[Gayathri * *et al.*, 7(4): April, 2018]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

IJESRT
INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

T-TRACKING ALGORITHM FOR DATA TRACKING IN WIRELESS SENSOR NETWORKS

R.Gayathri*[1], S.Kiruthika[2] & P.Keerthana[3]

[*1] Student, CSE, Sri Shanmugha College of Engineering and Technology, Salem, India
[2] Assistant Professor, CSE, Sri Shanmugha College of Engineering and Technology, Salem, India
[3] Assistant Professor, CSE, Sri Shanmugha College of Engineering and Technology, Salem, India

DOI: 10.5281/zenodo.1219647

ABSTRACT

In Wireless Sensor Network the sensor nodes are being dispersed spatially, so the target tracking has become a key factor. In the existing system they have used the Face Tracking for tracking the target. They have developed non-overlapping region called Face. In that they have used Brink Detection algorithm for selecting the edges and Optimal Selection algorithm for selecting sensor node in each face. However, if the selected node fails then tracking accuracy will be lost. In this paper we have a new tracking scheme, called t-Tracking is designed to overcome the target tracking problem in WSNs considering multiple objectives: low capturing time, high quality of tracking (QoT). A set of fully distributed tracking algorithms is proposed, which answers the query whether a target remains in a "specific area" (called a "face"). When a target moves from one face to another face all the possible movements will be mentioned. Then query will be sent to all those nodes about their energy and coverage area. Based on the response from those nodes the best nodes will be selected for continuing tracking when the target moves to the next face. The result of this t-Tracking is compared with already existing face tracking..

Keywords: Wireless sensor networks, target tracking, sensor selection, edge detection, face tracking, fault tolerance.

I. INTRODUCTION

Wireless sensor network (WSN) refers to a cluster of spatially detached and committed sensors for recording and monitoring the substantial status of the surroundings and organizing the composed data at a central position. WSNs determine ecological environment like wind speed and direction, pressure, temperature, pollution levels, sound, humidity, etc.

A wireless sensor network (WSN) in other words can be defined as a system of (possibly low-size and low-complex) devices denoted as nodes that can intellect the surroundings and converse the data collected from the monitored area all the way through wireless links; the information is forwarded,

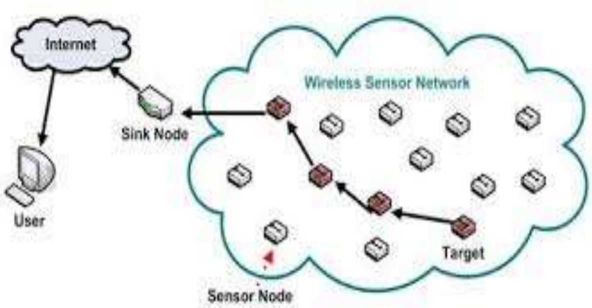

Fig.1 Example of wireless sensor network

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

probably via several hops relaying, to a sink that can use it locally, or is linked to further networks (e.g., the Internet) through an entryway.

In case of a wired network, the information will be shared through the wired connections that are used for the information sharing between the systems. So that the movement of the information will be know already, in case of any failure or other problems it can be recovered easily. But this wired network cannot be applied for a wide range. So we are moving for wireless network in which the information can be shared in a wide range due to its wireless connection. But the movements of information cannot be detected in advance in wireless network. The information will be shared from the source to the destination in any path based on the network formed. So the movement of information has to be tracked which will be useful in case of any problems during transmission.

There are various mechanisms available for tracking a target in the wireless environment such as Tree-Based tracking, Cluster-Based Tracking, Prediction-based Tracking, Mob cost Message-Based Tracking and Hybrid methods. But all those varied mechanism are concerned within the three common procedures developed for the aim of target chase.

