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Application of Dijkstra's Algorithm in Wireless Communication System

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Abstract: ***This paper presents the implementation of Dijkstra's algorithm to find the shortest path in real time especially in wireless communication network. Wireless communication network consists a large number of sensor nodes (transmit and receiving proto- col nodes) scattered in an environment to collect the protocol regarding the environment. Every sensor node has a specific range to send the protocol to the destination so the protocol is sent by nodes through the use of routing algorithm (shortest path algorithm). The suitable algorithm should be accurate operation, stability, simplicity, equity and optimality which all characteristics are present in the Dijkstra's algorithm.***
The most important feature of these sensor networks is the presence of dynamic topo- logy and which leads the mobility of the nodes. This mobility needs a routing capable of adapting to these changes. This makes the weak protocol to travel and hence fading occurs. So using of Dikstra's algorithm will solve the problem of fading in wireless communication system
Keywords: Fading, Dikstra's algorithm, Protocol

I. INTRODUCTION

Today wireless communication systems ha- ve been affected by an continuously increa- sing customer expectations on wireless wid- eband internet services and are continuously evolving improvement on technologies. Wireless communication system must increase their ability to respond the quick challenges. So the new generation wireless systems (3G\4G) are being designed for this purpose. The efficient characteristics of (3G\4G) is that it provides a high data rate transmission speed at data rate up to 348kbps\2mbps for 3G and for 4G it is 100mbps\1gbps. So designing the system for such a high data transmission has become a research hotspot for wireless communication system where the multipath fading is an important factor. In recent years research is going in the industry and academic to decrease the fading in wireless commun- ication system.

A wireless sensor network consists a large number of sensor nodes which are scattered in an environment to collect the protocol concerning the environment. The main feature of such networks are they don't have a fixed structures and are used without any fixed stations or any wire connections to exchange protocol and so to manage the networks. Hence the nodes present in such type of network works in cooperation with each other, to have this cooperation and coordination there must be strong communication among which we send protocol [4]. Every sensor nodes has a specific sensory range and in order to send the protocol to its destination needs to locate nebourring nodes and communicates with them so that the package should be guided to its destination and protocol package are sent by nodes with the use of routing algorithms [3]. Hence in the routing process in sensor- type networks hardware imposes restriction on the network [5].

The suitable routing algorithm must have the following characteristics; accurate operation, stability, simplicity, equity, and optimality [2]. Since sensors contains limited processing capability and power, and hence the protocol obtained from the nodes is transmitted to other node which is strange in this characteristics. This node function as the central node (SINK) [7] and hence processes complete knowledge of the network to transmit this protocol , the nodes requires a lot of power and many solutions has been offered to provide for this.

Take an example of LEACH protocol, which deals the clustering problem in networks, has an ability to aggregate data for reduce the energy used by sensors, and it can facilitate the process of protocol from the sensor network and hence it is capable of forming the suitable structure for expandable routing for doing this the nodes present in cluster their protocol to the other node titled the cluster head, and this node aggregates the protocol and sends it to sink [6]. In this way the number of transmissions is reduced The PEGASIS protocol like LEACH protocol also decreases the number of transmission through aggregation of the data. But the difference in this protocol a chain of sensor nodes is formed in which every node can receive protocol and then send it to the neighbor is closer to it [1].

II. BACKGROUND'S AND PROBLEMS IN WIRELESS COMMUNICATION SYSTEM

Wireless communication have undergone rapid development in the last ten years with much remarkable improvement in its performance and now wireless communica- tion have become a part of our lives. However, when the first generation of wireless communication system began to emerge to provide voice service in early 1980's. Then it was considered as a luxury. The 1G called analog mobile phone service (AMPS), first introduce the concept of cellular service with frequency division multiple access (FDMA) technology. It exists and has low spectral efficiency and low power efficiency. Then in the early 1990's. The second generation (2G) was developed with digital technologies and 2G provides basic voice service and short messaging service (SMS) the majority of 2G deployed around the world and or global system for mobile communication system (GSM) Network and it is based on time division multiple access (TDMA) technologies and supports with data rate 9.6kbps since in 1990's 2G has evolved to meet the need of rapidly increased demand for data service. Currently, wireless system is dev- eloped continuously but several factors significantly affect the wireless market. One of them is that customer expectations have risen to demand high data rate multimedia applications for example video applications.

The second one factor is the rapid develop- ment of multimedia technology and internet. 3G is a new standard that rise to challenge these factor services in the 3G were broadened from regular telephone service to include high speed internet service and video communication.

Now industry migrants 3G into 4G wireless system designers facing two significant technical challenges they are namely band width limitations and effect of multipath fading .And this multipath fading is an inherit phenomenon in warless communica- tion which occurs the transmitted single experiences reflection and scattering. The characteristics multipath fading signals is the rapid fluctuation of the amplitude of the radio signal over a very short period of time or travel distance.

