RESEARCH ARTICLE OPEN ACCESS

A Novel Topological Approach Using Transferable Belief Model for Distributed Data-Static Version

Pooja .S.Verma*, Ms Purnima Soni**, Prof S.D. Kamble***
*(Department of Computer Science, RTMNU, India Email: poojaverma137@gmail.com)
** (Department of Computer Science, RTMNU, India Email: purnima_456@yahoo.co.in)
*** (Department of Computer Science, RTMNU, India Email : shailesh_2kin@rediffmail.com)

ABSTRACT
The paper adds transferable belief Model to a multiagent distributed context using tree topology. Agent acting as a node collects data independently using graph with cycles. The cyclic structure better describes interaction among mobile units. Static Scenario is been considered where agents provide data that do not change over time. A cyclic graph algorithm is proved to converge to basic belief assignment based on transferable belief model.TBM is used as an application in sensor networks.
Keywords – Cyclic Graph Algorithm, Multiagent System, Transferable Belief Model

I. INTRODUCTION

Data Fusion plays an important role in the context of multiagent system where information coming from different sources are aggregated in order to provide meaningful description of the surrounding environment. The single agent paradigm must be inadequate when uncertain reasoning is performed by entities of a system between which there is some distance either spatial, temporal or semantics. For these systems a multiagent view where each agent is an autonomous intelligent subsystem is more suitable. Each agent holds its own its own partial knowledge, accesses some computational resources. A multiagent approach offers several advantages such as larger range of task domains or higher robustness and flexibility.TBM introduces the idea of open world assumption in DS framework. The TBM approach has been effectively used in diagnostic application and target identification. The proposed system mainly focuses on extension of transferable belief model to a multiagent distributed context where distributed data aggregation unit is available based on tree topology.

(TBM) to a multiagent distributed context where no central aggregation unit is available and the information is been exchanged locally among agents. In this framework, agents are assumed to be an independent reliable source which collects data and collaborate to reach a common knowledge about an event of interest. Two different scenarios are considered: In first one agent are supposed to provide data that don Agent acting as a node collects data independently using graph with cycles. The cyclic structure describes better interaction among mobile units. Static scenario is been considered where networks agent provides data that do not change over time. Classification is been done by means of distributed data fusion based on tree topology. A cyclic graph algorithm is been proposed to converge to basic belief assignment based on transferable belief model.TBM is mainly used as an application in sensor networks. The data aggregation gives the idea to combine the data coming from different sources to route to eliminate redundancy, minimize number of transmission and thus save energy. Computing data aggregation is to construct a tree rooted at sink where each nodes forwards its locally aggregated data collected from its subtree to its parents. The BBA represents atomic information in theory of evidence.

II. RELATED WORK

Andrea Gasspari [1] focuses on the extension of the transferable belief model

not change over time (static scenario), while in second one agents provide data that change over time (dynamic scenario). A protocol for distributed data aggregation which is proved to converge to the basic belief given by an equivalent centralized aggregation schema based on TBM is provided. Since multiagent represents an ideal abstraction of actual networks of mobile robots or sensor robots

which are envisioned to provide most various kinds of task.

Mustafa Reda Senouci [2] proposed a new evidence based coverage model based on the transferable belief model (TBM).The evidence based coveragemodel offers a generic mathematical abstraction of sensor coverage that can be extended in any ways. Evidence combination is shown to improve significantly sensing coverage by exploiting the collaboration about sensors. Extensive simulation based on both synthetic data sets and data traces collected in a real deployment experiment for vehicle detection demonstrates the benefits of the evidence based model over state of art coverage models. An additional work remains to be made to associate to this coverage model a sophisticated placement algorithm.

Sebastian Destercke [3] compared the problem of measuring the conflict between two bodies of evidence represented by belief functions has known a regain of interests. Related to this issue Dempsters rule plays an important central role. This system proposes to study the notion of conflict from a different perspective. It starts by examining consistency and conflict should have. It then extends this basic scheme from basic to belief functions in different ways. In particular it do not makes any priori assumptions about sources (in) dependence and only consider such assumptions as possible additional information.

Xiwei Liu, Wenlian Lu [4] proposes the consensus problem with infinite problem time varying delays for linearly coupled static network is investigated.The delay affects only the off diagonal terms in continuous time equations. At first it defines effective consensus ability index. Then by using graph theory and a new concept of consensus, it has been proved that under some mild conditions the network can realize consensus.