1. Device nodes should grasp their location with least ranging and estimation error and therefore the distance between the target and device node should be calculated accurately.
2. Sensors should kind self-organizing groups (clusters). The cluster head ought to communicate to the sink regarding the target's location.
3. The target detection info ought to be passed to the central sink for process. The device nodes should detect node failures and avoid such path to communicate with the sink. Knowledge redundancy should be avoided.

Fig 2 depicts a Wireless device Network. In WSN the sensor nodes area unit classified into either a sensing node or a routing node. The sensing node is accountable for collection the information concerning the practicality that the network was deployed. The routing nodes area unit accountable for forwarding the detected info to the sink and share the information among the clusters. Supported the need the node will act as a routing node also as a sensing node. In case of failure of the routing node, the sensing node nearer to the sink or the neighboring cluster performs the routing operation.

The sensors area unit initially programmed before deployment to prepare themselves into cluster and choose the corresponding routing nodes.

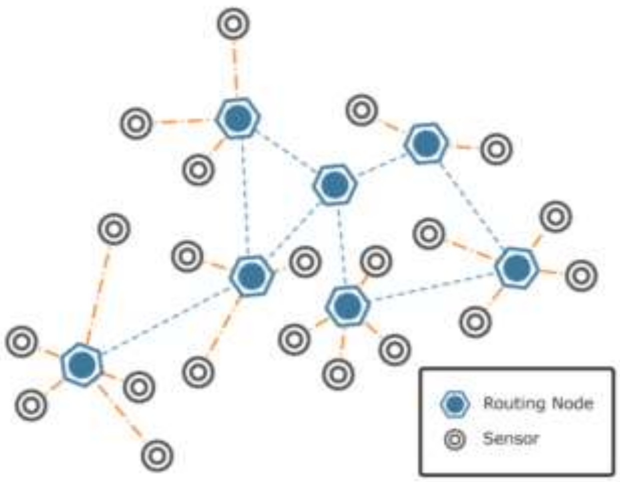

Fig 2: Wireless device Network

The remaining of the paper is organized as follows. Section II describes some related work about various target tracking. Section III presents the working procedure of Face tracking. In Section IV, we proposed the t-Tracking which has high accuracy. Section V concludes the paper.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

II. RELATED WORK

Ossi Kaltiokallio et al "Poster Abstract: Distributed RSSI Processing for Intrusion Detection in Indoor Environments"

The RSSI has shown to be helpful additionally for detective work changes within a WSN caused by e.g. movements of persons. In stable conditions the RSSI measurements area unit nearly constant, however once the conditions modification the measurements show increasing variance. Many studies have shown that the RSSI will be exploited for intrusion detection and chase of a moving person or vehicle. However, these studies have confidence the transmission of all the collected measurements to a central base station for process, or on the preparation of further nodes that relay the collected measurements. This approach isn't power economical, since radio transmissions and receptions area unit the foremost power-hungry operations performed by the nodes. Also, if every deployed node is needed to transmit entire RSSI time-histories to the bottom station, the latency of the system becomes large to create it helpful in emergency things like fires, sieges, or terrorist attacks. This work tackles the higher than mentioned limitations by distributed process of the RSSI signal. Preliminary tests show that a reliable motion detection and localization will be obtained by making a grid of radio links within the network and by process the RSSI measurements during a distributed manner. During this approach, the nodes transmit to the central base station solely alert notifications associated with vital events, minimizing the latency and reducing the facility consumption. Motion detection is achieved within the system by a TDMA transmission protocol wishing on a correct time synchronization of the nodes. Through this, the nodes area unit ready to additional scale back their power consumption by turning on the radio solely in correspondence of the regular transmissions.

