Function of Agents Recommending as Node for a Large Network Communication Using Intelligence Algorithm

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Abstract: Emergence to network is responsible to bring number of opportunities but at the same time it's becoming difficult task to provide user's satisfaction in the form optimal solution for a large network. To provide optimal solution for a large connected network there have been various approached of intelligent algorithms like Diskastra's algorithm for shortest path, kruskal's algorithm(initiates with an edge) and Prim's algorithm(initializes with a node). This paper presents an approach to enhance shortest path algorithm in the form applying agent's theory of node in a linear cross over methodology between two nodes that is source and destination. The proposed approach is first observes the behaviour of network with the help of intelligence algorithms and use of optimal path to reduce the travel time of agents in the form of node. Use of various intelligence algorithms make easy to analyze the demand of user in move on In addition presented Swarm Intelligence Algorithm is conscientious to apply agents with a variety of parameters to optimize the time and cost.

IndexTerms **– Intelligence, Shortest Path, Optimization, Algorithm**

I. INTRODUCTION

It has always been a field of curiosity to analyze the nodes in network to find out shortest path between source and destination. Status of source and destination is always same whereas status of rout between source and destination differs. These different routes have specific purpose to solve user's problem. In initial days such kind of study was performed manually later invention of intelligence algorithm brought a rapid change in this field. Numbers of algorithms were invented to find out the shortest path in the form of calling optimal solution [1], [2].

II. ARTIFICIAL INTELLIGENCE

SI is the collective behavior of natural or artificial, decentralized, self-organized systems.AI is the intellect demonstrated by software and hardware programs. Artificial Intelligence is the part of computational study where the goal is to spawn intelligence, whether in matching human being-like intelligence or not. Most important AI research scholars and text books define this field as "the study and design of intelligent agents", where an intelligent agent is a arrangement that perceives its environment and takes actions that increase its chances of success. John McCarthy, who coined the term in 1955, defines it as "the science and engineering of making intelligent machines".

- AI is generally defined as the learning of making computers to perform things that require intelligence when carried out by humans.
- AI is the study of ideas that enable computers to take decision based upon past results which makes it an intelligent system.

III. SWARM INTELLIGENCE

Due to the rapid growth of user demand on network enabled environment the artificial intelligence is playing important role day by day. In this series the swarm intelligence is supposed to play crucial operate and can be measured as a division of Artificial Intelligence techniques [3]. Such methodologies or an approach of artificial intelligence has fascinated more concentration of researchers and digital users for the purpose of lucratively to answer a multiplicity of troubles. Group of the nodes cooperating with certain behavioral pattern to achieve defined goal can be understand as a meaning of swarm [5], [6]. From the computational point of vision the swarm intelligence models are considered part of computing algorithms. These practices are valuable for solving various problems for the purpose of distributed optimization. The basic principle of swarm intelligence centers on probabilistic-based searching algorithms. There are a various models of swarm intelligence that have been proposed and explored [7], [8]. The most commonly use of swarm intelligence models consist of followings:

- Probabilistic technique for solving computational problems(Ant colony optimization)
- Particle swarm optimization
- Bacterial foraging
- Honey bee swarming

