

An Efficient Routing in Wireless Sensor Network using Traffic Control and Load Balancing Technique

A.Santha Devi¹, Dr. V. Vinoba²

¹Ph.D., Research Scholar, PG & Research Department of Mathematics, K.N.G.A.College, Thanjavur, Tamil Nadu, India.

²Assistant Professor, PG & Research Department of Mathematics, K.N.G.A.College, Thanjavur, Tamil Nadu, India

¹santha7771@gmail.com

Abstract—The very powerful nature of WSN applications requires self-sorted out, independent conduct to beat their key asset challenges. One of the conceivable purpose behind clog in WSN is a result of out of line circulation of information movement in the system. The impact of uncalled for movement use will bring about temperamental ways that can over-burden the nodes and rapidly drain the vitality of sensor node bringing about dividing the system with the making of hotspots. Load irregularity among problem area hubs causes arrange blockage and most punctual vitality consumption of nodes in WSN. This builds the likelihood of detaching or parceling the system and unexpected passing of whole system. The wastefulness in the WSN is more credited to stack irregularity or impartial activity. In this paper, traffic control and load balancing (TC-LB) plan for routing in WSN is proposed. The plan uses the disregarded data amid course revelation process and considers a composite directing metric to decide congested status of a hub and to uphold the movement stack adjusting. The proposed conspire is simulated utilizing ns-2 and the outcomes exhibit that the proposed component performs superior to the current ad-hoc ondemand distance vector (AODV-LB) calculation of different execution measurements, for example, packet transfer evaluation, throughput, routing overhead, end-to-end delay, load sharing and energy utilization.

Keyword-Load Balancing, Traffic control, routing overhead

A wireless sensor networks are imagined for modern, common, and military purposes to screen, identify, and track occasions as per application prerequisites. The profoundly unique nature of WSN applications requires self-composed, self-sufficient conduct to defeat their key asset challenges. One of the conceivable explanation behind blockage in WSN is a direct result of unreasonable dissemination of information movement in the system. The impact of out of line movement use will bring about insecure ways that can over-burden the nodes and rapidly drain the vitality of sensor nodes bringing about dividing the system with the formation of hotspots. The hotspot issue in a system can debilitate a nodes assets, for example, transmission capacity, preparing power, battery vitality and memory stockpiling. Moreover, on the off chance that one of the intensely stacked nodes is congested, it can prompt bundle misfortune and cushion flood, bringing about longer end-to-end delay, corruption in throughput, and loss of transport associations. The wastefulness in the remote systems is generally ascribed to stack awkwardness. Thusly, successfully dealing with the circulation of the systems administration workload will be of extraordinary worry in WSN. Load adjusting is considered as one of the system to relieve blockage in multi-bounce WSN. By expanding the workload over a sensor arrange, stack adjusting lessens hotspots in sensor nodes and builds the immediate correspondence between nodes in the sensor organize. The fundamental inspiration driving burden adjusting is to diminish the execution time of the heap and to ensure that all assets in the system are used ideally and productively. To deal with the issue of hotspots utilizing appropriate circulation of activity load and moderation of blockage.

I.INTRODUCTION

A wireless sensor network are regularly sent in brutal conditions while the sensor hubs is normally unrealistic to be provided with vitality boundless. So how to utilize the vitality effectively to expand WSN lifetime and make the vitality utilization more adjusted has turned into the essential objective of sensor organize plan. At show, the fundamental steering calculations for remote sensor systems are LEACH, HEED and TEEN. These investigations concentrate just on the age of group heads, yet let the bunch head speak with base station specifically. Be that as it may, in light of the fact that the sensor group head hub is a long way from the base station, so the bunch head exchange information to the sink hub will expend a lot of energy.

In this paper a novel advanced clog mindful vitality productive movement stack adjusting plan for WSN is proposed. TC-LB is an on-request directing convention that uses a composite metric by coordinating two parameters, to be specific expended vitality and parcels in the node support. These two parameters speaks to the node status. TC-LB suitably disseminate the activity of congested nodes amid directing.

