops at the intermediate routers while reaching the destination. Routing is the process of forwarding of a packet in a network so that it reaches its intended destination. The main goals[4] of routing are:

- Correctness
- Simplicity
- Robustness
- Stability
- Fairness
- Optimality

Routing Algorithms

The routing algorithms[4] play a major role to route the packets from source to destination and the routing algorithms are classified into static & dynamic routing. Static routing is also called Non-Adaptive routing & dynamic routing is called Adaptive routing.

- **Non Adaptive Routing Algorithms:** These algorithms do not base their routing decisions on measurements and estimates of the current traffic and topology. Instead the route to be taken in going from one node to the other is computed in advance, off-line, and downloaded to the routers when the network is booted. This is also known as static routing.
- **Adaptive Routing Algorithm:** These algorithms change their routing decisions to reflect changes in the topology and in traffic as well. These get their routing information from adjacent routers or from all routers. The optimization parameters are the distance, number of hops and estimated transit time.

ANALYSIS

This section has two sub-sections. First section is used to compare the Dijkstra’s shortest route algorithm with the proposed algorithm. Second section is used to find the bandwidth effective route using proposed algorithm.

Dijkstra’s Algorithm vs. Proposed Algorithm [4,5]

This section discusses the pros and cons of Dijkstra’s algorithm with proposed algorithm and gives the best results. From Figure 1, source routes are identified. Then, various intermediate routes to the destination are identified. From these routes, next node to the destination is identified. Further route building process is done with minimum distance route. This process is done until it reaches the destination. By keeping track of each flow, nodes that could not provide requirements and nodes that are misbehaving can be identified and corrected. Assume the source node as ‘A’ and destination node as ‘D’. The following steps explain the proposed algorithm in detail with an example network (Figure 1).

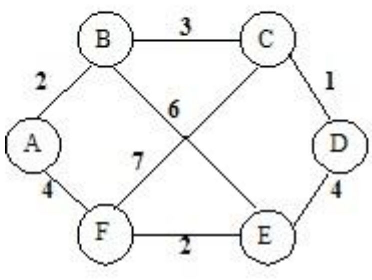


Figure 1: A Network with Distance

In Figure 1, the Intermediate Routes and their distances are,

$$A \rightarrow B = 2$$
$$B \rightarrow C = 3$$
$$C \rightarrow D = 1$$
$$B \rightarrow E = 6$$
$$A \rightarrow F = 4$$
$$F \rightarrow E = 2$$
$$E \rightarrow D = 4$$
$$F \rightarrow C = 7$$

Figure 1 is analyzed using Dijkstra's shortest route algorithm and then it is analyzed using the proposed algorithm. The various steps involved in the Dijkstra's shortest route algorithm are as follows. The asterisk (*) indicates that the shortest route computation is over.

Step 1

The source routes are,

$$A \rightarrow B = 2$$
$$A \rightarrow F = 4$$

Step 2

From step 1, select one route with minimum distance.

Hence,

$$A \rightarrow B = 2$$

Step 3

Move from node B to next node and compare.

$$A \rightarrow B \rightarrow C = 5$$
$$A \rightarrow B \rightarrow E = 8$$
$$A \rightarrow F = 4$$

Step 4

From step 3, select a route with minimum distance. Then,

$$A \rightarrow B \rightarrow C = 5$$

Step 5

Move from node C to next node and compare

$$A \rightarrow B \rightarrow C \rightarrow D = 6^{*}$$
$$A \rightarrow B \rightarrow E = 8$$
$$A \rightarrow F = 4$$

Step 6

Now consider the remaining routes, i.e. move from node E to next node. Then

A → B → C → D = 6*
A → B → E → D = 8*
A → F = 4

Step 7

Now, move from node F to next node

A → B → C → D = 6*
A → B → E → D = 8*
A → F → E = 6

Step 8

Then, move from node E to next node

A → B → C → D = 6*
A → B → E → D = 8*
A → F → E → D = 10*

Asterisk shows that the paths are reached to the destination node 'D'.