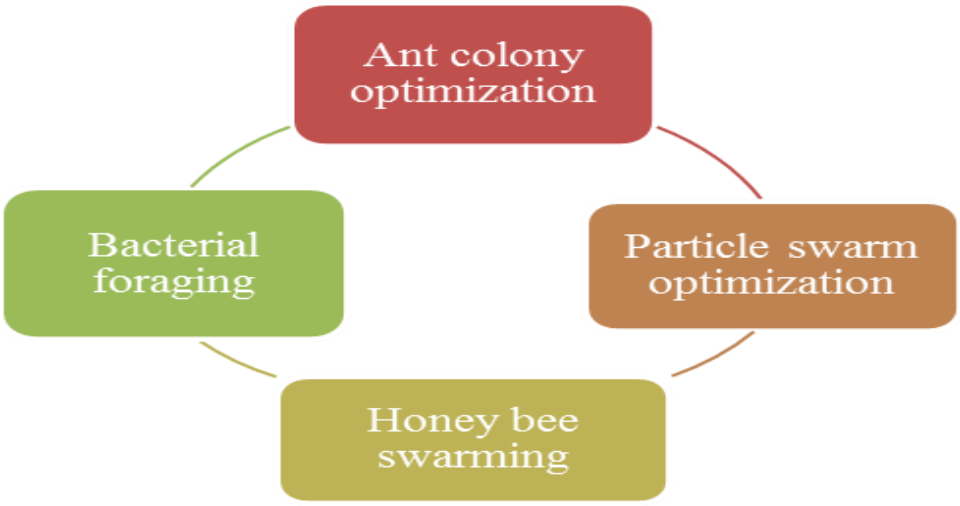

Fig. 1. Swarm Intelligence Model

Various kinds of behavioral models are observed in swarm approach where the swarm intelligence contracts with modeling of simple agents. These agents are responsible to interact locally among each other. Their environment of each agent leads to the appearance of a coherent functional pattern. These models are very much useful and stimulated by the social behavior of various insects like bees, flies, beetles and many more [9]. Each and every warm intelligence models has number of general properties where every entity made up of a simple agent to ensure effective communication among agents in swarm approach.

At the same time there is need of a way where agents can be made able to cooperate each in an effective distributed manner. This approach has a fix line to follow that the process is without a central control mechanism. Tis process without central locking is responsible to reduce the probability of failure of central computing agent. The above mentioned characteristics are accountable for high degree of robustness of swarm intelligence models in the growing rate of network and highly demand of involving ICT. Hence it is easy to say that the model of swarm intelligence is easy to adopt in practice as well as behavior of the swarm emerges out. To achieve defined goals [10], [11].

Swarm Intelligence systems obtain useful behaviors is described in figure given below:

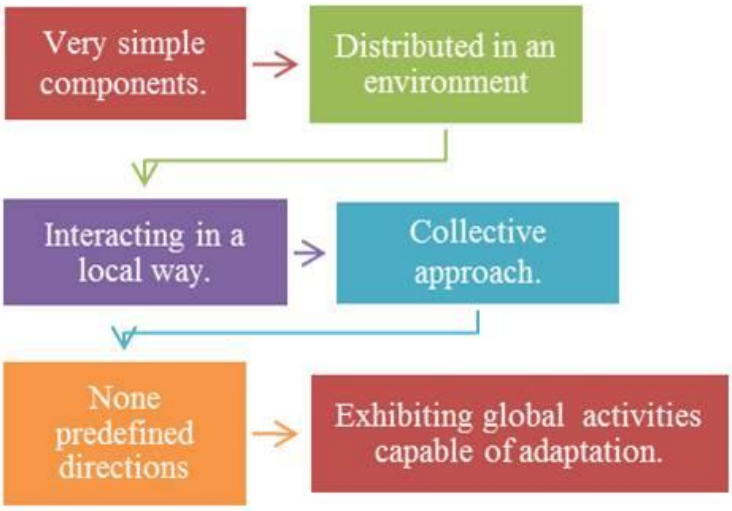

Fig. 2. Behavior of Swarm Intelligence Systems

Ant Colony Optimization

Ant colony optimization is generally used for the observation of social behaviour for the optimization of process and effective output in a networked system. It was proposed by Dorigo to measure and analyze the behavior and routing technique which is adopted by ants while moving to search the food [12]. In spite of not being human and sense in the form of intellectuality aunts are able to find the shortest path from their home known or termed as protectorate to their food sources and going back from food source to their destination [16], [17]. The process of algorithm is as follows:

- Start moving to search food
- Once aunt find food they start observing the environment around
- Return to their colony followed by chemical substance which is known as pheromone.
- Other ants will follow rout of chemical substance produced by first one.
- In this series of step more pheromone is deposited which is adopted followed by path.
- Other ants to detect and follow the path based on the higher amount of pheromone
- Pheromone will evaporate as time passes out which is responsible to reduce to attract the strength
- Pheromone will be evaporated quickly depending upon the time taken by ants to transverse from colony to the food source and back.
- Concentration of pheromone may increase in the condition that ants who are currently following the track is high then the.

