CLUSTER BASED ROUTING IN WIRELESS SENSOR NETWORK THROUGH SMO

Ms. S. Surya [1], Dr. R. Ravi [2]

[1]Research Scholar, Anna University Recognized Research Centre, Department of Computer Science and Engineering, Francis Xavier Engineering College, Vannarpettai, Tirunelveli 627003, Tamilnadu, India.

[2]Professor, Anna University Recognized Research Centre, Department of Computer Science and Engineering,Francis Xavier Engineering College, Vannarpettai, Tirunelveli 627003, Tamilnadu, India.

Abstract:

Swarm intelligence aims at collecting information about self- organized systems. In employs decentralized mechanism to collect the information to reduce the faults. The behavior of the organisms like bees, honey, ants, fish, birds and so on are monitoring accordingly. In This paper, the spider monkey optimization (SMO) is used. It helps to solve the problem of energy constraint in wireless sensor network (WSN)in focused. In the routing protocol, cluster head is selected. The fitness value is determined for the local leader and global leader. The position update is made through self – Adaptive SMO. It helps to reduce the number of iterations for position update. The Golden search (GS) Algorithm verifies the efficiency in position update. The Simulation helps to achieve the efficiency of the above algorithms.

Keywords:*Golden Search, Self-Adaptive, spider monkey optimization, Swarm Intelligence, Wireless Sensor Network.*

I. INTRODUCTION

The Word “Swarm usually describes collective behavior of the living creatures like Bees, honey, ants, fish, birds and so on. Swarm attempts to describe the features of the nature through the creature’s behavior [1]. Through the monitoring of the creatures in detail is made essential to solve the optimization problems.

Swarmintelligence (SI) is employed to solve the real world optimization problem. Swarm intelligence obtains the near optimal solution for the optimization problem. In order to analyze the behavior of the creatures through swarm intelligence (SI) the below conditions are to be analyzed.

Self organization is a technique of swarm intelligence (SI) which helps to analyze the interaction at the global level [3]. The interaction at the local site is determined separately. Therefore, SI uses a parallel mechanism to define the interactions.

The other factor that SI uses is the division of labour. A group is formed such that the tasks are assigned to each individual. The completed tasks are managed by cooperative labours. [4, 6, 9].

The other algorithms that swarm intelligence is widely accepted are particle Swarm optimization [8], Artificial Bee colony optimization [10], Ant colony optimization [5] and Bacterial foraging optimization [7].

SMO is used in WSN to detect the faults among the sensor nodes. SMO helps in providing the routing process through WSN. SMO also helps in handling the large scale networks in which the resources are preserved [2].

II. RELATED WORK

The groups are formed through fission - fusion Swarm process. It forms temporary or subgroups that are small in size. The member of the subgroups constitutesa larger group which helps for case communication among the members of the group [11].

The fission – fusion process of spider monkeys [12] tells the characteristics through which long distance communication is made. Through this communication process, the spider monkeys are grouped [13]. The grouping of the spider monkeys is nearly 50 individuals [14]. The grouping explains foraging where search of food over a long distance. The travel is made throughout the day. The member of group constitutes a larger group range. The division of the group is made by the female spider money. The female spider monkey is the leader of the group leads the group to find food. Due to insufficient /no food the females spider money [15] divides the group into smaller groups. The smaller groups are temporary. The groups may shine further if needed on an Average 3 members are in a group [16].

