



PSO Based Route Optimization Technique to Enhance Network Lifetime

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Abstract— *This paper proposed Swarm Intelligence based route optimization techniques to enhance life span of network based on several parameters such efficient energy utilization, power management, by saving energy and time. A enhanced approach of PSO and DSDV protocols used as a basic method for implementation. By deploying gateways shortest paths are find out to send the packets or initiate the communication process between nodes. An optimized route is located by saving the time and energy or managing delay, throughput using combinational approach of SI techniques.*

Keywords— *Wireless Sensor Network, PSO, DSDV, AODV*

I. INTRODUCTION

Wireless Sensor Networks have been perceived and re-searched in recent years. This type of system is composed of a massive number of sensor nodes which have numerous sorts of sensors. Using sensors of these nodes, nodes gather information regarding the environment of terminals such as, temperature, light, energy, humidity, power, and motion etc. Each terminal in a sensor network is outfitted with a radio transceiver, an energy source (usually battery) and a microcontroller. Each node is equipped with a multiple sensors, such as seismic, acoustic infrared, still/motion video camera, etc. The nodes ordered in clusters, identify events. and has adequate processing power to make a decision, and in turn transmit the decision to other nodes in the cluster. One node acts as cluster master and the communication takes place through radio waves by using communication protocol [1].

II. DESTINATION SEQUENCE DISTANCE VECTOR PROTOCOL DSDV

DSDV is routing technique that focus on determine the shortest paths [2]. This protocol is based on the bellman-ford algorithm to discover the enhanced way. Dijkstra's algorithm with the support of unconstructive weights is also related to DSDV protocol .DSDV fall in the proactive category of routing protocols; thus, each mobile node keep a table hold all the unfilled destination, the number of hops to reach each destination, and a succession number. The sequence number is assigned by the destination node. [3] A new sequence number is added to each routing table of formal RIP. By the help of sequence number mobile nodes can distinguish stale route information from new one and thus avoid the establishment of routing loops [2]. In order for the nodes to keep track of moving other nodes, a periodic message consisting of routing table is sent by each node to its neighbors. The same message can also be sent if significant change occurs at the level of the routing table. Thus, the update of the routing table is both time-driven and event-driven [2].

III. PARTICLE SWARM OPTIMIZATION

PSO is an algorithm modelled on swarm intelligence, that locate a explanation to an optimization crisis in a search space, or model and expect public activities in the existence of objectives. The PSO is a stochastic, population-based computer algorithm based on SI. The PSO technique was first depicted in 1995 by James Kennedy and Russell C. Eberhart. The particle swarm suggests this type of communal optimization. A problem is given, and some way to estimate a proposed clarification to it exists in the structure of a fitness function. A communication organization or social network is also defined; allocate neighbours for each individual to cooperate with. Then a population of persons defined as arbitrary guesses at the problem clarification is initialized. These individuals are aspirant solutions. They are also known as the particles, hence the name particle swarm. An iterative process to enhance these candidate solutions is set in motion. The particles calculate the fitness of the candidate solutions repeatedly and retain information about the location of best success. The individual's best solution is called particle best or the local best. Each particle formulated this information accessible to its neighbours.

Every Particle in the swarm is signified by the following characteristics:

- i. Current position of the particle
- ii. Current velocity of the particle

PSO is the latest evolutionary optimization techniques carry out searches uses a population of particles.[4].

IV. RELATED WORK

Ennaji and Boulmaf [2], concentrated research on routing in sensor networks, supported by a simulation of a sensor network. The simulation focuses on finding the best routing protocol, in terms of wait and dropped packets. The protocols studied are AODV and DSDV. The interpret results show that DSDV is best protocol for our simulation.

Misra and Thomasious [5], proposed a simple, least-time, energy-efficient routing protocol with one-level data aggregation that ensures enhanced life span of network.

Othman and Yahya [6], proposed an Energy Efficient and QoS aware multipath routing protocol (EQSR) to maximize the network life period through balanced energy consumption across multiple nodes, uses the concept of service differentiation.

Selvi and Umarani [4], focused onto the comparative analysis of successful approach of optimization technique optimistic by SI : ACO and PSO. A full analysis is created out to provide these procedures with fitness sharing, aims to examine whether this boosts performance could be enabled into evolutionary algorithms.