- A shorter path will be armored quicker based on the situation when other ants follow the path
- Ants keep adding their pheromone for the purpose to make pheromone deposit stronger
- Apply the condition to continue above point that it evaporates and loses its power to attract others.
- Finally the output of shortest path between the ant colony and the food source will be emerged

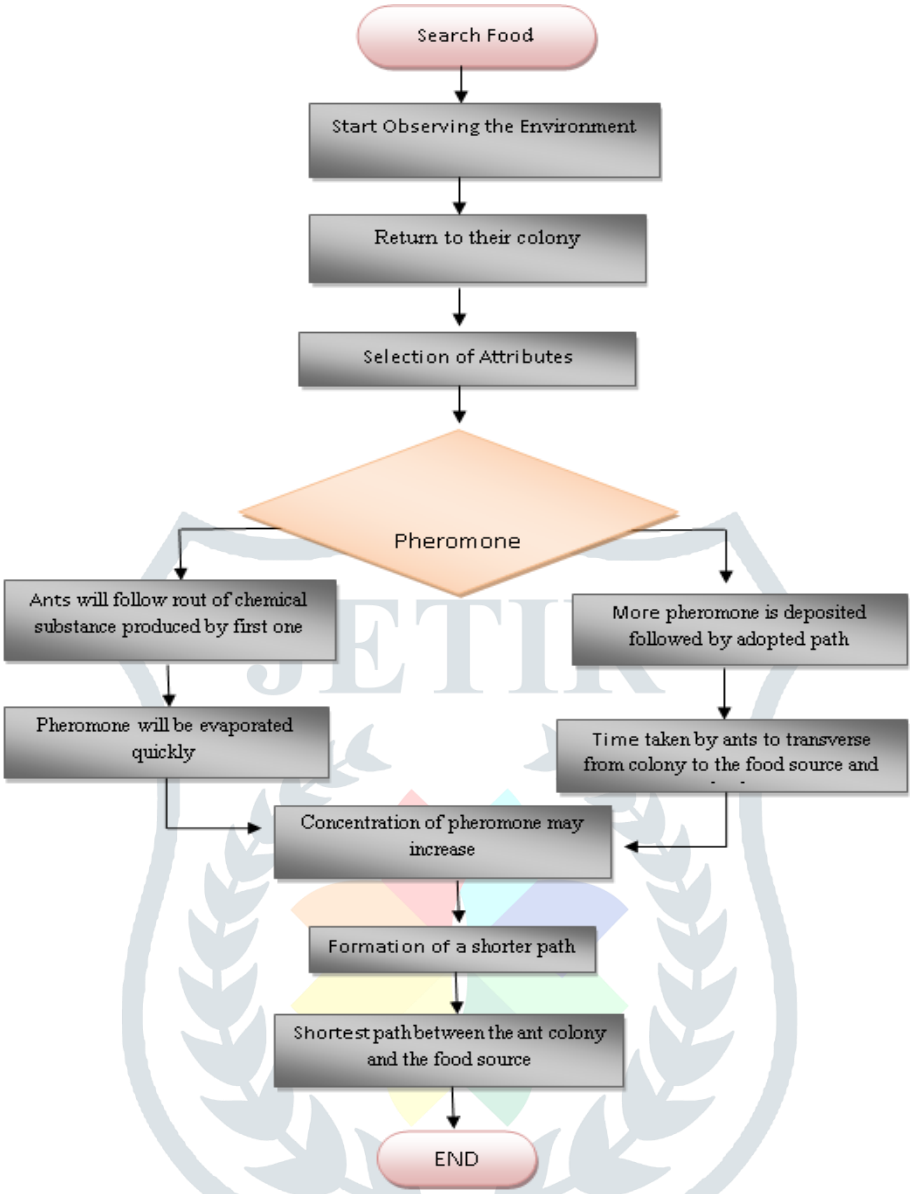

Fig. 3. Process of Finding Shortest Path

Based on the above point of statements it is easy to observe that pheromone is used for purpose of their communication and have wish to select the path which is marked by the pheromone depending upon concentration pheromone. Pheromone evaporation is considered a valuable mechanism to get output where the space is to be explored [18], [19].

IV. PARTICLE SWARM OPTIMIZATION

Motivated by the societal behavior of bird flocking and fish schooling, particle swarm optimization is a smoldering computation model that has its roots in natural life. An advance in Swarm Intelligence was first projected by Eberhart and Kennedy. Unlike the genetic algorithm, particle swarm optimization does not make use of filtering operators such as crossover and mutation in searching for a solution. Instead, it utilizes a inhabitants of particles that "fly" through a multi-dimensional search space with given velocities in some direction. Each particle encodes with a single intersection of all search possibilities. The connected position and velocity of each particle is being generated haphazardly. At each stage of generation, the velocity of the particle is stochastically adjusted according to the previous position for the particle itself and the close to best position. This is achieved by using some fitness evaluation function. The transaction of each particle evolves to an optimal or near-optimal solution. Particle swarm optimization model has numerous advantages. The search process is stout and efficient in maintaining assortment, and is capable to reach the global optimization solution with a high probability for the given problem. The algorithm is easy to understand with only a few variable parameters. It is fast converging, and can be conducted with parallel computation. Variants of particle swarm optimization have been proposed, e.g. canonical particle swarm and copious informed particle swarm [15].

Bee Colony Optimization