III. PROPOSED METHODOLOGY

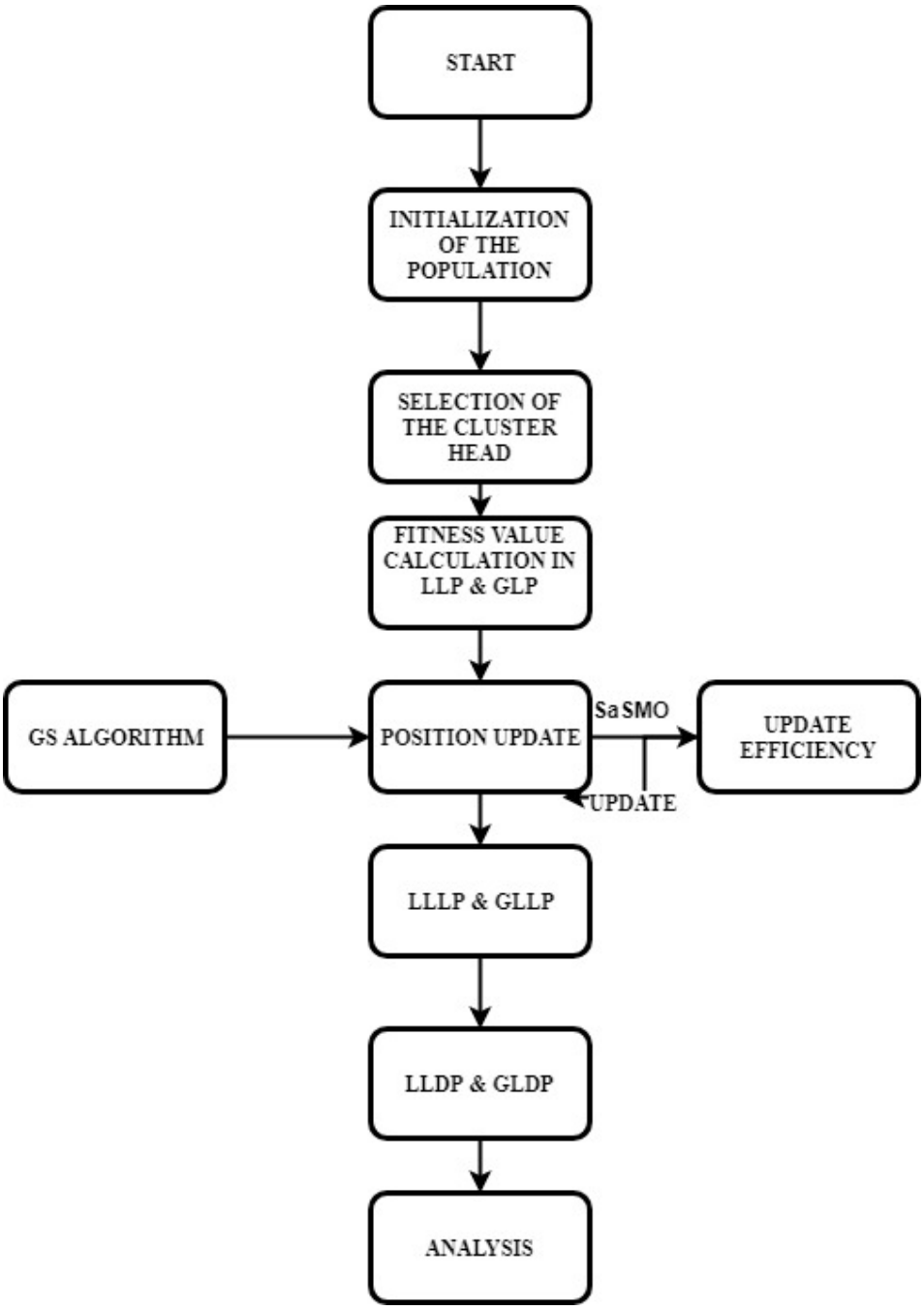

Fig 3.1: System Architecture

The fig 3.1 illustrates the system Architecture. The process starts with the population Initialization. In WSN, it is said as selecting the number of sensor nodes the population initialization is the selection of M spider monkeys.

3.1 SELECTION OF THE CH (CLUSTER – HEAD)

In SMO, a cluster based louting protocol is used to increase the network performance and to minimize the energy consumption. After the population initialization, the cluster head is selected to collect the data from the remaining nodes. The node with highest energy is selected as the CH. In SMO, the female spider monkey is always selected as CH.

The next CH is selected after the first CH is dead. The next CH is the next female spider monkey with highest energy. The dynamic process is adopted due to the location of the CH. For better performance the new CH is selected among the neighboring nodes.

3.2 LOCAL LEADER PHASE AND GLOBAL LEADER PHASE (LLP & GLP)

After the selection of the CH, the population is divided into local and global group. The leader is selected among the local and global group. The members of the local group constitute the global group. The selection of new location is determined through the greedy selection. The update to new location is based on the fitness value. The fitness value is selecting the best location from the number of possible locations. The fitness value calculation and updation in LLP and GLP are performed separately.

3.3 SELF - ADAPTIVE SMO (SaSMO)

The self adaptive SMO is widely used to reduce the complexity. It is mainly used for position update which linearly reduces the iteration process.The number of iteration is reduces from 100% to 50%. It is used to obtain the optimal solution with reduced complexity.It updates the position of the local leader and global leader.