Saleem et al. [7], provided an far-reaching survey of routing protocols and thrash out the broad principles of swarm intelligence and of its application to routing.

Basioni et al. [8], studied the QoS of an energy-able cluster-placed protocol known as energy-Aware routing Protocol (EAP) particularly about lifetime, loss percentage, delay and throughput, and considered some changes on it to increase the performance.

Jindal et al.[1], proposed a WSN based radio technology for communication of nodes through a logical relationship.

Zungeru et al.[9], surveyed state-of-art routing protocols from classical routing to swarm intelligence situated protocols. Presented a comparison of classical and swarm situated protocols.

Abdulla et al. [10], proposed a hybrid approach that combines two routing strategies, flat multi-hop routing and hierarchical multi-hop routing.

Jagdale et al. [11], examined function of two routing protocols for MANET– DSDV and Ad hoc On- Demand Distance Vector routing (AODV)

Rabeb et al. [3], The field of WSN is undergoing a main revolution, opening the prospect of important impact in many application areas (safety, health, environment, food safety, manufacturing, tele-communications. Routing is elementary such a network because there is no infrastructure that manages the information exchanged among network nodes. Two main classes of routing algorithms are definite, the first is the class flat and the second is that of the hierarchical algorithms

KalaiMagal and Revathy [12], surveyed routing protocols for sensor networks and presented a classification for the various approaches pursued. The three main class detailed in this paper are data-centric, hierarchical and location-based.

Nagar et al. [13], introduced ACO and PSO with implementation of student selection process (SSP), accomplish to present jobs to students within educational institutes or in a common job fair, is shown using ACO and PSO.

Gaber et al. [14], presented a systematic performance study of three routing protocols AODV, DSR (Dynamic Source Routing) and Optimized Link State Routing (OLSR) protocols for WSNs. These routing protocols are implemented and replicated using OPNET Modeller simulator.

V. PROPOSED WORK

The main attention of previous work of WSN was on dropping energy utilization in improved PSO protocol with cluster energy optimization algorithm. But delay initiated and the packet dropped in communication use a lot of energy in the substitute key which diminish the life span of network in extensive sense. Hence network life period decrease at the cost of large packet fall and more delay with minor throughput. A little awareness has been given to the fact of providing superior performance metrics. There is a need to concentrate on such limitations while consuming less energy.

This dissertation performs following tasks to implement PSO on DSDV protocol with PSO having cluster energy optimized.

- i. Study of PSO and DSDV protocol.
- ii. Implementation of PSO on DSDV protocol.
- iii. Compare the results in NS2 using PSO on DSDV with DSDV.

In this paper we have proposed a protocol based on PSO with DSDV protocol to develop th duration of a network. At first, DSDV protocol locates the path for communication of nodes. The chosen route must be optimized, because dissimilar routes consume different type of energy as the nodes rises in the route of network, the more energy is required. Thus PSO protocol is used for optimization of paths. The optimized route uses less energy in comparison to inefficient routes.

A. Tools used for implementation

NS is an event driven network simulator program, invented at the University of California Berkley, which includes many network objects like as protocols, applications and traffic source behaviour. The NS is a part of software of the VINT project that is supported by DARPA since 1995.

