TARGET TRACKING USING WSN FOR EFFECTIVE ENERGY UTILIZATION

[1]VARSHARANI GURAV, [2]MANOJ M. DONGRE

[1,2]Department of Electronics and Telecommunication Engineering Ramrao Adik Institute of Technology, Navi Mumbai, India
E-mail: [1]ranigurav22@gmail.com, [2]mmdongre04@gmail.com

Abstract- Wireless Sensor Network (WSN) contains a no of sensor nodes which collect information process them and send the information to the sink for further processing.WSN can be operated in harsh places where human presence is risky. Wireless network lifetime is dependent on batteries of sensor nodes and replacing and recharging batteries is impossible Target tracking is the most significant application of wireless sensor network (WSN).Due to various issues in wireless sensor network such as limited batteries, high mobility of node, sensor node failure, unpredictable environment target tracking become challenging task. Therefore, new algorithm is proposed called brink detection with help of face tracking. It helps to track the target in timely fashion and recover from special cases.

Keywords- Wireless Sensor Network, Face tracking, Path finding ,path tolerance ,Network Lifetime.

I. INTRODUCTION

Latest advances in digital electronics, Micro electro mechanics, Wireless networks have deployed in large scale of sensor nodes in networks because of its attractive characteristics i.e small size with low cost, computing power and energy consumption multipurpose functionalities when compared to early generation of sensor nodes. WSN have more functionality which can be useful to communicate between humans and machines. These network used in plenty applications but its actual application is target tracking, such as combat zone observation, discovery of prohibited boundaries passage, gas drip, fire blowout, and natural world observing [15].Tracking of target can be performed using single or multiple nodes but single nodes give more power consumption and pressure on other nodes. While multiple sensor gives correctness and energy equivalent. WSN have limited characteristics compared to Ad-hoc networks such as sensor nodes ability of memory storage, processing and the existing energy source. Wireless Sensor Networks are generally assumed to be energy restrained because sensor nodes operate with small capacity DC source or may be placed such that replacement of its energy source is not possible [11]. Typically, a Wireless Sensor Network is application-driven and mission-critical. One of the main design goals of WSNs is to carry out energy efficient data communication while trying to prolong the lifetime of the network. Many excellent ideas have been proposed for target tracking with WSN [5]. Research about target tracking can be roughly divided into three categories [1]: Tree-based schemes, Cluster based schemes and Prediction-based schemes.

In general, the tracking algorithm is mainly based on the network architecture as given as Tree-based methods organize the network into a hierarchy tree eg. STUN (Scalable Tracking Using Networked Sensors), Some of the examples for Cluster based tracking are RARE, Dynamic Clustering Tracking Algorithm DCTA and Adaptive Dynamic Cluster-based Tracking (ADCT).Examples of prediction-based algorithm are given PES (Prediction-based Energy Saving), DPR (Dual Prediction-based Reporting) and DPT (Distributed Predicted Tracking) [2].

II. INTRODUCTION TO FACE TRACKING

Object tracking is one of the challenging application for Wireless Sensor Network. Numerous factors are considered when evolving algorithm for tracking target include single vs. multiple targets, stationary versus movable nodes, target indication, good energy organization and network construction. Old target tracking approaches make use of a central approach. As the no of nodes increases transmission of messages from nodes to base station increases which consume more bandwidth. Thus, this methods are not liable, lacks scalability. In WSN, each node has very limited power and consequently traditional tracking methods based on complex signal processing algorithm are not applicable [2].Therefore, the object Tracking algorithm should be designed in such a way that it result in good quality tracking with low energy consumption. In this paper we propose brink detection using Face Tracking framework to detect movements of a target.

In Face Track scheme, initially cell Creation takes place in the plane. When target is tracked by one of the node it team up information with other nodes and initial cell construction takes place. The nodes forms the cell. The cell in which target is present is called active cell i.e. current cell Cc, target is about to cross the brink between cells, then edge detection algorithm takes place. Then, acute area is recognised. Acute area means the area having maximum chance of target survival. Tracked information is passed to (forward cell) Cf. After delivery of message, nodes in Cf change their state to active. When object leaves the edge, message is transmitted to previous Cc node except couple nodes (CN) to return to off state. Then discovery of movements of target is done. All nodes not gives useful information. Sensor nodes which offer outcome to maximize tracking precision and decrease energy rate for communication of data are preferred.