II. LITERATURE REVIEW

Centrality-based power control for hot-spot mitigation in multi-hop wireless networks

In this research, power control as an approach to adjust transfer stack in remote sensor systems. We demonstrate that if the correspondence scope of hubs are appropriately expanded by expanding their capacity levels, better transfer stack adjusting can be accomplished notwithstanding while directing on the most brief ways. In all cases, picking just a little subset of hubs and expanding their capacity levels is adequate to accomplish stack adjusting that is altogether superior to anything disparate steering plans. The essential preferred standpoint of such power control based load adjusting is that it protects every one of the advantages of briefest way steering and still accomplishes a huge hand-off load adjusting. Since every one of the qualities of most brief way directing is held, such load adjusting can be connected to any sort of discretionary topologies (e.g. grouped) and movement designs (e.g. hub to entryway) where unique directing can't be connected. The proposed stack adjusting plan does not course the information on dissimilar courses to abstain from going through the hubs close to the inside. Rather, the information is directed on the briefest ways just and the hubs which are relied upon to transfer more parcels for others are skipped or bounced over. On account of uniform topologies, this outcomes into longer jumps being taken close to the middle which lessens the hand-off load weight of congested hubs without expanding the transfer heap of the hubs on the fringe. Power control based load adjusting exhibited here appoints higher power levels to hubs which are relied upon to hand-off more packets.

A novel Load Balanced and Lifetime Maximization Routing Protocol in Wireless Sensor Networks

In this paper, a new routing protocol named Load Balanced and Lifetime Maximization Routing (BLM) which can significantly enhance the execution of system in Robustness, Reliability and Lifetime. In BLM, instead of pick the closest sink to convey, sensor hubs will pick transfer hubs in view of its neighbors' Potential Function. Dissimilar to conventional directing strategies, which are typically constrained by neighborhood topological learning, our convention is versatile to the difference in arrange topology for the extra Global Informative Mechanism (GIM). By BLM, we can adjust vitality utilization and information activity over the whole system, and guarantee vigorous, dependable and in addition survival of the system. A proposed a heap adjusted steering (BLM) to drag out the lifetime of Wireless Sensor Networks. BLM depends on a disseminated directing calculation and a worldwide enlightening component. We presented the idea "potential esteem" in steering development. Every hub can achieve the errand allotted by framework utilizing nearby data. In the interim, sinks can change hubs' conduct by adjusting their own particular parameters, and adjust movement stack among the system adequately. On account of potential based steering plan and worldwide instructive system, BLM is strong to sink disappointment and versatile to lopsided activity stack. Moreover, BLM can draw

out the lifetime of the system essentially when occasions are created in the system in a topsy-turvy way.

Adaptive and Secure Load-Balancing Routing Protocol for Service-Oriented Wireless Sensor Networks

A novel procedure for information conveyance through multipaths. It is the principal period of our versatile load-adjusting multipath directing plan to improve the information privacy in the administration arranged WSNs, which is like secure convention for dependable information conveyance. The distinction is that we utilized the mystery sharing calculation to isolate the information bundles as per the proposed way empty proportion. A heap adjusting approach that figures the way empty proportion of multipaths is proposed for multipaths. The way empty proportion can be utilized to assess the heap over multipaths, which is gotten from assessing load adjusting, way stack, imperative ways, and significance of hubs over multipaths. A built up a versatile load-adjusting multipath steering convention (SM-AODV) for WSNs that utilizations stack adjusting, clog control, and secure conveyance plan to address the constraints in existing multipath directing plans. In SM-AODV, the bundles are conveyed crosswise over multipaths utilizing a protected and dependable plan, which decouples the hub's abilities for applications and offers advancement choices not accessible in current plans yet. SM-AODV accomplishes generous unwavering quality change in directing downstream rush hour gridlock by utilizing a mystery sharing plan at the source. SM-AODV embraces a versatile clog control conspire, which is viable even for the situation that hub or connection disappointment happens every now and again.

A Reverse AODV Routing Protocol in Ad Hoc Mobile Networks

The R-AODV to maintain a strategic distance from RREP misfortune and enhance the execution of directing in MANET. R-AODV utilizes totally same technique of RREQ of AODV to convey course answer message to source hub. We call the course answer messages invert ask for (R-RREQ). R-AODV convention can answer from goal to source if there is no less than one way to source hub. In this way, R-AODV keeps a substantial number of retransmissions of course ask for messages, and consequently reduces the clog in the system. Also, R-AODV will enhance the steering execution, for example, bundle conveyance proportion and end-to-end delay. Fruitful conveyance of RREP messages are imperative in on-request steering conventions for specially appointed systems. The loss of RREPs causes genuine impedance on the directing execution. This is on account of the cost of a RREP is high.