Yunbo Wang et al "Analysis of Event Detection Delay in Wireless Sensor Networks"

The traffic within the network is sculptured supported a temporal fluid model, that considers traffic generated by nodes as an eternal fluid flowing towards the destination. The ensuing spatio-temporal fluid model captures the dynamics of the generated packet flows. The empirical validations and simulation studies reveal that the developed model is appropriate for prime density networks and low traffic rate applications, common options of an oversized category of WSN applications. Motivated by the actual fact that queue build up in low-rate traffic is negligible, a lower-complexity model is additionally developed. This model extends the end-to-end delay analysis for single packets in our previous work, and derives the event detection delay by 1st getting the end-to-end delay for every packet. This approach needs lower process power. To the simplest of our information, this can be the primary work that investigates the event detection delay in large-scale multi hop WSNs. in depth tested and simulation experiments validate each approach in many network eventualities. For the eventualities during which the framework doesn't yield correct results, potential reasons area unit in brief mentioned. The ensuing framework will be used to investigate the results of network and protocol parameters on event detection delay to comprehend real-time processing in WSNs.

Wensheng Zhang., Et al "Dctc: Dynamic Convoy Tree-Based Collaboration for Target Tracking In Sensor Networks"

Propose a dynamic convoy tree-based collaboration (DCTC) framework to sight and track the mobile target and monitor its close space. DCTC depends on a tree structure known as convoy tree, which incorporates sensing element nodes round the moving target, and also the tree is dynamically organized to feature some nodes and prune some nodes because the target moves. Because the target 1st enters the detection region, sensing element nodes that may sight the target collaborate with associate degree other} to pick a root and construct an initial convoy tree. Wishing on the convoy tree, the foundation collects info from the sensing element nodes and refines this info to get additional complete and correct info regarding the target victimization some classification algorithms. Because the target moves, some nodes within the tree become isolated from the target and area unit cropped. Since most sensing element nodes keep asleep before the target arrives for power saving, the foundation ought to predict the target moving direction and activate the correct cluster of sensing element nodes so these nodes will cite the target as shortly because the target shows up. Because the convoy tree reconfigures itself, the foundation additionally ought to be modified to optimize the communication overhead.

Yan Zhou et al "posterior cramér–rao lower bounds for target tracking in sensor networks with quantized range-only measurements"

A typical downside in WSNs that amount measurements based mostly chase, seems to be significantly enticing. However, there's very little result on the certain analysis for target chase victimization amount range-only measurements, particularly below the WSN circumstance wherever unremarkably over one sensing element is

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

activated during a time instant and over one bit is allotted for every sensing element. Targeted on the posterior CRLB analysis for target chase during a WSN victimization amount range-only measurements. Below the belief that native sensing element noises area unit reciprocally freelance, the unvarying calculation of posterior CRLB springs. Results for target with dynamics sculptured by each constant rate (CV) and constant acceleration (CA) area unit obtained. Its price mentioning that we tend to don't specify the sensing element sort and a general range-only activity model for native sensing element is employed.

Ossi Kaltiokallio, et al "Target Tracking in Wireless Sensor Networks Based on the Combination of KF and MLE Using Distance Measurements"

In this system, conferred a replacement approach for target chase during a wireless sensing element network by combining most probability estimation and Kalman filtering victimization the gap measurements. The utmost probability reckoned is employed for prelocalization of the target and measuring conversion to get rid of the measuring nonlinearity. The born-again measuring and its associated noise statistics area unit then employed in a regular Kalman filter for algorithmic update of the target state. The planned approach is incredibly easy and nonetheless effective. Simulation and experimental results have shown that the planned approach improve the chase accuracy compared to the unremarkably used extended Kalman filtering approach.

III. FACE TRACKING SCHEME

Tracking the target (information) has become a foremost task in wireless sensor networks (WSNs). Initially the target was tracked by using the distance between the node and the target or by measuring the distance between the node and the target. In case of a changeable environment or during failure of sensor nodes, tracking the target may be failed. So in order to overcome this, a new tracking framework called, Face Track has been designed (see Firure.3). In this the non-overlapping polygon regions are formed in the network which is called as face. The target will be moving through the various faces while it is moving from the source to the destination. The sensor nodes of the current face in which the target is moving will track the movement of the target. When the target moves to the adjacent face then the sensor nodes of that face will be continuing the tracking.