Primarily cell construction not saved during tracking because of exhaustion of battery, breakdown of identified node. In case of changeable brink lengths, when the target go away from the sink, the energy utilisation for communication and data broadcasting is more.

III. PROPOSED SYSTEM

3.1. Brink detection algorithm

This algorithm is used to identify the edge of the cluster. In network domain planarized graph such as voronoi diagram is used. In general while application of tracking target as refer to below fig.3.1.1 that the sensor nodes which can detect the target movement and nearer nodes kept in active mode and others nodes till target reaches to that node kept in inactive node to save energy of network. To continuously monitor mobile target, a group of sensors must be turned in active mode just before target reaches to them. All sensor nodes changes because its depend on the speed of target and organization of cluster head.

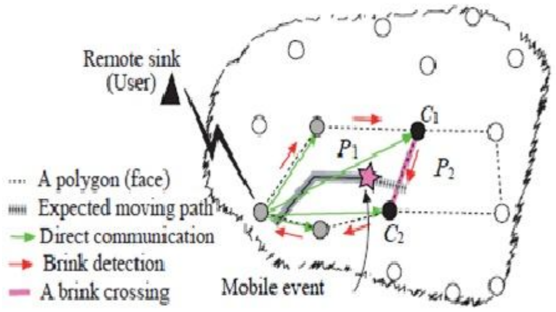

Figure 3.1.1: An example application with a sink showing a vehicle being tracked through a polygonal-shaped area[1].

As figure 3.1.1 shows typical situation of an enemy vehicle tracking application Sensor nodes are informed when the vehicle under surveillance is discovered, while some nodes(such as black nodes) detect the vehicle and send a vigilance message to the nodes on the vehicle's expected moving path, so as to wake them up. Thus, the grey nodes which come across the vehicle's moving route can be ready in prepare in advance and remain cautious when it comes in its visibility. To save energy the nodes which are active to track target can participate in target tracking and giving full coverage,the target lying inside P1,as shown in Fig.3.1.1[1], can be detected as it goes across an edge/link (such as, <C1; C2>) toward P2. The two points (e.g., the black nodes in Fig.3.1.1) become couple nodes chosen from all of the points (neighbouring nodes), through a selection process to lead the tracking the target from Pi(current/active polygon) to Pj(future/further polygon). Normally, the faces can be of different sizes and geometrical polygonal-shaped forms in the WSN. For the sake of simplicity, we call them polygons throughout this paper. Brink is formed at the edges of the hub. The two nodes become a couple node. The edge becomes the brink. The aim is to find common edge while object crossing couple node and confirms that the object goes away from present hub and moving to next cluster, which could permit for tracking in a suitable pattern. Brink is discovered based on the target's location. As the object travels to a brink it concentrates follow spot. The follow spot is divided into three-phase detection Square detection phase, Rectangular detection phase, crossing phase.

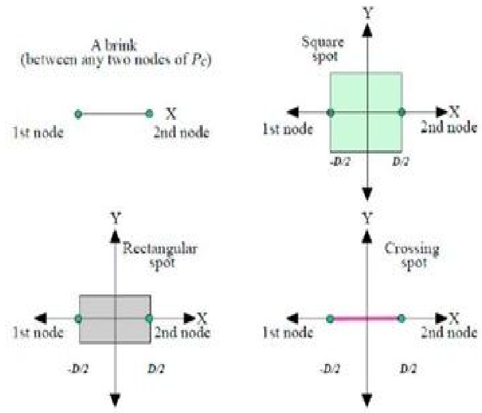

Figure 3.1.2: Three-phase detection spots, where the X-axis shows the brink crossing [1].

To estimate the phases, we consider the brink to be mapped over the X -axis, as shown in Fig.3 ,the brink length is denoted by D, and i and k are the couple nodes. We assume that D oc dik and D/2< rs. D is achieved from (D/2) to (-D/2). D< rs is a length of both square and rectangular spots. Hence, $A=D^2$ is for the total rectangular spot, and A=D/2*D is for the total rectangular spot.

