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A Competent Target Tracking Procedure in Wireless Sensor Networks

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Abstract- In the field of wireless sensor network target tracking plays a vital role. Because it receives the raw value by the sensor and generates clear meaningful output which is applicable not only for larger applications but also in individual isolated applications. This paper develops a heuristic algorithm for an efficient tracking targets in wireless sensor netwo (WSN) to build . Such design wireless sensor network to track objects given effective to achieve arbitrary topology of wireless sensor networks . We consider the two Way frequency moving object in each pair of sensor nodes and link transfer fees .This problem is formulated as 0/1 integer programming problem. It proposes a solution based on relaxation (-LR based) Lagrangian heuristic algorithm to solve the optimization problem . The experimental results presented showed that the algorithm to a optimization now effectively create tracking objects.Furthermore, the algorithm is very efficient and scalable in terms of the time of the settlement.

Index Terms- WSN, Target tracking, Lagrangean Relaxation (LR).

I. `INTRODUCTION

The rapid growth of sensor technology and wireless communication has led to the development of wireless sensor networks (WSNs) . WSNs the benefits inexpensive and wireless communication capabilities. It consists of several sensors , sink nodes and back- end system . These sensors work in conjunction with the physical information collected from the field sensor , and process and the information to the sink nodes transmit . Over time, the back- ends get reviews according to information provided by the sink nodes can [3 , 4] information .

Object tracking is the key issue of WSNs application widely deployed for military intervention detection and monitoring of wild animals. Object tracking wireless sensor networks two critical operations [7-9]. First monitoring place. Sensor nodes are needed to detect and track the states of movement of moving objects. Second report. The object detection nodes should report her findings to the sink. These two operations interspersed throughout the process monitored. Our focus, in previous studies [1, 2], which was developing strategies to reduce energy consumption in the reporting activities.

In this work, preliminary studies are extended to the effective monitoring of objects in wireless sensor networks. We focus on the problem of building an efficient network of wireless sensors for monitoring services objects that use the tracking object tree. Therefore, it motivates us to construct a heuristic algorithm to deal with the problem with a wireless network topology sensor given arbitrary rates of two ways object moves frequency of each pair of sensor nodes, and the link handoff. The total cost of communication can be calculated and is limited by the cover tree objects.

The calculation of the difference in cost of communication[1, 2] . First, we look at the two -way moving object frequency of each pair of sensor nodes and the frequency of return of the object moves every few sensor nodes is different. Secondly we consider the link transfer rates.The weight of each solid link represent eliminate transfer fees between a pair of adjacent communication nodes or between a pair of sensor node and communication node, and the weight of each link line represents the frequency of the object movement between a pair of adjacent sensors. Communication costs 70 (10 * 7) to move from object sensor xy sensor, and the communication cost is 56 ((8 + 6) * 4) when the sensor and object x sensor moves .

In this paper, we have the problem as a 0/1 integer programming problem where the objective function is the total cost communication subject to the limitations of routing trees reduced, and formulate transformation of variables. We use relaxation based (based in LR) Lagrangian heuristic algorithm to solve the sub-prime problem and a workable solution.

The problem is formulated as a non-linear optimization based on three variables problem making roads, trees left and tracking links. The routes are the original destination pair between the sensor nodes and sink node. Links tree trees left objection track. Next links are links to the object moves from X to Y Sensor sensor, sensor and provides tracking information upward to the first common ancestor by observing links [1]. For example, track links are the links between communication node p sensor node in Figure 1. To meet the schedule and quality requirements of optimal decisions, the Lagrangian relaxation method, which has been successfully adopted to solve many famous NP-complete problems [6 5], it is used. In more computational experiments, we expect our proposed tracking algorithm for efficient and effective in the treatment of complex optimization problem objects.
The revision , this study differs from previous work in two points [1, 2] . First, we look at the two -way moving object frequency of each pair of sensor nodes and data transfer link . Secondly , we offer a mathematical model the optimization problem LR and LR based heuristic algorithm is proposed to describe the problem.

II. PROBLEMATIC DEPICTION

Our approach to draw hierarchical tree object tracking information about the presence of the object and keep this information current. Sensor nodes are needed to detect and track moving objects motion states. The information about the presence of the detected object is stored in the communication nodes and each node store particular Communication set of objects jointly detected by their descendants. This set is called the set detected. For example, by a sensor in a leaf node set consists of only objects within the detection range of the sensor, while the root node found set contains all the items in the area of the sensor [1] appears.

The effective object tracking a WSNs problem is modeled as a graph G (V, A), where V sensor nodes and communications nodes (including receiving node) distributed in a plane and two-dimensional link L (eg, (i, j) represents the j radio node covered i), as shown in Figure 1 and 2.

For example, the sensor sub-graph of Figure 1 shows a 2D field sensor linked edge of some of the neighboring sensors. Each object weight frequency switching every few sensor nodes moving.