In the event that the RREP is lost, a lot of course revelation exertion will be squandered. Moreover, the source hub needs to start another round of course revelation to set up a course to the goal. We proposed turn around AODV, which endeavors invert RREQ. R-AODV course revelation prevails in less attempts than AODV. We led broad recreation concentrate to assess the execution of RAODV and contrasted it and that of AODV utilizing NS-2. The outcomes demonstrate that R-

AODV enhances the execution of AODV in many measurements, as the parcel conveyance proportion, end to end deferral, and vitality utilization.

III. EXISTING WORK

A large number of papers have investigated in WSNMS. These papers can be classified into two categories. WSNs with mobile sinks or stationary sinks. The mobility of sinks leads to frequent re-establishments of routes from sources to sinks, which cause extra energy consumption and high end-to-end delay. Thus, WSNs with multiple stationary sinks (WSNMSS) are adopted in many applications. In routing protocols designed for WSNMSS, a routing protocol described as NearestSink is usually adopted. In this protocol, sensor nodes choose the nearest sink as their destination of data packets. Admittedly, since it ensures packets reach sinks through the smallest number of hops, this scheme pursues the least energy consumption in the whole network. However, in some cases, the geographically asymmetric generation of event data packets leads to asymmetric energy consumption. Nodes near the sink with higher traffic will deplete their energy earlier and part of the network will lose function. In a recent paper, Suzuki et. al try to solve this problem by proposing a scheme called DispersiveCast. In this scheme, once the difference between the traffic of two sinks exceeds the predetermined threshold, the sinks will command the sensor nodes in hot area to send their packets to two sinks with probabilities. However, opposite to the distributed nature of wireless sensor networks, the centralized characteristic of this scheme limits its scalability in implementation. Furthermore, based on the fact that sending ratio is calculated just by the number of hops, this scheme could not be sufficiently effective in operation.

Most existing multipath directing conventions for the most part don't misuse the administration arranged engineering over WSNs. Connection disjoint-based multipath directing is a smart thought to regard every application as an administration undertaking that can be upheld through more adaptable convention plan and asset administration. The administration situated WSNs ought to abstain from sending directing messages to inconsequential hubs. Every hub ought to have the capacity to recognize benefit related hubs and forward to them the steering message. In WSNs, the connections between a source hub and a goal hub might be extremely insecure and go down whenever. Every hub over these connections ought to have the capacity to detect, process, and transmit data of the checked territory, in which the directing plan is a standout amongst the most basic outline issues in WSNs and an enormous number of steering plans have been proposed. The majority of these steering plans can be arranged into four classifications: multipath-based directing plan, question based steering plan, transaction based directing plan, and QoS-based steering plan. The multipath steering plan ought to have the capacity to adjust stack and give high total data transmission and adaptation to internal failure on multipaths. The sections of bundles are collected at the goal hub, which might be influenced because of the disappointment of transitional hubs, and along these lines, a vigorous multipath is important to give

solid and powerful transmission over multipaths. Multipath directing conventions, for example, specially appointed on request multipath separate vector (AOMDV), Temporally Ordered Routing Algorithm (TORA), on-request various course upkeep in AODV expansions (ORMAD), and obstruction limited multipath steering (I2MR) are the most widely recognized cases in impromptu systems.

The issue of lopsided transferring has been tended to basically by contriving directing techniques in which steering ways purposefully attempt to abstain from passing by means of focus. Bended ways in curveball directing, one-turn rectilinear ways in Manhattan steering and edge reflection ways of space directing are a few cases of such methodologies. It allude to such focus shirking steering procedures by and large as different directing. Any such different steering plan increments transferring heap of the hubs close to the fringe of the system while taking without end some handing-off weight from the hubs around the middle. This outcomes into better general load adjusting. This favorable position includes some significant downfalls of different penances. The greater part of the disparate directing plans rely upon geometrical properties of the system (for mapping the system over symmetric space like torus or circle) which constrains their relevance to uniform topologies as it were. Vitality proficiency is the primary goal in a directing convention as WSN have extraordinary limitations of vitality. To guarantee the vitality effectiveness of the proposed steering calculation hypothetical investigation is spoken to in this Section. The movement stack appropriation among the sensor hubs is considered and is related with normal vitality utilization of the hub to process the activity.