A polygon will be having more than one adjacent face with a common edge (brink). The target may be moving to any of the adjacent face. It has to be detected that to which face is the target is going to move next by which the sensor nodes of that face can be ready for tracking the target without any tracking loss. This detection can be done by using the edge detection algorithm which is developed for the intimating the movement of target from one faces to another face in advance. This helps in the replacement of sensor nodes in case of failure. There are three phases in this algorithm

- Square detection phase: this phase does not guarantee that the target may cross the brink or not
- Rectangular detection phase: this phase guarantees that then target will be crossing the brink
- Crossing phase: in this phase the target will be crossing the brink.

Then an optimal selection algorithm is also developed which is used for selecting a new sensor nodes in each face for tracking the target in case of failure of the actual node which has to track the target.

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Impact Factor: 5.164
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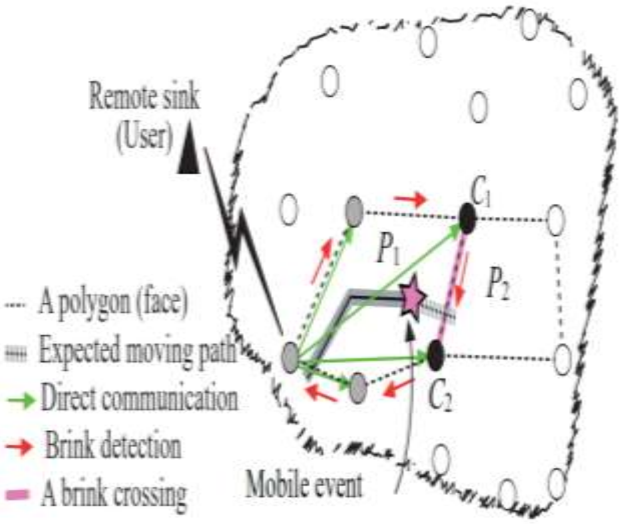

Fig. 3. An example application with a sink showing a vehicle being tracked through a polygonal-shaped area

The brink through which the target is moving will be connected by two nodes which are called as active nodes.

The active node always has the following information such as
1) Its own information.
2) Information about adjacent neighbors.
3) Information about active neighboring nodes.
4) Information about neighbors through direct communication.

The problem in this existing system is that the target must be in any one of the sensor nodes coverage area and both the nodes must have the energy to track the target until it moves to the next region. If the nodes do not have the energy until the target moves to the next region the tracking will be stopped or else if the target moves away from the coverage region of both the nodes then the tracking will be stopped.

IV. IMPEMENTATION OF t-TRACKING

t-Tracking an entity, e.g., a respective authority that intends to follow a target, is called a tracker, which can also be called a mobile sink because it traverses through the network. A tracker is assumed to be a single generic source such as a mobile user or a respective authority. A target can be any mobile entity such as an enemy vehicle or an intruder. Thus, two mobile nodes, "Target" and "Tracker", are implemented. A WSN composed of a set of static sensor nodes is deployed in a plane, where the target moves in dynamic patterns. Through graph planarization, the WSN is organized into non-overlapping areas, which is usually carried out in localized geographic routing (particularly, in face routing).Each face, comprising a number of nodes, corresponds to a local area of the WSN.

