International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

Analysis of Coalitional Game Methodology for Packet Delivery in MobileAdhoc Network

Golla Saidulu & Masku Naveen Kumar
[1]Assistant Professor, Dept of CSE, CMR College of Engineering And Technology
[2]Assistant Professor, Dept of CSE, SCIENT Institute of Technology

ABSTRACT: *We suggest ansolutionbased on a coalition formation among mobile nodes to cooperatively deliver packets among those mobile nodesinside the comparable coalition. To find out the payoff of every cellular node, a non-stop time Markov chain model isformulated and the anticipated value and packet sendingrescheduling are obtained whilst the mobile node is in acoalition. Because each the expected fee and packet delivery postpone depending on the possibility that every cellularnode will useful resource other mobile nodes inside the same coalition to forward packets to the destination mobile node in theequal coalition, a bargaining model sport is used to discover the fine supporting possibilities. Behind the payoff ofevery mobile node is acquired, we find out the resolutions of the coalitional game that are the constantcoalitions. A distributed algorithm is reachable to gain the constant coalitions and a Markov-chain-basedthe analysis is used to estimate the steady coalitional systems obtained from the distributed algorithm.*

KEYWORDS-

I. INTRODUCTION

Ad hoc networks are infrastructure-less multi-hop wirelessnetworks where each node participates in routing by forwarding data for other nodes. Those networks are self-organizingand are used when usual infrastructure is not available ornot suitable, e.g., in wireless sensor networks (WSN), vehicular networks (VANET), public protection and disaster relief(PPDR), or military systems. In order to implement practicallarge ad hoc networks, gathering nodes in clusters (calledclustering) was first proposed in the early 80s [1] for HFpacket radio networks, and has so far triggered a lot of workin the literature. For instance, it was proposed in the contextsof VANETs [2] and cognitive radio networks [3].

Most existing works about ad hoc network clustering havefocused on unstructured networks. For example in [4] theauthors propose the lowest identifier (LID) and highest degreeclustering (HC) algorithms where nodes with the lowest identifier, respectively the largest degree within their neighborhood,become cluster head (CH). To form the clusters, non-CHnodes affiliate to their neighbor CH with the lowest identifier,respectively the largest degree. The stability of the clustersformed with LID or HC, has been improved in [5] with theleast cluster change (LCC) mechanism that only performs reclustering when multiple CH nodes become neighbors. In thevote-based clustering (VOTE) proposal [6], non-CH nodesjoin a CH only if the number of its cluster members isbelow a threshold, thus limiting the cluster size. Based onthe knowledge of node location information, another approach[7] attempts to estimate the nodes relative mobilities and tocapture the mobility patterns to form stable clusters. For thesame purpose, the authors in [8] propose to build clusters usingpast, current and predicted nodes' positions through the helpof a learning automaton. The clustering algorithm defined in[9] uses a Gauss-Markov model to calculate the velocity anddirection of the nodes. The novelty of signal-attenuation awareclustering algorithm (SECA) [10] lies in the introduction oflink qualities (based on received signal strength) combinedwith the nodes relative mobilities, to determine if a node becomes CH. Authors in [11] use centralized genetic algorithmsand particle swarm optimization to select a stable CH.By contrast, only a few papers have tackled the problem ofclustering structured networks. The authors in [12] introducethe type-based clustering algorithm (TCA). This clusteringscheme associates a stability factor to each node and selects asCH the nodes that have the largest stability factor in a radioneighborhood. The stability factor takes group membershipinto account using the IP subnet of each node. A limitation of [4] TCA lies in the fact that two CH nodes cannot be neighbors.A

International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

direct consequence in dense networks is the formation oflarge clusters. A second example is detailed in [13] whichproposes a topology management mechanism for hierarchicalgroup oriented networks, where groups are based on geographical locations. In [14] we have proposed the so-calleddistributed clustering based on operational group algorithm.This algorithm forms size limited clusters whose membershipis close to the groups, and thus outperforms other clusteringalgorithms from the literature

II. PROPOSED WORK

The proposed framework will be practical for sustaining various mobile applications based ondistributed cooperative packet delivery.