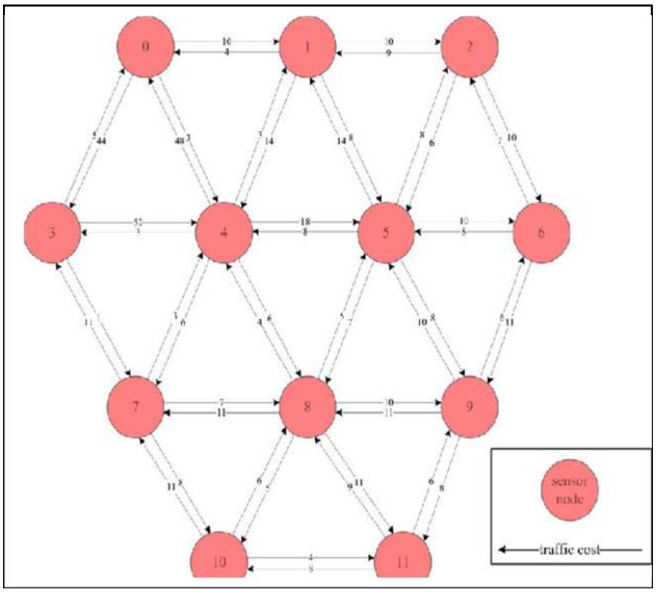

Fig. 1: Example of 2D sensor sub-graph.

Figure 2 illustrates tracking sub - trace interconnected edge 2D sensor ' s of a pair of adjacent communication nodes or sensor field - communication nodes . Each link represents weight transfer rates link.

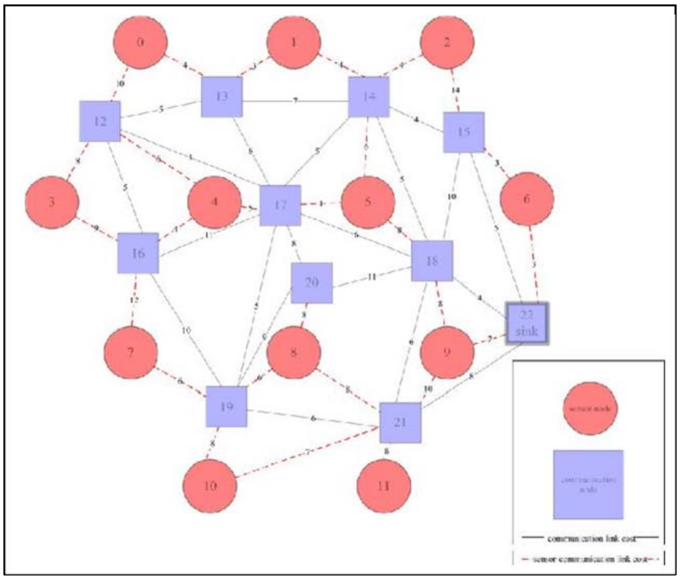

Fig. 2: Example of 2D tracking sub-graph.

In this paper, we consider a network topology wireless sensor given arbitrary, two-way movement object frequency rates of each pair of sensor nodes and transfer link. The field sensor comprises sensor nodes and communication nodes. We hierarchical network topology architecture. All sensor nodes send data to the communication nodes topcoat. Ultimately, the detection information sent to the sink node.

A good tracking method is characterized by low total communication [1] cost. Given a sensor board and a tree of shell objects, we can calculate the total cost of communication.

We define the total cost of communication for a graph G and T tree object tracking as the sum of individual donations of all pairs of adjacent sensor nodes in G:

The total costs of Communication (G, T)ΣΣ Σ = t (XYI, j) Rxy (i, j)x ∈ S and ∈ S (i, j) ∈LWhere S is the set of all sensor nodes and L is the collection of all links. The decision t (XYI, j) = 1 if z (x, y) = 0 I z (i, j) = 1 (location reporting uses objects the link (i, j) when the motion sensor object x and sensor) and 0 otherwise, where z (if, j) = 1 if the s sensor node using the link (i, j) to reach the sink node and 0 otherwise. Rxy object movement frequency of X to Y and (i, j) transfer costs associated with the link (i, j).

Figure 3 shows tree object tracking a 2D field with another edge sensor connecting a pair of adjacent nodes . Each link weight represents the cost of the transfer link between a pair of adjacent communication nodes or communication nodes sensor.The root node is the sink. This particular example is a shortest path tree(SPT) .

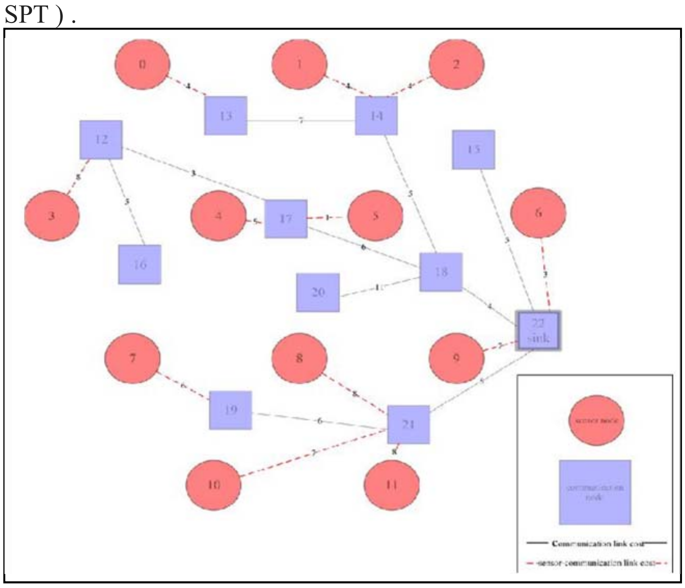

Fig. 3: Example of 2D object tracking tree.

