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Genetic Algorithm Based Multicast Routing Used In Mobile Ad Hoc Networks

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ABSTRACT

Many intelligent optimization techniques like Artificial Neural Networks (ANN), Genetic Algorithms (GAs), etc., were being proposed to find the static shortest path. Rapid advancements in the wireless communication particularly in the field of mobile networks has emerged as two major fields namely Mobile Ad hoc Networks (MANETs) and Wireless Sensor Networks (WSN). In order to find the shortest path (SP) with in this network becomes a dynamic optimization problem due to nodes mobility. Nodes usually die due to low energy or it may move, this scenario makes the network to be more complex for finding shortest path. In this paper we propose a novel method of using Genetic Algorithms (GAs) to solve the dynamic shortest path discovery and routing in MANETs. The experimental results indicate that this GA based algorithm can quick adopt to environmental change (i.e. the network topology change) and produce high quality solutions after each change.

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INTRODUCTION

Mobile ad hoc network (MANET) could be a self-organizing and self-configuring multihop wireless network that consists of a group of Mobile Hosts (MHs) that may move around freely and join forces in relaying packets on behalf of one another. Manet supports strong and efficient operations by incorporating the routing functionality into MHs. Routing protocols conjointly maintain property once links on these methods break as a result of effects like node movement, battery emptying, radio propagation, and wireless interference (Corson, 1999). In multichip networks, routing is one of the necessary problems that as a vital impact on the performance of networks. So far, there square measure in the main 2 kinds of routing protocols in MANETs, namely, topological and geographic routing. Here, I adapt and investigate many genetic algorithms(GAs) that square measure developed to traumatize general DOPs to unravel the DSPRP in MANETs. First, I design the parts of the quality GA (SGA) specifically for the DSPRP. Then, I integrate many immigrants, memory schemes and their combination into the GA to boost its capability for the SPs in dynamic environments. Once the topology is modified, new immigrants or the helpful information keep within the memory will facilitate guide the search of excellent solutions within the new setting (Cheng, 2009; Cobb, 1993).

Related work:

A near-optimal routing algorithmic program using a changed Hopfield neural network (HNN) is conferred. Since it uses each piece of knowledge, at the peripheral neurons, in addition to the extremely correlated data at the native vegetative cell, quicker convergence and higher route optimality is achieved more than with existing algorithms that use the HNN. Moreover, all the results are comparatively freelance of topology for all source-destination pairs (Ahn, 2001). This paper presents a replacement neural network to resolve the shortest path drawback for inter-network routing (Ahn, 2002). Experimental results show that associating in nursing improvement in successful convergence and improves computation performance. This could extend the power of the genetic algorithmic program to trace environmental changes for the pursuit of dynamic optima (Dasgupta, 1992). This paper introduces mm EA, associate in nursing organic process algorithmic program for multimodal optimization supporting multidimensional exploration of the search area. Experiments and comparisons with similar techniques

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from literature, for static and dynamic atmosphere, prove that mm EA technique is promising (Branke, 1999). The dynamic organic process algorithmic program ought to warrant an appropriate performance improvement to justify the extra procedure price (Wang, 2004). This paper proposes a replacement dynamic organic process algorithmic program that uses variable relocation to adapt already converged or presently evolving people to the new status.

Methodology:

Network model:

First sample network has to be designed with some added mobile nodes to the particular network region. Then, the connections will be established and path cost will be set for each connectivity.

Shortest path:

This module is used to find the shortest path from the source node to the destination node. Here shortest path is calculated for both Uncast (The packet is sent from a single source to a specified destination to find the shortest path) and Multicast routing (The packet is sent from a single source to a multiple destination to find shortest path).

Dynamic environment change:

This module is designed to make change in the network model. Here two techniques used to change network model. In MANET, nodes are not in fixed positions, so we have to maintain the diversity level. The immigrants method and memory scheme method is used to improve the performance of GA, by storing the old environment changes for the new generations.

Dynamic SP routing Problem:

In this section, our network model then formulate the DSPRP. A communication link (i, j) cannot be used for packet transmission unless each node i and node j have a radio interface with a typical channel (Toh, C.K., 2002). The target of the DSPRP is to quickly realize the new optimum delay-constrained least price acyclic path when every topology modify (Din, 2005; Lewis, 1998; Giordano, 2002).