From step 8, the ultimate shortest route is,

A → B → C → D = 6

Drawbacks

1. It requires more number of steps.
2. The amount of time required is more.
3. It finds only one path (Best path).

Proposed Algorithm

The proposed method has less number of steps compared to previous method. It requires less amount of time and it finds other alternate paths along with the best path. The other alternate paths are used when the best path is failed.

This method is well suited for all the networks to calculate the minimum best path along with the other alternate paths.

The channel parameters can be used are distance, delay, number of hops etc. Here in this the parameter used is distance.

Step 1: Calculate the distance to the neighboring routers.

Step 2: Choose the best neighbor as the next node and from there calculate the next best neighbor.

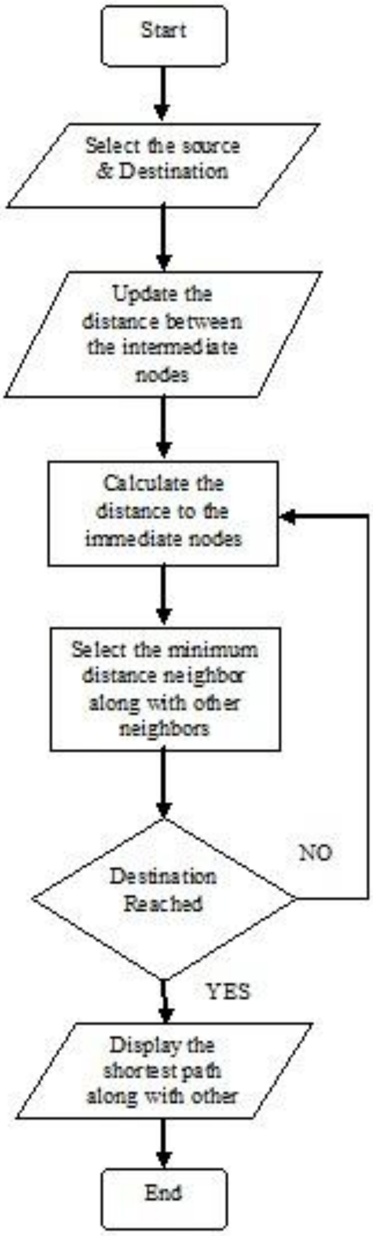
Here computing the path parallelly from the other neighbors that are ignored previously.

Step 3: Now choose the best neighbor as the next node and from there calculate the next best neighbor. Repeat this procedure until the destination node is reached.

Here more number of paths are calculated along with the best path. If the best path is failed then an alternate path is chosen from the available best paths.

The flow chat for the proposed method is shown figure 2.

Flow Chart for Proposed Method



The following steps are derived from the proposed algorithm.

Step 1

The source routes are,

$$A \rightarrow B = 2$$
$$A \rightarrow F = 4$$

Step 2

Select the best path & choose the next neighbor from the best path and also calculate the paths from the other neighboring paths.

$$A \rightarrow B \rightarrow C = 5$$
$$A \rightarrow B \rightarrow E = 10$$
$$A \rightarrow F \rightarrow C = 11$$
$$A \rightarrow F \rightarrow E = 6$$

Here the best paths according to their distance is given by,

$$A \rightarrow B \rightarrow C = 5$$
$$A \rightarrow F \rightarrow E = 6$$
$$A \rightarrow B \rightarrow E = 10$$
$$A \rightarrow F \rightarrow C = 11$$

Step 3

Now find the distance to the next node, here it is the destination node. The best paths are indicated according to their distance as shown below.

$$A \rightarrow B \rightarrow C \rightarrow D = 6$$
$$A \rightarrow F \rightarrow E \rightarrow D = 10$$
$$A \rightarrow B \rightarrow E \rightarrow D = 12$$
$$A \rightarrow F \rightarrow C \rightarrow D = 12$$