Proactive routing protocol expect hubs to trade directing data occasionally and figure courses constantly between any hubs in the system, paying little respect to utilizing the courses or not. This implies a considerable measure of system assets, for example, vitality and transmission capacity might be squandered, which isn't alluring in MANETs where the assets are obliged. Then again, on-request steering conventions don't trade directing data intermittently. Rather, they find a course just when it is required for the correspondence between two hubs. Because of dynamic difference in organize on impromptu systems, connects between hubs are not perpetual. In events, a hub cannot send parcels to the expected next bounce hub and therefore bundles might be lost. Loss of bundles may influence on course execution in various ways. Among these bundle misfortunes, loss of course answer brings considerably more issues, since source hub needs to re-start course revelation technique.

IV. METHODOLOGY

A wireless sensor network demonstrate where all the sensor node are arbitrarily sent and once they are conveyed they end up stationary. Following are the suspicions considered in the model:

- 1) The network is signified as a collection of large number of identical sensor nodes and nodes are randomly deployed.
- 2) WSN is represented as a directed graph $G = (V, E)$ of E edges and V vertices.
- 3) $\forall v \in V$ is characterized by a circular transmission range R and a carrier sensing range r .
- 4) $\forall v \in V$, $N_e(v)$ denotes its neighborhood, A duplex link exists between v and every $u \in N_e(v)$ and is represented by the directed edges (u, v) and $(v, u) \in E$.
- 5) Important WSN applications like continuous monitoring are considered.
- 6) The set of paths between source vertex s and destination vertex d is denoted as P .

The proposed TC-LB is outlined in view of the essential functionalities of existing technique. The calculation holds the substitute ways found amid course revelation. The calculation builds up interface disjoint ways from source to goal. The way determination depends on the route cost metric. In TC-LB, course ask for RREQ bundle is started by the source hub where as course way is set up by the goal hub. The transmission way is set up in the switch bearing. To find connect disjoint ways, every hub advances just a single course ask for RREQ bundle in course disclosure process. The RREQ parcel design is changed to incorporate a field first jump neighbor of the source through which course ask for is passed. Goal creates RREP parcel and gauges route cost for every one of its neighbors and advances the bundle to the neighbor with least cost and enters all the other way points of interest in the steering table. Transfer hubs in the wake of accepting the RREP parcel, add their activity to route cost and processes the subsequent route cost in the wake of choosing its neighbor and picks the base cost neighbor. The transfer hub advances the RREP on essential way and reserves different ways data in the directing table. This limits the steering overhead meanwhile keeping up the subtle elements of interchange ways. The RREP parcel organize is changed to incorporate two fields hub load and route cost. The hub stack metric shows current activity of a hub and is utilized to figure the way movement through the hubs from source to goal. The route cost metric speaks to cost of the way from goal to downstream neighbor of the present hub. A pathlist which stores every single accessible course for various goals. Courses are arranged in the request of goal. Various courses for a similar goal are arranged in the request of expanding route cost. The pathlist table is utilized to discover all the substitute ways and their particular expenses. This data is put away in the table with goal hub ordering and in an arranged request. This kind of capacity decreases way choice many-sided quality and guarantees that dependably a way with less movement is chosen first.