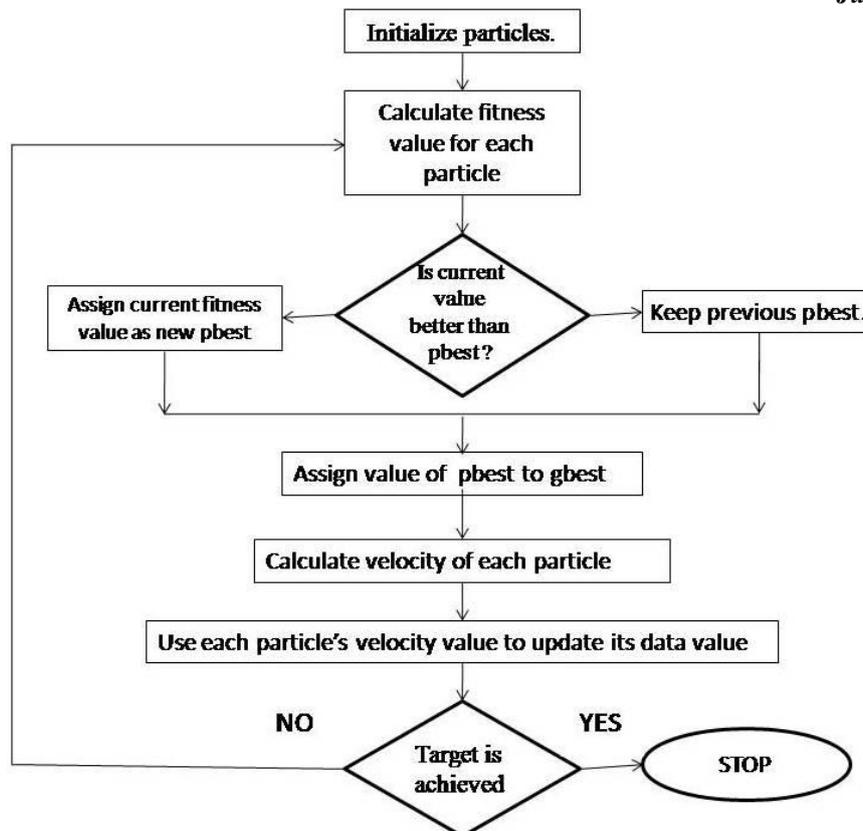


Fig. 1 Flow Diagram Illustrating the PSO Algorithm

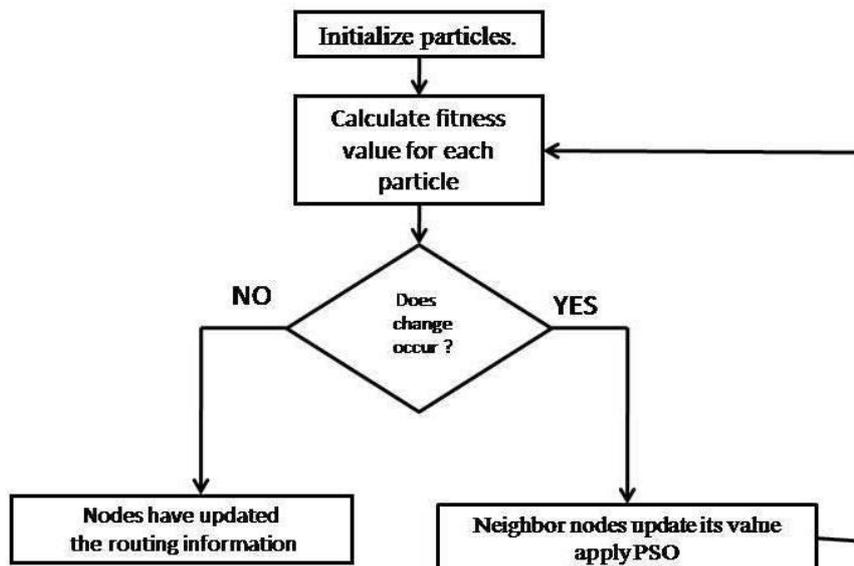


Fig.2 Flow chart Illustrating the DSDV Protocol

Simulation Environment

In this dissertation we are implementing PSO on DSDV protocol using network simulator (NS2.34). The simulation is performed on Ubuntu 10.04. A WSN of 50 nodes with a simulation time of 20 seconds is considered. The mobile nodes are placed on a 1200 X 1200 flat grid. Thus, 50 different nodes were involved in the communication. WSN models are defined with help of two model:

- a) System Model
- b) Radio Model

B. Simulation Result and Analysis

AVERAGE CONSUMED ENERGY: There is a comparison between the consumed energy of the simple DSDV and the modified DSDV-PSO approach. Fig depicts that at simulation time 20s the average consumed energy in simple DSDV is 14.0775 joules whereas the average consumed energy in modified DSDV-PSO is 14.0144 joules. Total consumed energy in DSDV is 703.874 joules and in DSDV-PSO is 700.721 joules.