III. PROPOSED METHOD IN WIRELS CONICATION

In this paper we will perform routing in wireless communication network by the use of dijkstra's algorithm which will solve the major problems of fading in wireless communication system. In wireless commu- nication when we transmit a information package we need to reach it another node in shortest possible time in order to decrease the fading because fading will be major if the whole work of transmitted protocol should not reach its destination in real time .so to cover and identify the shortest path in wireless communication system plays a major role which came be better by using the dijkstra algorithm for searching shortest distance in shortest possible time

IV. DIJKSTRA'S ALGORITHM

We will show how we can employment the Dijktra's algorithm in wireless communication to find the shortest path in real time and reduce the fading which is major problem in wireless communication system Given a weighted graph where V is the set of vertices and E is the weighted edges, and the shortest path problem is to find a minimum a- weighted path between two nodes (identify the source node by S and the destination node by D) in the given graph below .the execution of the Dijkstra's algorithm on a weighted graph starts at the source node S results in a shortest path tree rooted as S. In other words we can say that Dijktra's algorithm will actually return the minimum weighted paths from the sources node to the other entire vertex in the weighted graphs. The algorithm is discussed in below.

Begin: Algorithm Dijkstra–shortest path

1) For vertex $v \varepsilon V$

2) Weight[V] $\leftarrow \infty$ || an estimate of the minimum weight path (shortest path) from S to V

3) End for

4) Weight [S] $\leftarrow 0$

5) S $\leftarrow \Phi$ || Set of nodes for which we know the minimum- weight path from S

6) Q$\leftarrow$V || Set of nodes for which we know estimate the minimum- weight path from S.

7) While $Q \neq \Phi$

8) U $\leftarrow$ Extret –Min (Q)

9) S $\leftarrow$ SU{u}

10) For each vertex V sucess that

(u,v) ε E.

11) If weight[v] > weight[u] + weight (u,v) then

12) Predecessor(v) ← u

13) End if

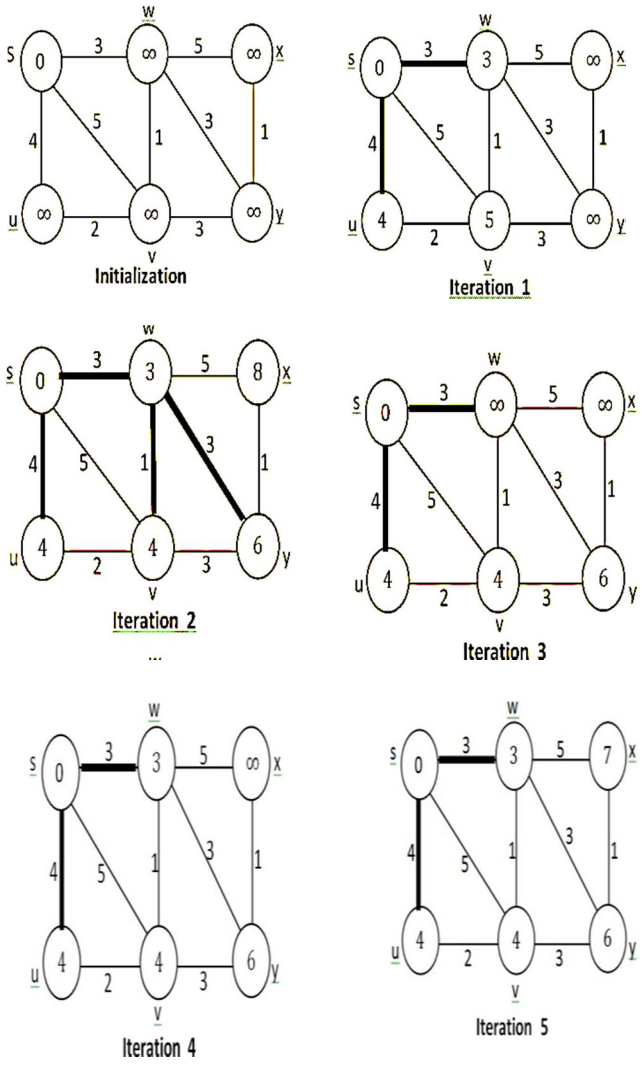
14) End for

15) End while

16) End Dijkstra's shortest path

Dijktra's algorithm proceeds in iterations and began with the weights of the minimum – weight path (shortest distance) from the source vertex to every other vertex is assumed to be + (as estimated valueindicates that path are not actually known) and from the source vertex it itself is assumed to be 0 during each iteration , we find the shortest path from the source vertex