A send and reply function algorithm

If path does not exists for destination then
 insert_path(d, p_j)
 end if

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if RREP(seq_no) == rtable(seq no) then
  cost1 = RREP (route_cost) + T1 + Tne(i)
  cost1 = rtable (route_cost) + T1 + Tne(i)
  if (cost1 < Cost2) then
    disjoint = check_disjoint(RREP(pj), rtable(pj)
  if disjoint == true then
    insert_path(RREP(pj)) else
      delete_path(rtable(pj))
      insert_path(RREP(pj))
End if
End if
End if
if RREP(s) == index then
  pathfind()
end if

```

An Energy productivity is the primary target in a directing convention as WSN have extraordinary limitations of vitality. To guarantee the vitality proficiency of the proposed steering calculation hypothetical investigation is spoken to in this Section. The activity stack dissemination among the sensor nodes is considered and is related with normal vitality utilization of the hub to process the movement. To appraise stack on a hub, its separation from the sink, lingering vitality and parcels in it's cushion are considered. To infer movement stack appropriation the accompanying suppositions are made. Expected activity at a hub is ascertained in light of its separation from the sink. Sensor hubs are equally conveyed in a circle detecting region of range R and heap of a hub incorporates both beginning and sending parcels. The documentations utilized as a part of the numerical articulations are spoken to. The activity at a hub I at a separation r from the sink is ascertained. From Eq. (2), it is surmised that the activity at singular hub is specifically utilization by a hub in WSN is communicated in Eq. 4. The normal vitality utilization of hub v is given Eq. 5 [1]. Add up to vitality utilization of the considerable number of hubs along a way p_j is ascertained in Eq. 6. On the off chance that similar information transmitted on single way is appropriated among n ways at that point normal vitality utilization is given in Eq. 7. For each source s and destination d , there exists a set of paths $P = (p_1, p_2, p_3, \dots, p_n)$.

To send packets from s to d along a path p_j probability is assigned to choose that path p_j . In multi path routing, probability of choosing a path is required.

$$T_i = \frac{1 - D^2 * R}{2 * D * h} * A$$

$$\Psi_j = \frac{L(p_j)}{\sum_{j=1}^n L(p_j)} \quad (2)$$

$$\mu = \mu_r + \mu_t + \mu_{idle} \quad (3) \text{ and } (4)$$

$$\mu = \mu_r + \mu_t + \mu_{idle} \quad (5)$$

$$\mu_{avg} = \sum_{i=1}^V T_i * \Psi(p_j) * \mu \quad (6)$$

$$\mu_{avg} = \frac{\sum_{i=1}^V T_i * \Psi(p_j) * \mu}{|P|} \quad (7)$$

where $|P|$ = Total number of paths in P

$$\eta = \frac{\mu_c}{\mu_i} \quad (8)$$

$$\text{Max}(n) = \min(\max(u_{avg})) \quad (9)$$

From Eq. (6) and Eq. (7), we can infer that proposed conspire expends less vitality than single way. Vitality utilization is enhanced in the proposed conspire as steering metric considered is vitality mindful. η in Eq. 8 speaks to life time of a sensor hub. ≈ 1 speaks to vigorously stacked hubs or maximally used hubs in the system. To limit vitality utilization and to expand life span of the system, movement of these hubs is to be circulated and their use is to be limited. The proposed plot picks delicately stacked hubs in finding the way and uses in excess of one way to transmit the information. Subsequently, TC-LB is vitality mindful and vitality effective.

Traffic minimization

In the writing, multi-way steering is considered as an advancement issue with a target work that limits the blockage. On the off chance that the length of the every way is confined at that point, an achievable way stream on a course limits the clog. For any way $p_j \in P$ arbitrary stream on the way is figured as in Eq. 11. Attainable activity of the way p_j is figured as in Eq. 12. The cost capacity to decide clog on connect is communicated in Eq. 13

$$P_e = E_{Th} + Q_{Th} \quad (10)$$

Here, $\sigma \approx 1$ denotes to very used connection in the system. On the off chance that numerous such connections are in the system causes organize clog.

$$p_{j_{e_e}} = \sum_{e \in p, e \in E, i=1}^N \varrho_e \quad (11)$$