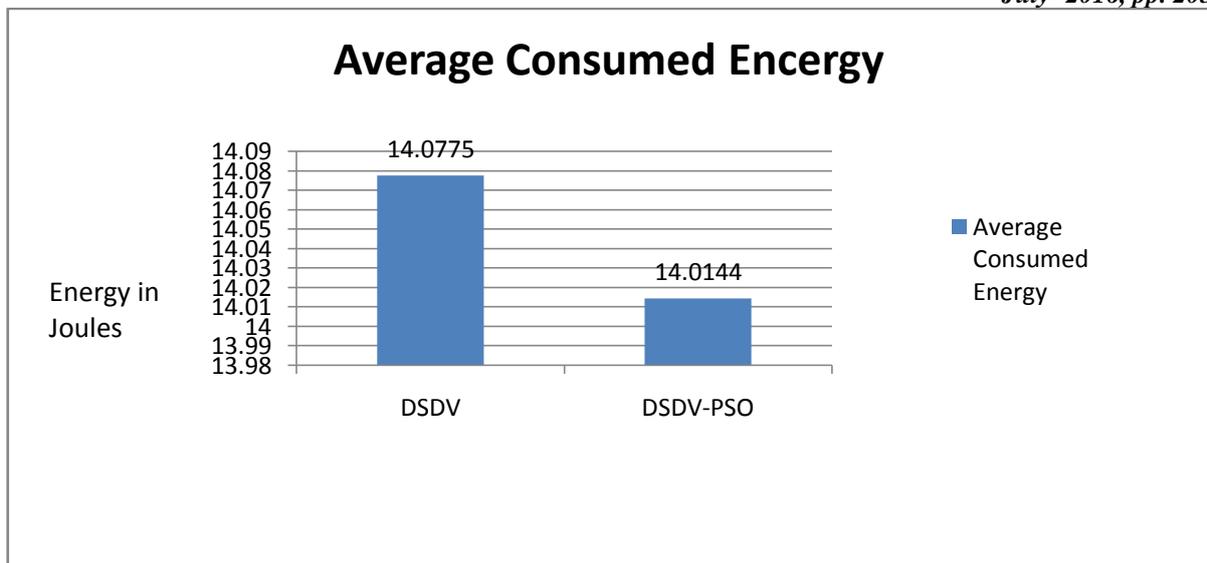


Fig 3. Average Consumed Energy of DSDV & DSDV-PSO

TOTAL CONSUMED ENERGY: This graph shows total consumed energy at DSDV routing or after applying PSO. A graphical representation of total consumed energy of simple DSDV and the modified DSDV-PSO.