Specialized GA for the SP Problem:

This section describes the frame work of the GA for the SP problem. The frame work of the GA involves several key components: genetic representation, population initialization, fitness function, selection scheme, crossover, and mutation (Ali, 1993).

Genetic Representation:

A routing path is encoded by a string of positive integers that represent the IDs of nodes. Each locus of the string represents an order of a node (indicated by the gene of the locus). The gene of the first locus is for the source node and the gene of the last locus is for the destination node. The length of a routing path should not exceed the maximum length (Leonard, 2003).

Population Initialization:

In the GA, each chromosome corresponds to a potential solution. The initial population Q is composed of a certain number of, say q chromosomes. To promote the genetic diversity, in our algorithm, the corresponding routing path is randomly generated for each chromosome in the initial population. We start to search a random path from s to r by randomly selecting a node v1 from N (V1), the neighbourhood of s. Then, we randomly select a node v2 from N (V1). This process is repeated until r is reached. Since the path should be loop-free, those nodes that are already included in the current path are excluded from being selected as the next node to be added into the path, thereby avoiding reentry of the same node into a path.

Fitness Function:

It is used to find the least cost path between the source and the destination. Primary criterion of solution quality is the path cost. From the set of candidate solutions to choose the least cost path .

Selection Scheme:

Selection plays an important role in improving the average quality of the population by passing the high-quality chromosomes to the next generation. The selection of chromosome is based on the fitness value.

Crossover and Mutation:

A GA relies on two basic genetic operators, crossover and mutation. Crossover processes the current solutions so as to find better ones. Mutation helps a GA keep away from local optima. Both crossover and mutation may produce new chromosomes that represent infeasible solutions. Therefore, we check if the path represented by a new chromosome is acyclic. If not, a repair function will be applied to eliminate the loops.

RESULTS AND DISCUSSIONS

This project implemented in Java Program

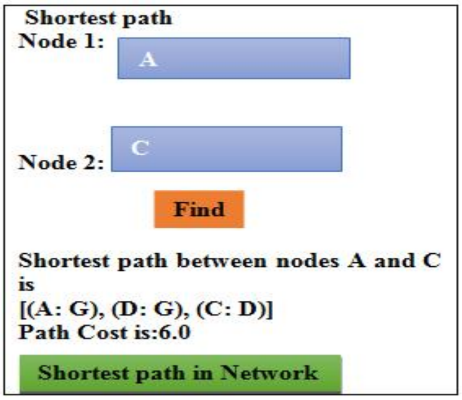

Fig. 1: Shortest Path.

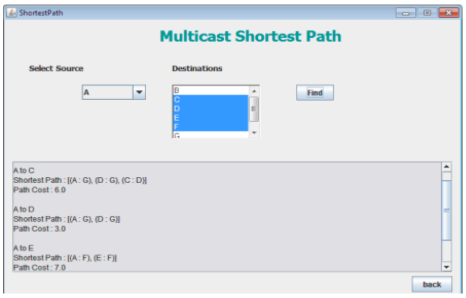

Fig. 2: Multicast Shortest Path.

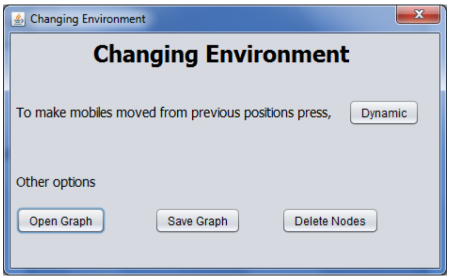

Fig. 3: Changing Environment.

Conclusion:

MANET is a self-organizing and self-configuring multi hop wireless network, which has a wide usage nowadays. This paper investigates the application of GAs for solving the DSPRP in MANETs. Immigrants and/or memory schemes that have been developed for GAs for general DOPs are adapted and integrated into - specialized GA to solve the DSPRP in MANETs. The experimental results indicate that both immigrants and memory schemes enhance the performance of GAs for the DSPRP in MANETs. Finally this work investigates both the effectiveness and efficiency of GAs with immigrants and memory schemes in solving the DSPRP in the real-world networks, i.e., MANETs. There are several relevant future works. One interesting work is to further investigate other approaches developed for GAs for general DOPs to solve the DSPRP in MANETs and other relevant networks.

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