3.4 POSITION UPDATE AND EFFICIENCY

To analyzethe efficiency of the position update the GS(Golden Search Algorithm) is used. The GS is used to find the variance of the minimum and maximum for the position update. After achieving the iteration process through SaSMO, the GS validates the best location. After the validation of the local leader and global leader, the position is updated.

3.5 LLL AND GLL PHASE

The Local leader learning (LLL) phase and Global leader learning (GLL) phase determines the highly fitted solution of the local leader and global leader.The updated position is compared with previous position. It there is no updation, the count of LLL and GLL is incremented by 1.

3.6 LLDP and GLDP

Local leader Decision phase (LLDP) and Global leader Decision phase (GLDP) cheeks if there is any new updation of the position. If there is no updation then the groups are divided into smaller groups and cheek for the next best position. After the division of groups, if there is no updation, finally they are combined into a single group.

IV. PERFORMANCE ANALYSIS

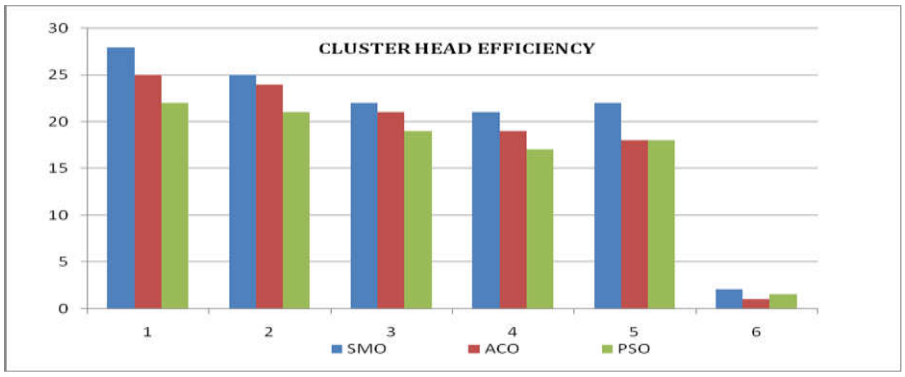

Fig4.1:Cluster Head Efficiency

The fig 4.1 shows the cluster head efficiency in SMO. It is seen that the selection of cluster head in SMO has much higher efficiency than the other systems.

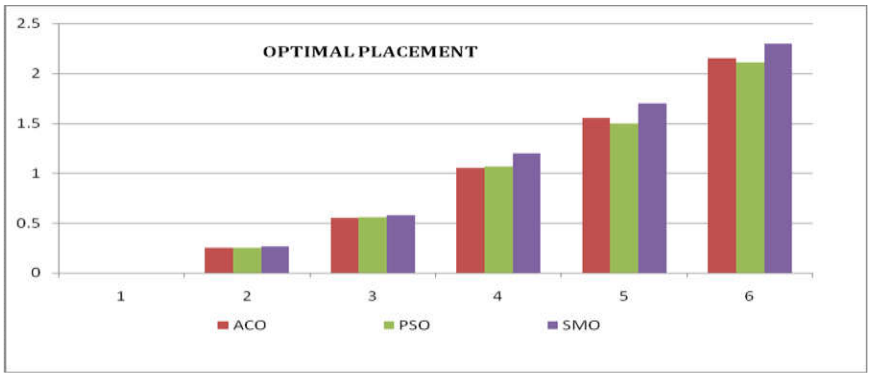

Fig 4.2: Optimal placement of the sensor node

The fig4.2 shows the optimal placement of the sensor nodes. It is noted that the highest efficiency is obtained in SMO than the other optimization techniques.