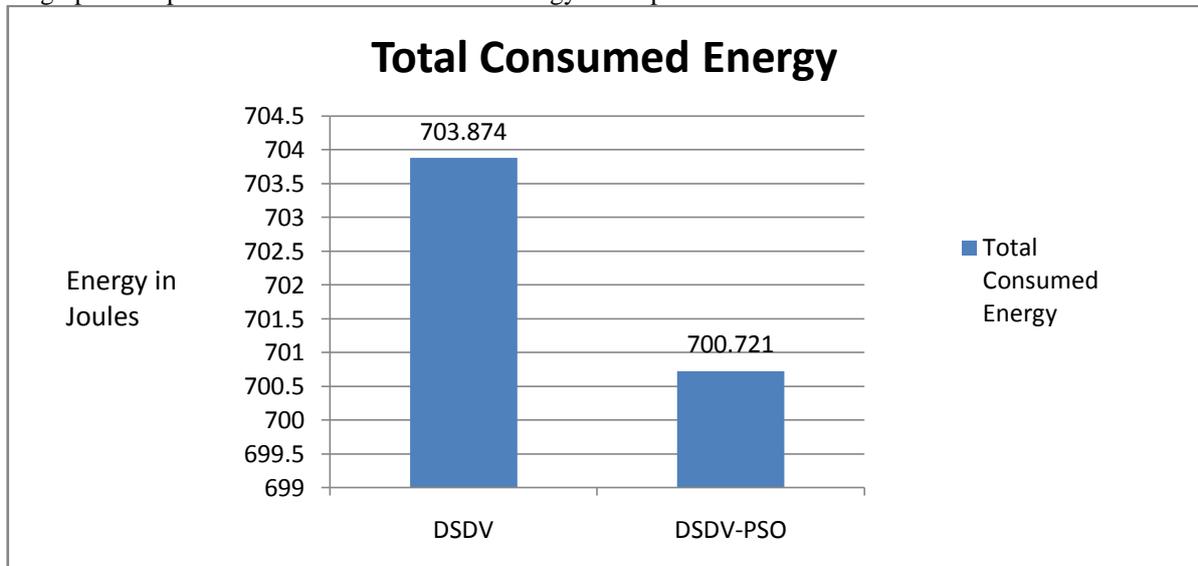


Fig.4 Total Consumed Energy of DSDV & DSDV-PSO

TOTAL PACKETS DROPPED: This graph shows of comparison of total packets dropped of simple DSDV and the modified DSDV-PSO. Packet drop in DSDV-PSO is 1 while in case of DSDV packet drop is 116.

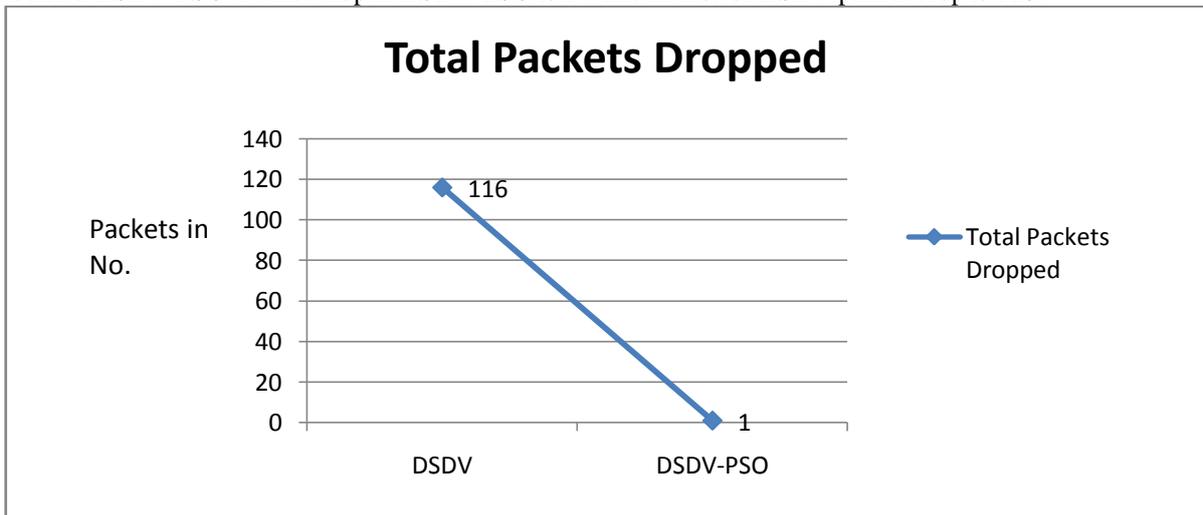


Fig.5 Packets dropped of DSDV & DSDV-PSO

AVERAGE DELAY: The graph depicts graphical view of comparison of average delay (in ms) of simple DSDV and the modified DSDV-PSO. Average delay in case of DSDV is 0.507 ms where as in case of DSDV-PSO average delay is 0.0063 ms.