Yongwook Choi [5] addresses the minimum spanning tree (MST) problem, which is an important primitive in many applications of wireless networks, eg, broadcasting, data aggregation and topology control. Data aggregation paradigms commonly use trees to schedule the transmission of data from all nodes in the graph from sources; minimum cost spanning trees help optimize the energy usage in this process. Various topology control algorithms also use MSTs to construct well connected sub graphs with provable cost relative to the optimum. The main goal in this paper is to study distributed algorithms for the Euclidean MST problem that have low energy complexity.

Darin England [6] describes and evaluates a robust topology for applications that operates on a spanning tree overlay network. Unlike previous work that is adaptive or reactive in nature, it takes proactive approach in robustness. The topology itself is able to withstand disturbance and exhibits good performance. It presents both centralized and distributed algorithms to construct the topology and then demonstrate its effectiveness through analysis and simulation of two clauses of distributed applications: Data collection in sensor networks and data dissemination in divisible load scheduling. The result show that robust spanning tree achieve a desirable trade off for two opposing metrics where traditional forms of spanning trees do not.In particular, the trees generated by algorithms exhibits both resilience to data loss and low power consumption for sensor networks. When used as an overlay networks for divisible load scheduling, they display both robustness to link congestion and low values to make the span of the schedule.

Stephen Boyd [7] analyzes the averaging problem under the gossip constraint for an arbitrary networks and find that the averaging time of the gossip algorithm depend on the second largest Eigen values of a double stochastic matrix characterizing the algorithm. Designing the fastest gossip corresponds to minimize this Eigen values which is an semi definite program (SDP). In general SDPs cannot be solved in a distributed fashion; however exploiting problem structure, it proposes a distributed sub gradient method that solves the optimization problem over the network.

Zied Elouedi [8] proposes a method for assessing the reliability of a sensor network in a classification problem based on the transferable belief model. First, it has developed a method for the evaluation of a sensor when considered alone. The method is based on finding the discounting factor minimizing the distance between the pignistic probabilities computed from the discounted beliefs and the actual values of data. Next, it develops a method for assessing the reliability of several sensors that are

supposed to work jointly and their readings are aggregated. The discounting factor are computed on the basis of minimizing the distances between the pignistic probabilities computed from the combined discounted belief functions and the actual values of data.

Yannick Fouquet [9] compared two statistical models of location. The location is thenidentified with a task executed normally or repeatedly pathological whereas a task persistence parameter assesses tendency to perservates.An external knowledge is made from a set of observables random variable provided by body sensors and organized either in a Bayesian network or in a reference knowledge base system containing the persons act metric profile. When a data missed or error occurred, an estimates of the joint probabilities of these random variables and hence the probabilities of all events appearing the network or the KBS was developed and corrects the bias of theLancasterand Zen graph classical approach which in certain circumstances provides negative estimates.Finally, they introduce the correction corresponding to a possible loss of the persons synchronization with the day versus night synchronizers to avoid false alarm.

Yogen.K.Dalal [10] proposes distributed algorithms for constructing minimal spanning spanning trees that operates on both concurrently and asynchronously and which are useful in store and forward packet-switching computer communication networks where there is typically no single sources of control. The difficulty in designing these algorithms arises from communication and synchronization problem. The paper discusses this problem and describes first distributed algorithm for constructing minimal spanning tree. This algorithm and the principle and techniques underlying its design will find application in large communication networks and large multi processor computer system.

Flavio Fiorini [11] proposes the data aggregation problem for multiagent systems. Agents are supposed to providean independent reliable source which collects data and collaborate to reach a common knowledge. Agents are supposed to provide data those changes over time. A protocol for distributed data aggregation which is proved to converge to basic belief assignment given by centralized aggregation based in transferable belief model is provided.

III. RESEARCH METHODOLOGY

A cyclic graph algorithm is been proposed to converge to basic belief assignment based on transferable belief model. The BBA represents the atomic information in the theory of evidence. In following figure 1, at first nodes will be created. Then it will create graph with these nodes .After that it will input source and destination. Then it will create graph with these nodes.After that it will input source and destination. Then it will goto next node in cyclic order.If destination is reached then it will deliver data and wait for next data. If destination is not reached then it will again goto next node in cyclic order. Following figure 3.1 shows Cyclic Graph Algorithm:-