(s) to a particular vertex u, which will be the vertex with the minimum weight among the vertex with the minimum weight among the vertex that have been not yet obtained . we then explore the neighbors of u and then determine whether we can reach any of the neighbor vertex say v from s through u on a path with weight be less than estimated weight of the current path we know from s to v, if we could find such a neighbor of v we then set the predecessor of v to be the vertex u on the shortest path from s to . This step is said to be relaxation step and is repeated over all iteration. The darkened edges shown in the working example in figures below. The run time complexity of the Dijksta's shortest path algorithm is



Example to illustrate the Working of Dijkstra's Algorithm

This is the quick identification of shortest path algorithm in the real time when so many paths are available. So if we use this algorithm in the wireless communication system we can make our communication so strong without any fading

V. CONCLUSION

The high- level contribution of this paper is the ideas of using Dijktra's algorithm in the wireless communication system so that we can decrease the fading the wireless communication system and transmit protocol in the shortest possible time and also covering the shortest distance to the destination because in the most cases we cannot find the best route if we consider only one of these two parameters because there is this possibility that the node which is at the shortest distance from the destination may not have sufficient power to transmit the protocol due to this reason the protocol is not received properly and we face the problem of fading. So if we use the Dijktra's algorithm in this wireless system

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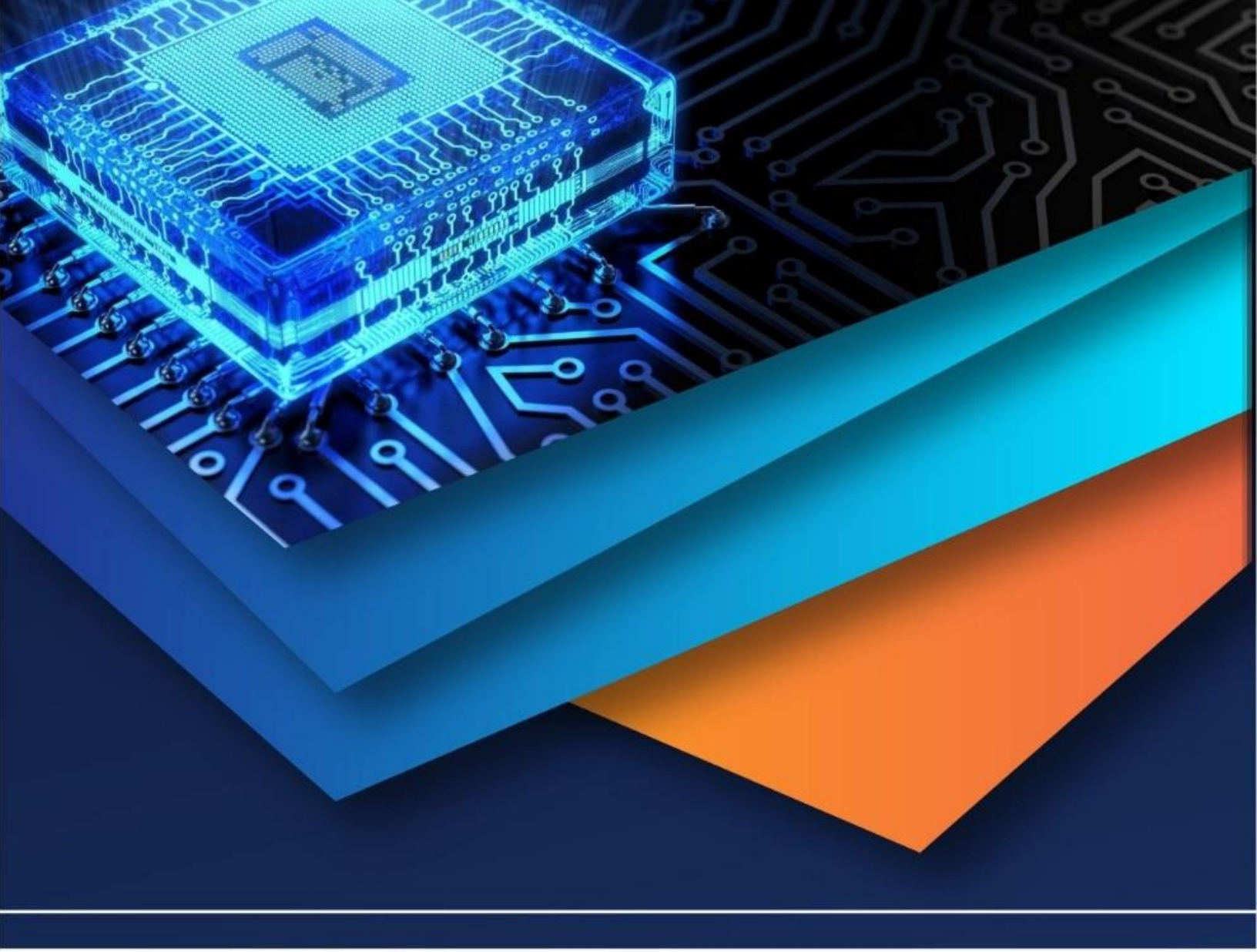

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