Suppose the target touches the rectangular phase, a joint-message is broadcast to Pf . When the target passes the crossing phase, Pf becomes the new Pc. All of the brinks in the previous Pc are removed, and the previous Pc becomes inactive and remains as a neighboring polygon.Variability of different parameters of the brink, i.e., 1) brink length, 2) local mean length ,and 3) local standard deviation, allow the CNs to identify the brink more easily.

IV. SIMULATION AND RESULTS

4.1. System requirements

The proposed energy efficient tracking framework is simulated in MATLAB R2013b platform. The energy cost and energy efficiency are the two most significant parameters to be analyzed to validate the algorithm. The simulation is implemented within a 100m x 100m 2D field, 60 random sensor nodes are placed in a plane. Throughout the implementation any two nodes use bidirectional communication. The distance among nodes (dik) which is small than the communication range (rc). We consider one case that is communication range (r_c) is greater than twice of sensing range(rs).

4.2. Simulation parameter

- Number of sensor nodes:Experiments are made with different number of sensor nodes It is seen that when the number of sensor nodes in a polygonal area increases, tracking errors are reduced.
- Tracking accuracy: To observe tracking accuracy the system analyze tracking error found(TEF).TEF is defined as an average error found in meters by all the nodes that are involved in tracking. The proposed scheme get better results in terms of mean and maximum tracking error for face tracking .
- Effective energy cost percentage (EECP) :

$$\frac{E_{\text{the nodes that can detect}}}{E_{\text{all the nodes that are in the activestate}}}$$

- Total Energy Consumption : It is measured as the energy consumed at initial stage to final stage energy with respect to target movement. It is observed that as the number of nodes increases the energy cost reduced Using number of nodes of target ranging from 10 to 60, energy cost is verified.

4.3. Simulation Results

Figure 4.3.1 shows network formation for 20 node .Nodes are distributed with centralized base station and target is moving across the nodes, and its destination place also not predicted so When target is moving across the nodes its error in the path calculated by Estimated vs Actual error.

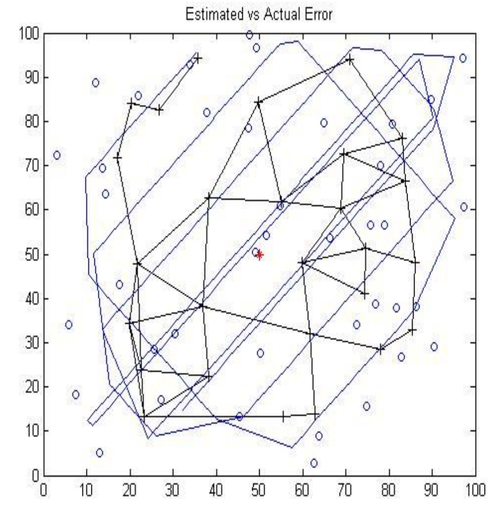

Figure 4.3.1.Estimated vs Actual error

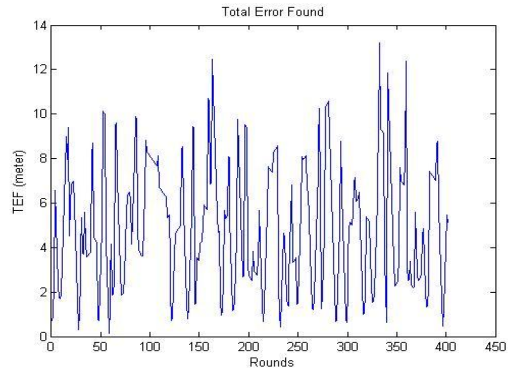

Figure 4.3.2: Total error found.

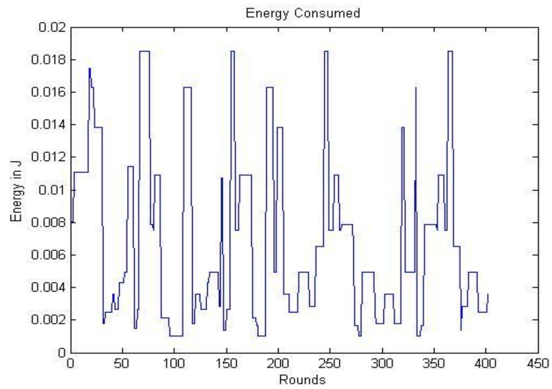

Figure 4.3.3: Total energy consumed.