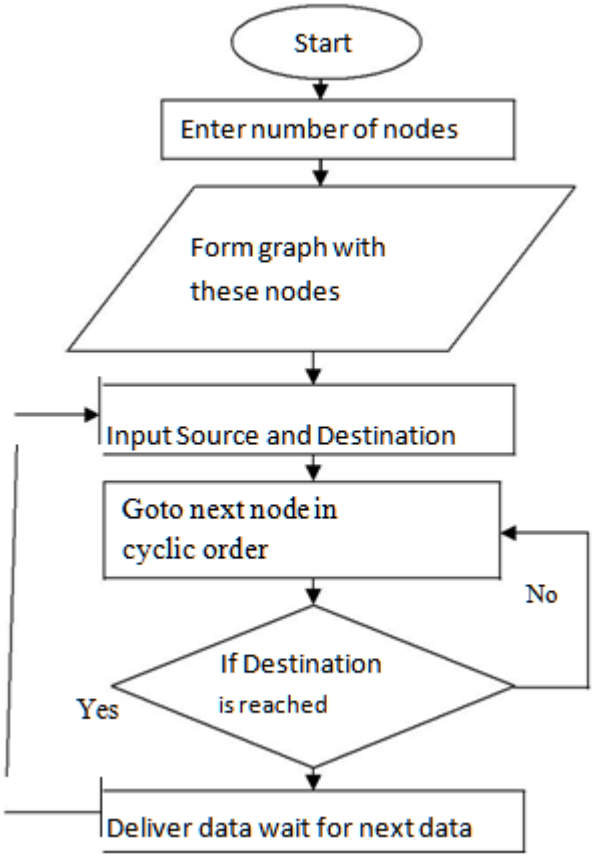

Figure3.1 Cyclic Graph Algorithm

IV. SIMULATION

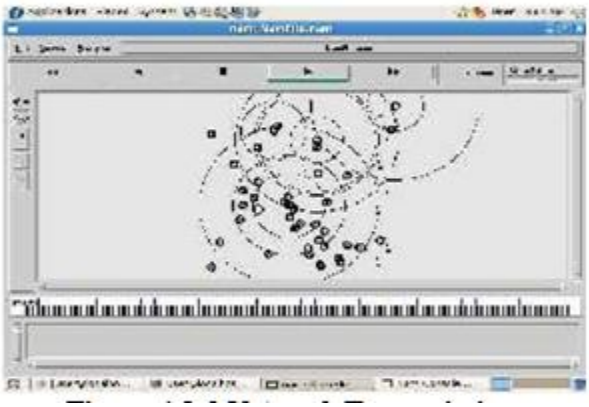

Figure 4.1.2 Network Transmission

Figure 4.1.2 shows communication between source and destination .It shows four data transfer .It shows communication between node 2 and node 4, node 3 and node 6, node 4 and node 7, node 5 and node8.The performance can be shown in figure below:-

The implementation of research methodology is been done through NS2.The parameters used are shown in figure 4.1.1 below:-

Figure 4.1.3 shows energy graph where X axis represents time and Y axis represents energy in joules. In figure 4.1.3, energy is increasing with respect to time.

Sr No	Parameter	Description
4.1	Routing Protocol	AODV
4.2	Transmission Range	250m
4.3	Nodes	30
4.4	Agents	UDP And Sink
4.5	Bounded Region	500*500
4.6	Mac Layer	802.11

Figure 4.1.1 Parameters Used

The performance of the proposed algorithm has been evaluated by considering network transmission and delay metric. The performance is shown in following
nam file:-

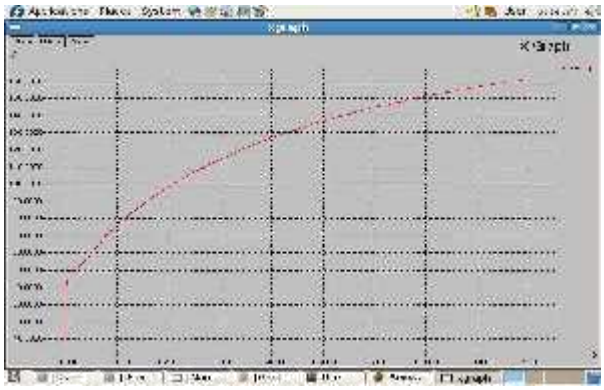

Figure 4.1.3 Energy Graph (Time Vs Energy)

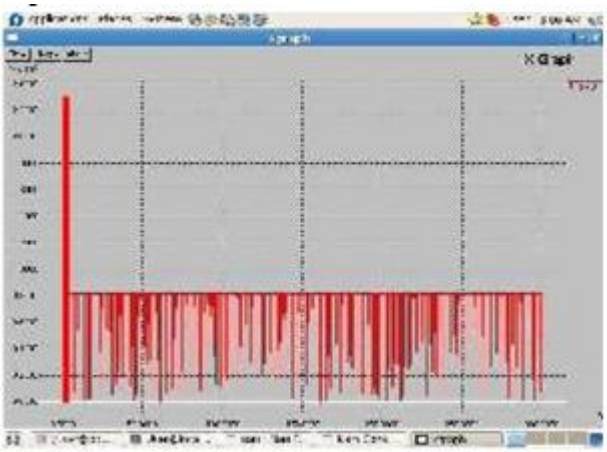

Figure 4.1.4 Delay Graph (Time Vs Delay)