A behavioral model of self-organization for a colony of honey bees was proposed by Seeley [17]. It was enthused by the searching behaviors of bees. Searching bees are sent out from their colony to search for promise foodstuff sources for the other bees. Once they find a good food source, a searching bee returns to the bee hive and informs the hive mates via a joggle dance. The secret of bee waggle dances was decoded with the help of observing preceding related results [17]. In quintessence, the waggle dance is a communication tool to execute communication with other bees. The searching bee delivers three pieces of important information to other's through the waggle dance, i.e., the distance, the direction, and the quality of the food source. The searching bee uses this waggle dance as an hint to sway other bees to follow her and to go back to the food source. It is painstaking that the conscription of bees is a function of the quality of the food source. As a consequence, more bees are attracted to more promising food sources. Such a approach is deployed by the bee colony to obtain good quality food in a fast and efficient manner [20], [22]. The bee searching behaviors shows the characteristics of self-organization, addictiveness, and robustness. There are several advantages of bee colony optimization from the computational point, i.e., it avoids locally optimal solutions, it searches for all the best possible solution based on the solutions obtained by the entire bee colony, and it is adaptive to modifications in the environment [23], [24]. Variants of bee colony optimization have been projected, e.g. virtual bee algorithms and fuzzy bee system.

V. RELATED WORK

This paper has introduced the "constrain function" with weight value to solve the data structure storage problem.

The numbers of search nodes are reduced by flouting reversed nodes and the weighted value is flexible enough to change for adapting the various network complexities [10].

Particle swarm optimization technique is useful in the progression of evaluating the optimized distance between source and destination of defined status. Here there concept of linear crossover algorithm is applied to PSO. Where the function in defines as unique in nature. Due the unique nature of functions there is no possibility of collision of the generated route with the obstacles. Two set of standards are used to follow the concept which are as follows:

- Point repair penalty
- Route repair penalty.