$$p_{j_{\rho_e}} = \sum_{e \in p, e \in E, i=1}^N \rho_e \quad (12)$$

$$\sigma = \frac{\varrho_e}{\rho_e} \quad (13)$$

In the proposed component way cost is utilized check the use of the connection. While building up the way in the turnaround bearing connections with least way cost are chosen. In this manner congested connections are maintained a strategic distance from for information transmission. This outcomes in clog minimization. A portion of the documentations utilized are p_e speaks to attainable activity on a connection. E_{Th} is the normal limit vitality of end hubs of a connection. Q_{Th} be normal limit line length of end hubs of a connection. e is arbitrary movement and σ is connect clog.

V. RESULT AND DISCUSSION

In this Section, the exhibitions of AODV-LB and TC-LB are assessed through broad reproductions. TC-LB and AODV-LB execution is assessed in view of the execution parameters parcel conveyance proportion, throughput, end-to-end postpone and appropriation of load at hubs. In Fig. 1, TC-LB exhibits the most elevated PDR than AODV-LB. Higher PDR of TC-LB is ascribed to keeping away from of congested hubs and avoiding parcel drops and timeouts. From Fig. 3, we can watch that TC-LB beats AODV-LB for throughput. This might be credited to productive directing ways accessibility in TC-LB. Single way steering calculations have less directing overhead than multipath calculations Fig. 4. demonstrates that AODV-LB has somewhat bring down directing overheads, when the quantity of hubs in the system is less when the system develops further, TC-LB has less overhead in view of the accessibility of multipaths and minimization of control parcels overhead in course revelation. A Normalized directing overhead is considered in the interim [0.0,1.0]. A surmise that at littler system size and low movement AODV-LB has bring down defer when contrasted with TC-LB. As the system measure increments and movement increments multi-way directing calculation performs better. Since, bundles encounter more deferral in single way steering since they are transmitting through most brief way hubs where as in multi-way directing back to back parcels may be transmitted by various arrangement of hubs. From the reproduction comes about exhibited in the writing it is affirmed that multi-way steering dependably brings about end-to-end postpone change in WSN. The visual translation reveals to us that TC-LB keeps up appropriate load circulation than AODV-LB. The sharp looks at a few hubs. TC-LB demonstrates less load dispersion than AODV-LB. The distinction in the heap demonstrates that TC-LB is performing movement stack adjusting betterly.

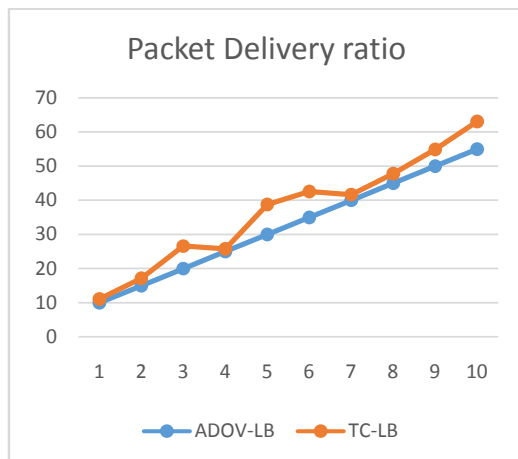


Figure:1. A packet delivery ratio of TC-LB and ADOV-LB with growing network size

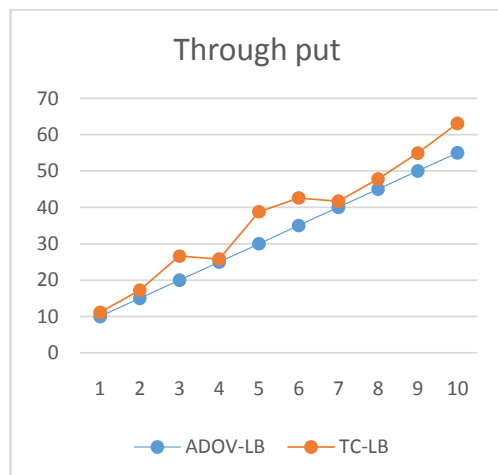


Figure: 2. A throughput of ADOV-LB and TC-LB with growing network size

VI. CONCLUSION

An improved blockage mindful vitality productive activity stack adjusting plan for steering in WSN is proposed. The proposed conspire saves every one of the advantages of briefest way steering and accomplishes a noteworthiness in stack adjusting. The course ways foundation in turn around way and hub with the base activity is chosen from invert bearing ensures that movement on close sink nodes are limited. This plan guarantees that substitute ways made are very little veered off from the most limited ways. Source dependably chooses different ways in the request of their expanding way cost. This guarantees proportionate transferring of information in the system and reducing blockage in the system. Reenactment comes about demonstrate that our plan is productive in limiting hotspot issues and system clog. In the proposed conspire source is choosing numerous ways for information transmission consequently, QoS can be accommodated different WSN

applications. All the substitute ways are kept up in routing table and best three ways are chosen for information transmission. Negligible of ways can be put away in the steering table to decrease stockpiling and computational overheads.

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