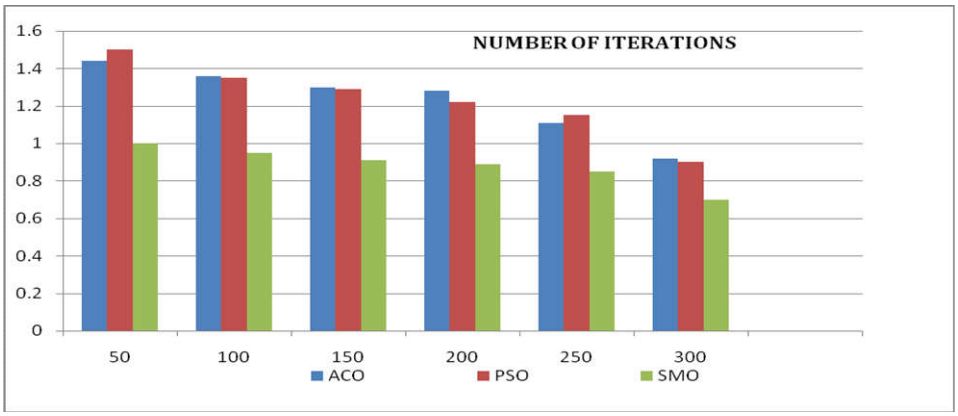

Fig4.3: Number of iterations in SMO

The fig4.3 shows the comparison graph of the optimization techniques. It is seen that the number of iterations in SMO is much lower than the other techniques.in SMO the iterations are reduced from 100% to 50%..

V. Conclusion

Swarm intelligence provides the optimization through SMO. The wireless sensor Network uses the routing protocol to solve the energy constraint and increases the network performance. The SaSMO provides the reduction in the number of iterations. The GS Algorithm analyses the efficiency of the position update. The simulation result shows the efficiency of these algorithms.

REFERENCES

[1]J. Bansal, H. Sharma, S. Jadon, M. Clerc, "Spider monkey optimization algorithm for numerical optimization", *Memetic Computing 6 (1), 31–47,* 2014.

[2]T. Gui, C. Ma, F. Wang, J. Li, D. E. Wilkins, "A novel cluster-based routing protocol wireless sensor networks using spider monkey optimization", *Proc. 42nd Annu. Conf. Ind. Electron. Soc. (IECON)*, pp. 5657-5662, Sep. 2016.

[3]K. Krishnanand, D. Ghose, "Glowworm swarm optimization for simultaneous capture of multiple local optima of multimodal functions", *Swarm Intelligence 3 (2), 87–124*, 2009.

[4]E. Bonabeau, M. Dorigo, and G. Theraulaz, "*Swarm Intelligence: From Natural to Artificial System*", OxfordUniversity Press, New York, 1999.

[5]Marco Dorigo , "*Ant colony optimization*", Scholarpedia, 2(3):146,2007.

[6]E. Bonabeau, M. Dorigo, and G. Theraulaz, "Inspiration for Optimization from Social Insect Behavio", *Nature,406:39-42,* 2000.

[7]K.M. Passino, "Bacterial foraging optimization", *International Journal of Swarm Intelligence Research (IJSIR),1(1):1–16,* 2010.

[8]K. Parsopoulos,M. Vrahatis, "Particle swarm optimization method in multiobjective problems" (http://doi.acm.org/10.1145/508791.508907), Proceedings of the ACM Symposium on Applied Computing (SAC), 2002, 603–607.

[9]Particle Swarm Optimization(http://www. iste. co. uk/?search text =clerc & ACTION =Search &cat =& ACTION=Search) by Maurice Clerc, ISTE, ISBN 1-905209-04-5, 2006.

[10]W. fengGao, S. yang Liu, "*A modified artificial bee colony algorithm*", Computers & Operations Research, 39(3), 687 – 697. doi: http://dx.doi. org/10.1016/j.cor. 2011.06. 007,2012.

[11]M.M.F. Symington "Fission-fusion social organization inateles and pan", *International Journal of Primatology, 11(1):47–61,* 1990.

[12]J. Sartore, "Spider monkey images", http://animals.national geographic.com /animals /mammals/spider-monkey, Retrieved on 21 December 2011.

[13]G.Ramos-Fernandez,"*Patterns of association, feeding competition and vocal communication in spider monkeys*", Atelesgeoffroyi. Dissertations, University of Pennsylvania.http://repository. upenn.edu/dissertations/AAI3003685. 1 Jan 2001.

[14]B. Simmen ,D.Sabatier, "Diets of some frenchguianan primates: food composition and food choices", *Int J Primatol 17(5):661–693*,1996.

[15]M.A. Norconk, W.G. Kinzey "Challenge of neotropicalfrugivory: travel patterns of spider monkeys and bearded sakis", *Am J Primatol 34(2):171–183*, 1994.

[16]T. Weise, R. Chiong, K. Tang, "Evolutionary Optimization: pitfalls and booby traps", *J ComputSciTechnol 27(5):907–936*, 2012.