Figure 4.1.4 shows an improvement in packet delay performance metric in wsn.By using above algorithm Performance of proposed algorithm is been increased. In figure 4.1.4, X axis represents time and Y axis represents delay in ms.

V. CONCLUSION

In the paper, TBM is been added to distributed multiagent distributed context based on tree topology. Static scenario is been considered where agents provide data that do not change over time. A cyclic graph algorithm is been designed to converge to basic belief assignment based on transferable belief model.A multiagent approach offer several advantages such as a larger range of task domain or higher range of robustness and flexibility.

The inherently distributed nature of these systems makes the design of effective algorithm very challenging as the overall performance depends significantly on interaction among agents.

REFERENCES

[1]. Andrea Gasspari, Flavio Fiorini, Maurizio Di Rocco and Stefano Panzieri" A Networked Transferable Belief Model Approach For Distributed Data" *IEEE TRANSACTION ON SYSTEMS,MAN AND CYBERNETICS,VOL 42 ,NO.2,April 2012*.

[2]. Mustafa Reda Senounci, Abelhamid Mellouk"An Evidence Based Sensor Coverage Model" *IEEE COMMUNICATION LETTERS, VOL 16, NO 9, September 2012*.

[3]. Sebastian Destercke and Thomas Burgur"Toward an Automatic Definition of Conflict between Belief Functions"*IEEE TRANSACTIONS ON CYBERNETICS, VOL 43, NO.2, APRIL 2013*.

[4]. Xiwei Liu, Wenlian Liu and Tianping Chen" Consensus of Multiagent System with Unbounded Time Varying Delays" *IEEE TRANSACTION ON AUTOMATIC CONTROL,VOL 55,NO 10,OCTOBER 2010.*

[5]. Youngwook Choi, Maleq Khan, Member IEEE, AnilKumar and Gopal Pandurangan"Energy-OptimalDistributed Algorithm For Minimum Spanning Trees"*IEEE JOURNALS ON SELECTED AREAS IN COMMUNICATION,VOL 27,NO.7,SEPTEMBER 2009.*

[6]. Darin England, Bhardwaj Veervalli, Jon B Weissman "A Robust Spanning Tree Topology for Data Collection and Dissemination in Distributed Environment"*IEEE TRANSACTION ON PARELLEL AND DISTRIBUTED SYSTEMS,VOL 18,NO 5,MAY 2007.*

[7]. Stephen Boyd, Fellow, IEEE, Arpita Ghosh, Student Member IEEE, Balaji Prabhakar, Member IEEE and Devavrat Shah "Randomized Gossip Algorithm" *IEEE TRANSACTIONS ON PARELLEL AND DISTRIBUTED SYSTEMS, VOL 18, NO 5, MAY 2007.*

[8]. Zied Elouedi, Khaled Mellouli and Philippe Smets "Assessing Sensor Reliability For Multisensor Data Fusion Within The Transferable Belief Model" *IEEE TRANSACTION ON SYSTEMS, MAN AND CYBERNETICS-PART B: CYBERNETICS, VOL 34, NO 1, FEBRUARY 2004.*

[9]. Dan, Jacques Nicol, Fouquet, Demongeot, Celine, Franco, and Bruno
[10]. Vuillerme"Estimation of Task Persistence Parameters from Pervasive Medical Systems With Censored
[11]. Data" *IEEE TRANSACTION ON MOBILE COMPUTING,VOL 12,NO 4,APRIL 2013.*

[12]. Yogen .K. Dalal, Member IEEE "A Distributed Algorithm for Constructing Minimal Spanning
[13]. Trees" *IEEE TRANSACTION ON SOFTWARE ENGINEERING, VOL SE-13, NO 3, MARCH 1987.*

[14]. Flavio Fiorini, Andrea Gasspari, Maurizio D
[15]. Rocco and Stefano Panzieri "A Networked
[16]. Transferable Belief Model Approach for Distributed Data Aggregation- Dynamic Version" *49th IEEE*
[17]. *TRANCSACTION ON DECISION AND CONTROL, VOL 15-17, DECEMBER 2010.*