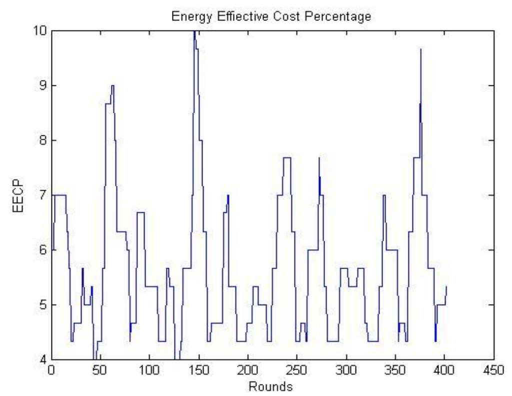

Figure 4.3.4: Energy Effective Cost Percentage

CONCLUSIONS

Target tracking in a highly dense network will be enhanced by using proposed algorithm Face tracking. We compare and analyze them from different angles to improve efficiency of network for less energy consumption. The performance will be evaluated with the help of simulation result. From the simulation, we compared the results of Number of sensor nodes, Effective energy cost percentage (EECP),Tracking accuracy, Energy cost, Total Energy Consumption.

ACKNOWLEDGMENTS

With great pleasure, I avail this opportunity to express my deep sense of gratitude to Dr. Ramesh

Vasappanavara, Principal, Ramrao Adik Institute of Technology and Director, Head of Department, Electronics and Telecommunication Department, for their encouragement and inspiration to publish the work. My thanks also go to my colleagues. I cannot end without thanking my lovely family for their unconditional support and love.

REFERENCES

[1]. [1] GuojunWang, MdZakirul Alam Bhuiyan, Jiannong Cao and JieWu, "Detecting Movements of a Target Using FaceTracking in Wireless Sensor Networks", IEEE Trans. Parallel and Distributed Systems, vol. 25, no. 4, April 2014.

[2]. [2] D.Charanya and G.V.Uma," Tracking Of Moving Object In Wireless Sensor Network",International Journal of Computer and Communication Technology ISSN (PRINT):0975 - 7449, vol.3, no.5, 2012.

[3]. [3] Md. Zakirul Alam Bhuiyan, Guojun Wang and Jie Wu,"Polygon-Based Tracking Framework in Surveillance Wireless Sensor Networks" 2009 15th International Conference on Parallel and Distributed Systems.

[4]. [4] Yunbo Wang, Mehmet C. Vuran ,Steve Goddard,"Analysis of Event Detection Delay in Wireless Sensor network this paper was presented at main technical program at IEEE INFOCOM 2011.

[5]. [5] Ziguo Zhong, Ting Zhu, Dan Wang and Tian He," Tracking with Unreliable Node Sequences"This full paper was peer reviewed at the direction of IEEE communication society subject matter experts for publication in the IEEE INFOCOM 2009 proceeding.

[6]. [6] Chih-Yu Lin, Student Member, IEEE, Wen-Chih Peng, Member, IEEE, and Yu-Chee Tseng, Senior Member, IEEE," Efficient In-Network Moving Object Tracking in Wireless Sensor Networks" IEEE TRANSACTIONS ON MOBILE COMPUTING, vol.5, no.8, august 2006.

[7]. [7] Dan Liu, Dan Liu, Yi An," Dynamic Cluster Based Object Tracking Algorithm in WSN" 2010 Second WRI Global Congress on Intelligent Systems.

[8]. [8] Josna Jose, Dr.R.Vijayakumar, " Analysis on Energy Efficiency in Tracking Multiple Objects Based on Polygon Tracking Method" IJSTE - International Journal of Science Technology and Engineering,Vol. 2, no. 3, September 2015.

[9]. [9] S.Diwakaran and P.Ganeshwari,"Object Tracking in Wireless Sensor Network based on the mixture of Kalman Filter and Probability based Model" International Journal of Engineering Science Invention, Vol. 3,no. 1, January 2014

[10]. [10] Mauri Kuorilehto, Marko Hannikainen, Timo D. Hamalainen," A Survey of Application Distribution in Wireless Sensor Networks" EURASIP Journal onWireless Communications and Networking 2005.

★★★