III. PRIMITIVE REASONABLE RESULTS

After optimally solve the Lagrange dual problem , we get a set of decision variables and develop a heuristic algorithm based on the LR voting this decision variables . Then you can create a set of feasible solutions of primal problem (IP) to get . The primal feasible solution is an upper bound (UB) of the problem (IP) and the solution of the problem Lagrangian dual ensure the lower limit (LB) of the problem (IP) . Iteratively , by getting problems and dual primal feasible solution Lagrangian problem , we UB and LB , respectively . The duality gap between the UB and LB , calculated by (UB - LB) / LB * 100 % , illustrating the optimality of the solution . The smallest gap estimated duality , the better optimality .

A heuristic algorithm based Primal -LR shown in Figure 5 to track objects tree algorithm in Figure 6 .

Algorithm Primal_Heuristic

Step 1 Using the shortest path tree algorithm (SPT) to find the initial primal value.

Step 2 We adjust arc weight $c_{s(i,j)} - \sum_{s\in S} u_{1\,s(i,j)}$ for each $(i,j) \in L$ and then run the Dijkstra algorithm to get the solution set of $\{x_p\}$.

Step 3 Once $\{x_p\}$ is determined, $t^{xy}_{(i,j)}$ and $z^{s}_{(i,j)}$ are also determined.

Step 4 We can have an object tracking tree now, and then iteratively execute the **Step 2~3** with LR multipliers that can be updated from dual mode problem.

Algorithm Object_Tracking_Tree
begin

Initialize the Lagrangean multiplier vector (u^1 , u^2 , u^3) to be zero vectors;
UB:=total communication cost of shortest path tree;
LB:=very small number; *improve_counter*:=0;
step_size_coefficient:=2; **for** *iteration*:=1 **to** *Max_Iteration_Number* **do begin**
run sub-problem(SUB1); **run** sub-problem(SUB2); **run** sub-problem(SUB3); **run** sub-problem(SUB4); calculate Z_D ;
if Z_D >*LB* **then** *LB*:= Z_D and *improve_counter*:=0;
else *improve_counter*:= *improve_counter*+1; **if** improve_counter= improve_Threshold
then *improve_counter*:=0; $\lambda := \lambda / 2$; **run** Primal_Heuristic Algorithm;
if ub<UB **then** UB:=ub; **/*** ub the the newly computed upper bound ***/**
run update-step-size;
run update-Lagrangean-multiplier; **end**;
end;

IV. EXPERIMENTAL RESULTS

In order to evaluate our proposed heuristic algorithm , it is compared with other heuristic algorithm as shortest path tree (SPT) algorithm . With the exception of this algorithm SPT , the proposed heuristic algorithm can also compare with the problem of dual mode (Low Bound, LB) value .
Figure 4 shows an example of the trend line values for primary problem solving (EM) and the value of a problem of dual mode (LB) . UB curve tends to decrease to achieve minimum viable solution. In contrast , healing LB tends to increase and converge quickly to reach the optimal solution. LR -based method ensures the results of the optimization between the UB and LB so duality gap as small as possible to improve our quality solution and achieve the Can optimization. In this example, the duality gap between UB and LB 1.2%.

This study shows the best place for minimum total cost of communications by the proposed algorithm. Eventually , the total cost of communications SPT algorithm is 5019 , the total cost of the LR -based communications (EM) algorithm is 4568 , and the value off dual problem (LB) is 4,513 .

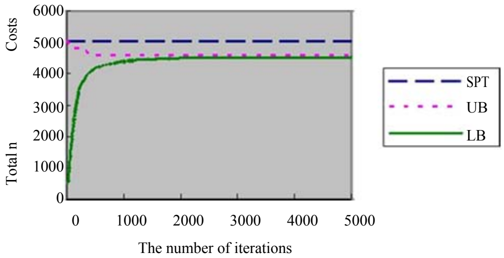

Fig. 4: The execution results of LR-based algorithm.

IV. CONCLUSION

In the area of target tracking wireless sensor network plays an important role.Because you get the gross value of the sensor output and generate significant clear that it applies not only to a larger applications,but also applications in an isolated individual.This study suggests a target tracking algorithm in wireless sensor networks.To our knowledge, the proposed process is truly innovative.This study defines the problem as an integer programming problem 0/1, and then set a Lagrangian relaxation based heuristic algorithm to solve the optimization problem .

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