Here the best paths according to their distance is given by,

$$A \rightarrow B \rightarrow C \rightarrow D = 6$$
$$A \rightarrow F \rightarrow E \rightarrow D = 10$$
$$A \rightarrow B \rightarrow E \rightarrow D = 12$$
$$A \rightarrow F \rightarrow C \rightarrow D = 12$$

Here the first shortest path is,

$$A \rightarrow B \rightarrow C \rightarrow D = 6$$

If the first route is failed, then the next route chosen is,

$$A \rightarrow F \rightarrow E \rightarrow D = 10$$

If the second route is failed, then the next route chosen is,

$$A \rightarrow B \rightarrow E \rightarrow D = 12$$

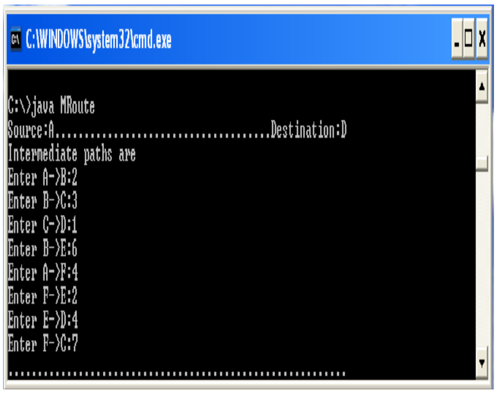
If the third route is failed, then the next route chosen is,

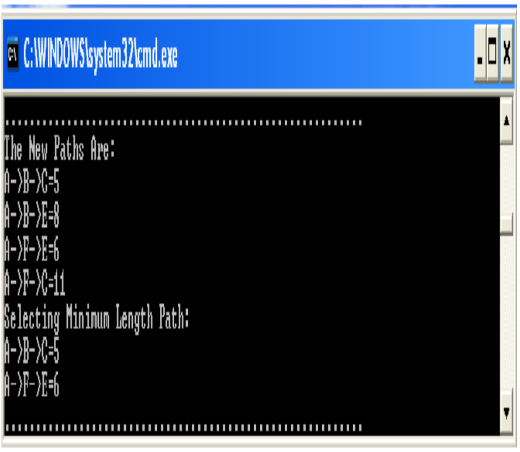
$$A \rightarrow F \rightarrow C \rightarrow D = 12$$

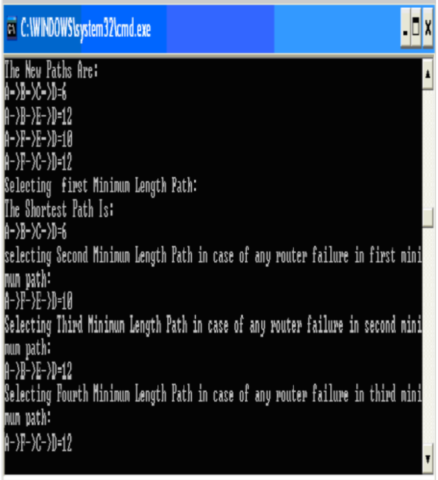
The proposed algorithm takes only 3-iterations to not only the best path, but also the alternate paths incase of a route is failed. The proposed algorithm is simulated using JAVA. The following figures show the simulation results of proposed algorithm.

SIMULATION RESULTS

The proposed algorithm was simulated using JAVA.







The simulation results are clearly shows that it requires less number of steps as well as more number of alternate paths.

CONCLUSIONS AND FUTURE ENHANCEMENT

This paper has proposed an algorithm and compared it with Dijkstra's shortest route algorithm. The result shows that our algorithm computes the routes very quickly. Almost it takes only half of the time compared to Dijkstra's algorithm.

It greatly reduces the time complexity in finding the shortest route. It also finds the other alternative routes in case of the actual route are failed. We are sure that, the outcome of this paper increases the efficiency of the network by identifying the path quickly.

Therefore, the efficiency of the network is increased. The result comes from simulating the algorithm. It has been simulated using Java. In future, it may be implemented to exploit the advantages. Also, it may be extended to be used in multicasting networks and in future generation networks.

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