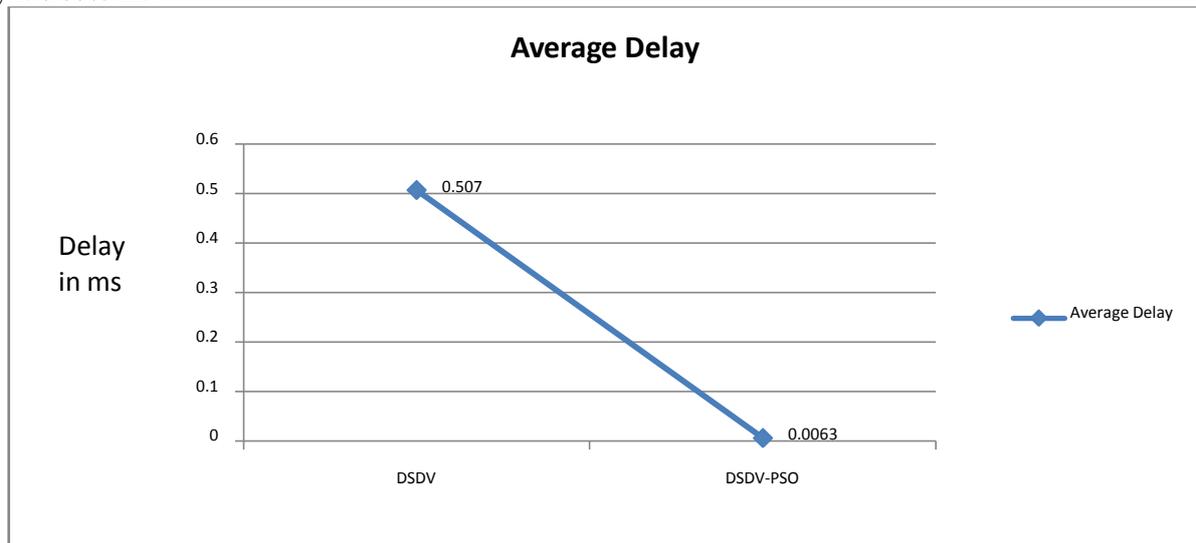


Fig.6 Average delay of DSDV & DSDV-PSO

AVERAGE THROUGHPUT: This graph depicts the graphical view of comparison of average throughput (in kbps) of simple DSDV and the modified DSDV-PSO. In case of DSDV throughput is 319491 kbps where as in case of DSDV-PSO throughput is 359970 kbps.

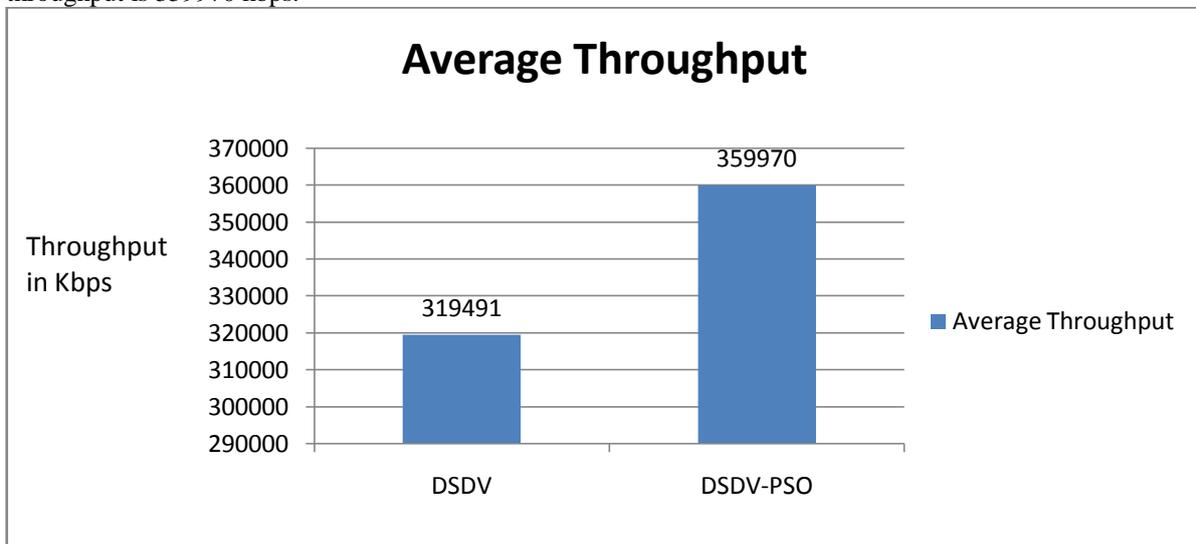


Fig.7 Average throughput of DSDV & DSDV-PSO

VI. CONCLUSION

In this paper, different routing protocol of WSN are studied : DSDV and PSO. A hybrid approach of ACO and PSO is applied to deploy the gateway easily which in turn saves time and energy and by applying fitness function onto particles to enhance network lifespan. DSDV protocol is used for implementation and it is enhanced by PSO optimization. A comparative analysis of DSDV and DSDV- PSO is taken on basis of different parameters such as packet delay, throughput, energy management.

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