Techniques of particle swarm optimization and differential evolution are compared for the purpose of evaluating the effectiveness of this methodology with linear crossover algorithm. Hence it is quite obvious to observe that linear gross over is responsible to generate best possible path [11].

Ant Colony Optimization Technique is also9 resented with ACO and has been used in various methodologies to find out the optimum distance for a given objects in the form of source S and destination D. Time to time updated versions have been proposed by researchers to overcome the found complexities in previous versions and these versions are known in the form of ACO1, ACO2 and ACO3.Since the growing rate of network the number of nodes are increasing in the same ration. To maintain the effectiveness of network the nodes are listed in the form of tabu list to find the optimum result I the applied algorithm [12].

ACO and PSO definitely provide the improved result but at the same time there is need to implement concept of link travel time. At the same time to find out an alternate route which is responsible to decrease the time to traverse into account link existing in virtual and real work [13].

An improved ant colony optimization algorithm works with two main features the first one is based on agent set strategy is adapted to rapid junction speed and second one is based on a dynamic update to the rules for heuristic parameter, based on entropy to enhance the feat in solving TSP [14].

Routing (find out the best path) in real dynamic network is a difficult one, for the reason that the architecture of the network varies a lot in real world. This problem is talked here using ant algorithm to explore the network using intelligent packets. The routes generated by ants are given as input to genetic algorithm. The genetic algorithm finds the set of optimal paths. The importance of using ant algorithm is to minimize the size of routing table [15].

PROBLEM IDENTIFICATION

Today in various organization uses of several algorithms to improve the performance and find the optimum in each and every field and also increase the results, the single algorithm is capable to produce the better results. In today's scenario everything in computing dimension is much enhanced and growing. So it's also reflecting on the algorithms as well. The planned approach uses the particle swarm algorithm to produce optimal result in shortest path of a graph.

VI. PROPOSED WORK

Here a particle swarm optimization has been proposed that may be decrease the cost and time to search the optimum route, with various parameter of PSO i.e. weight bandwidth, The contribution of this study is an improvement in decreasing the time and computation cost. The proposed technique uses to calculate the optimal route in graph through successfully implementation of particle swarm optimization. It can be stated that the optimal solution for shortest path in terms of nodes and computation cost in a graph fitness value, routes, network traffic and number of hop count.

First the shortest path application is adopted either in the form of artificial intelligence approach or with the help of pre-existing algorithm. The condition of network configuration is checked before applying above mentioned two approaches. Result found from artificial intelligence approach and results found from pre-existing algorithms are compared to find out the gap of result between source and destination. Finally the hybrid methodology is applied to get the optimal solution.

The main focus is on comparing the pre-defined algorithms results which were used to evaluate the shortest path in graph and the current swarm intelligence algorithms results, on ground of its implementation and network architecture. After that research gap

has carried out, the enhancement of the swarm algorithm through hybrid particle swarm optimization has been carried out. The major factor will be considered is time consumed in delivery of data packets.