The tracker intends to follow a target, it queries the WSN. The nodes in the WSN are periodically clock synchronized to be in an awake, active, or inactive state. Each node has the capability of sensing, computing, and communicating. When a node of a face receives a query request, it checks with its neighboring nodes whether or not it is the closest to the target; if it is, it is elected as a monitor and one of its neighbors is elected as a backup

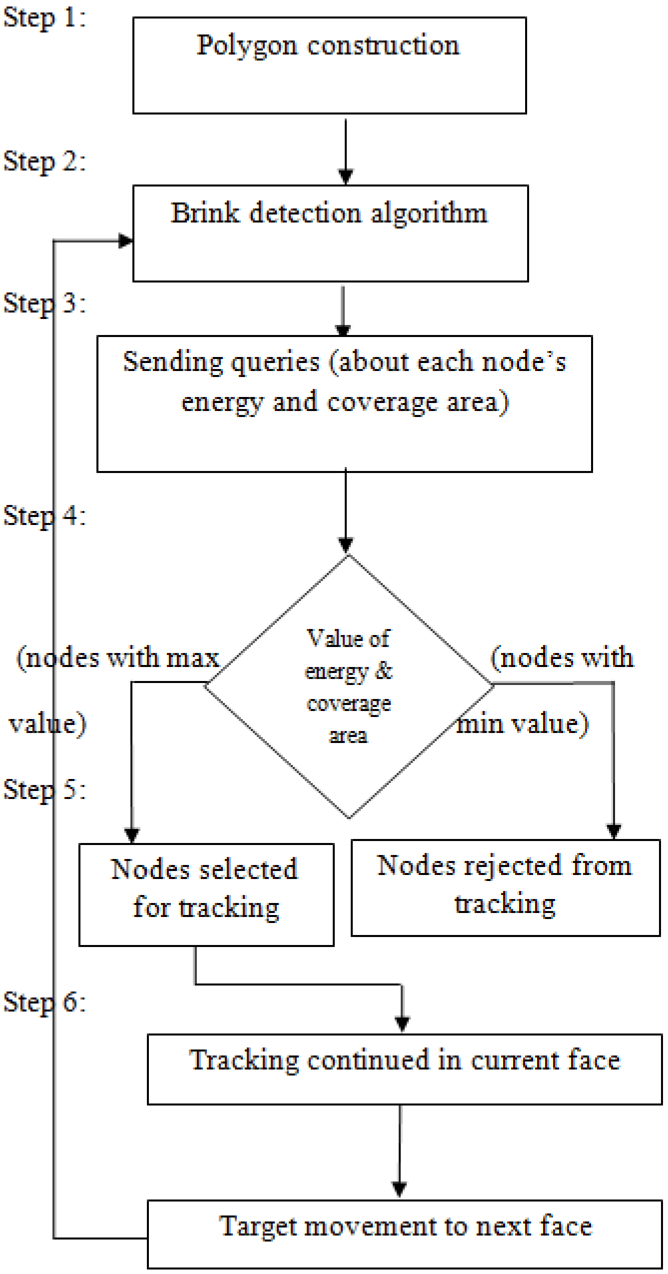

Fig. 4. Working procedure of t-Tracking

The monitor then works at the request of the tracker and sends information about the monitor itself, the backup, and the target, while the target traverses through the face. In the case that the monitor has any problem due to any reason, the backup takes the role of the monitor.

Target detection and localization is mainly performed by the cooperation between the monitor and the backup. The tracker then moves toward the monitor and queries for an update. If the target is still within the face, the monitor keeps tracking the target; at the same time, the monitor elects the next possible monitor and backup to be the new monitor and backup by using prediction method. If the target has already moved out of the area of the face, the monitor informs the tracker about the new monitor and backup, and the tracker moves toward them. Monitor and backup are two common sensors of the current face and one of its adjacent faces. When the monitor finishes its task, it changes its state to the inactive state. This is also true for the backup. In this way, a special linked list of monitors, backups, and other nodes in a face is formed as time goes on. If both the monitor

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

and the backup are viewed as one logical node at each time step of the tracking, this special linked list is simply a linear link of logical nodes. The flowchart (Fig.4) explains the working procedure of the t-Tracking scheme.

V. CONCLUSION

This paper gave the information about a new tracking scheme, called t-Tracking is designed to overcome the target tracking problem in WSNs considering multiple objectives: low capturing time, high quality of tracking (QoT). A set of fully distributed tracking algorithms is proposed, which answers the query whether a target remains in a "specific area" (called a "face"). When a target moves from one face to another face all the possible movements will be mentioned. Then query will be sent to all those nodes about their energy and coverage area. Based on the response from those nodes the best nodes will be selected for continuing tracking when the target moves to the next face. In the future endeavors, aim to further work in different aspects. One possible aspect is to investigate more practical issues in using the planarization concept for tracking, especially in the case of a large amount of localization errors. Another possible aspect is to verify the proposed scheme in different tracking situations.

VI. REFERENCES

[1] *Guojun Wang, Md Zakirul Alam Bhuiyan, Jiannong Cao, and Jie Wu,"Detecting Movements of a Target Using Face Tracking in Wireless Sensor Networks," IEEE Trans. On Parallel And Distributed Systems, Vol. 25, No. 4, April 2014*

[2] *O. Kaltiokallio, M. Bocca, and L.M. Eriksson "Distributed RSSI Processing for Intrusion Detection in Indoor Environments," Proc Ninth ACM/IEEE Int'l Conf. Information Processing in Sensor Networks (IPSN), pp. 404-405, 2010.*

[3] *Y. Wang, M. Vuran, and S. Goddard, "Analysis of Event Detection Delay in Wireless Sensor Networks," Proc. IEEE INFOCOM, pp. 1296-1304, 2011.*

[4] *Y. Zhou, J. Li, and D. Wang, "Posterior Cramer-Rao Lower Bounds for Target Tracking in Sensor Networks with Quantized Range-Only Measurements," IEEE Signal Processing Letters, vol. 17, no. 2, pp. 377-388, Feb. 2010.*

[5] *X. Wang, M. Fu, and H. Zhang, "Target Tracking in Wireless Sensor Networks Based on the Combination of KF and MLE Using Distance Measurements," IEEE Trans. Mobile Computing, vol. 11,no. 4, pp. 567-576, Apr. 2012.*

[6] *Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "Wireless sensor networks: A survey," Comput. Networks, vol. 38, no. 4, pp. 393–422, Mar. 2002.*

[7] *P. M. Djuric, M. Vemula, and M. F. Bugallo, "Target tracking by particle filtering in binary sensor networks," IEEE Trans. Signal Process, vol. 56, no. 6, pp. 2229–2238, Jun. 2008.*

[8] *Y. Ruan, P. Willett, A. Marrs, F. Palmieri, and S. Marano, "Practical fusion of quantized measurements via particle filtering," IEEE Trans. Aerosp. Electron. Syst., vol. AES-44, no. 1, pp. 15–29, Jan. 2008.*

[9] *L.M. Kaplan, "Global Node Selection for Localization in a Distributed Sensor Network," IEEE Trans. Aerospace Electronics Systems, vol. 42, no. 1, pp. 113-135, Jan. 2006.*

[10] *W. Xiao, L. Xie, J. Chen, and L. Shue, "Multi-Step Adaptive Sensor Scheduling for Target Tracking in Wireless Sensor Networks," Proc. IEEE Int'l Conf. Acoustics, Speech and Signal Processing (ICASSP), pp. 705-708, May 2006*

[11] *V. C. Gungor, O. B. Akan, and I. F. Akyildiz, "A real-time and reliable transport (RT)2 protocol for wireless sensor and actor networks," IEEE/ACM Trans. on Networking, vol. 16, no. 2, pp. 359–370, Apr 2008*.

[12] R. Niu, , and P. K. Varshney, "Target location estimation in sensor networks with quantized data," *IEEE Trans. Signal Process.*, vol. 54, no. 12, pp. 4519–4528, Dec. 2006..

CITE AN ARTICLE

Gayathri, R., Kiruthika, S., & Keerthana, P. (n.d.). T-TRACKING ALGORITHM FOR DATA TRACKING IN WIRELESS SENSOR NETWORKS. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, *7*(4), 517-523.