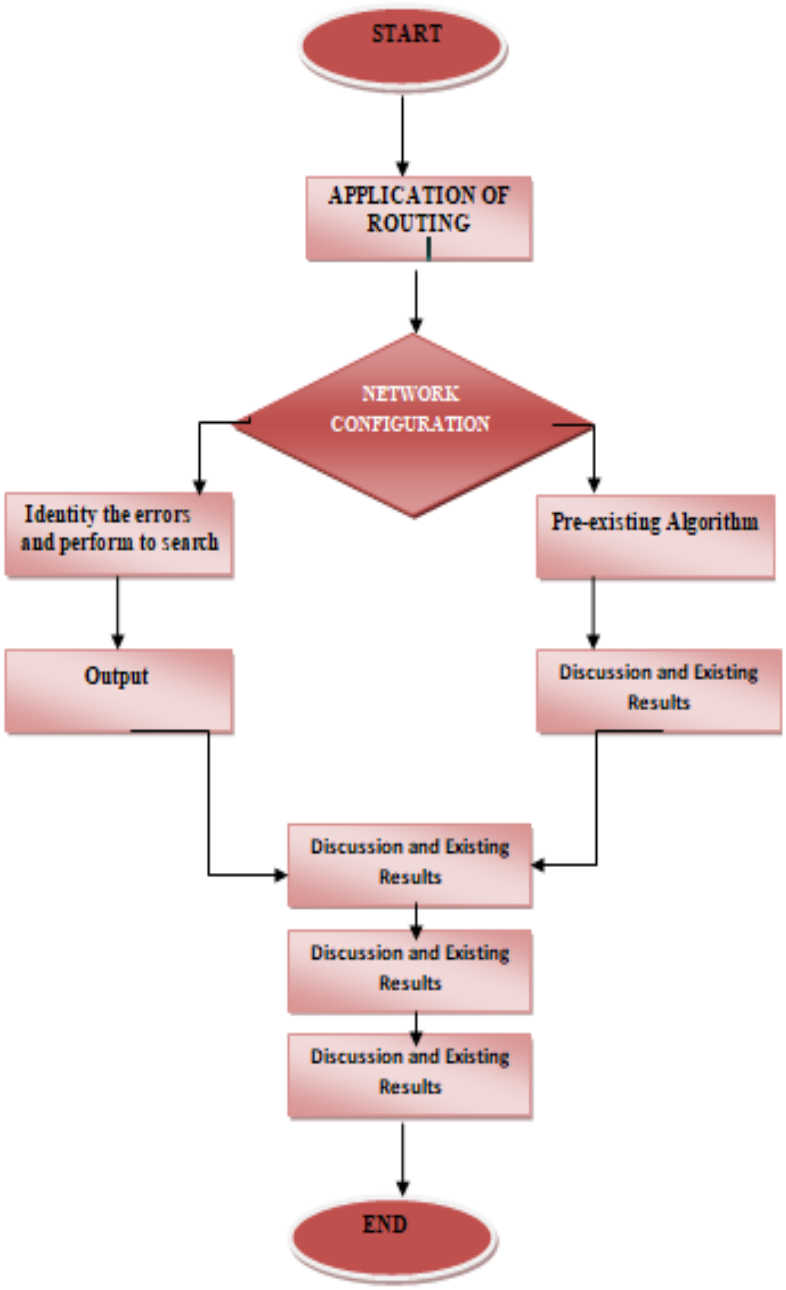

Fig. 4. Work flow for extraction of shortest path

VII. RESULT AND DISCUSSION

Due to this approach, it is assumed that the result is optimal. That the cost achieved is Best cost: 18660, Took: 348468 iterations, and 7.77 seconds and time is 399.0 seconds. With these results it is safe to say that PSO could be helpful to solve the current demands of today's internet.

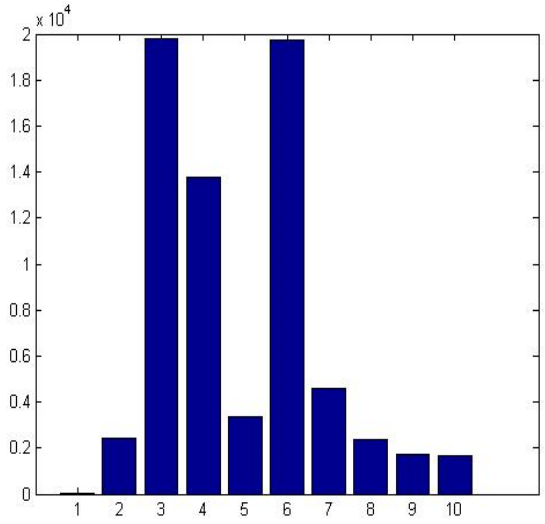

Fig. 5. Shortest path

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