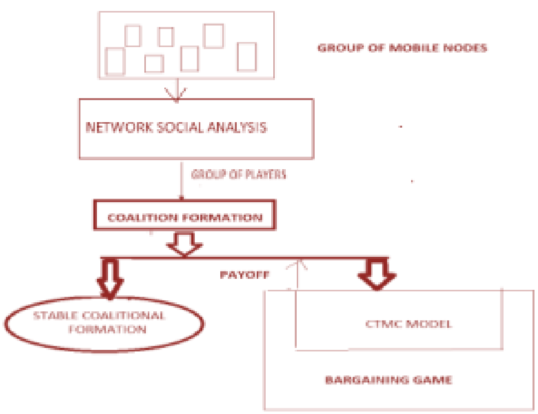

Fig.1. Block Diagram

Fig.1. Diagram showing the interrelationship among the three steps, namely, mobile node usingNSA,bargaining model game, and coalitional game.The proposed method consists of three interconnected steps as shown in Fig. 2. We initial use a NSAbased approach [8], [9], [10] to be familiar with which mobile nodes have the potential to aid other mobilenodes for data delivery in the similar group. After the NSA based mobile node grouping is finished, the mobilenodes in each group cooperate a coalitional game to obtain a constant coalitional structure. The payoff of everymobile node is a function of cost incurred by the mobile node in communicating packets and the release wait forpackets spreaded to this mobile node from a BS. A continuous-time Markov chain (CTMC) model [1] isoriginated to attain the expected cost and packet delivery delay for each mobile node in the similar coalition.Since the expected cost and packet delivery delay vary with the probability that each mobile node helps othermobile nodes deliver packets, a bargaining model game[11] , is used to find the best helping probabilities for allthe mobile nodes. For every mobile node, after the optimal probability of helping other mobile nodes isobtained, we can find out the payoff of every mobile node when it is a member of its current coalition. Itobtained from this game are used to determine the solution of the coalitional game in terms of stable coalitionalstructure. A distributed algorithm is used to attain the solution of the coalitional game and a Markov chain-basedanalysis is presented to evaluate the stable coalitional structures obtained from the distributed algorithm.We suppose that the packets are not instantly discarded from the cache of the BSs or the mobile nodes after theyare throw or promoted. In addition, there is a controller at the submission server which gather mobilityinformation of the nodes by using the subsequent method:

- When the mobile nodes meet each other, they make a proof of the time they meet.
- Given a definite time period (e.g., 1 hour), the mobile nodes compute the meet rate with other nodes byseparating the number of meet by the length of the time period.
- The mobile nodes provide the meet ratein sequence to the controller at thesubmission server irregularly.
- The controller maintains a record of the meet rate information for all the mobile nodes in the network,and this record is used for network social analysis (NSA). Also, the controller manages the informationswap among the base stations or access points.

III. SIMULATION RESULTS

In this section, we present a process for mobile node grouping based on social network investigation.The main difficulty of coalition structure is that the computational complexity increases exponentially when thenumber of nodes increases [5], [12]. that's why, the most important purpose of the anticipated NSA-basedmobile node grouping is to decrease the complexity of coalition structure when there are various mobile nodesparticipating in the supportive information delivery scheme. The key method of the NSA-based mobile nodegrouping is to sort out several mobile nodes which will not give to the supportive packet delivery(i.e., to splitthe mobile nodes into multiple social groups in which mobile nodes in a social group do not help with themobile nodes in another social group). A social network or a group is collected of nodes and ties. In thisrepresentation, every mobile node is a node and interaction of mobile nodes are ties. Whether or not a tie will berecognized between two nodes can be resoluted by using centrality metrics used in graph hypothesis andnetwork investigation. Centrality is a quantification of the relative consequence of a highest point within thegraph (e.g., how important a node is within a social group). We recognize how every node is important to othersbased on the Poisson modeling of the network which is called Poisson process based centrality. To recognizegroups of mobile nodes using their Poisson process-based centrality, we suggest an algorithm which ensures thatfor each mobile node in the same group, the possibility that the packet delivery postponement residues below anecessary time interval, can be maintained above a end threshold. Many mobile nodes can assist and appearancecoalitions.We presume that every mobile node in the equal coalition will bring and onward packets to othermobile nodes when they gather each other. Each mobile node k IN={1….N} has a communication range of gkmeters. We believe that over a period of time (e.g., 1 hour), we can expect the mobility and interencounter timepattern of every mobile node.Due to the property of speed and density of mobile nodes, the meet-associatedstatistical data may differ [21]. In such a case, the mobility and interencounter time pattern of mobile nodescomposed through a small time period can be uttered as temporary social make contact with pattern which canbe more useful than the increasing contact pattern to recover bring-and-onward-based data delivery [22]. Letmobile node k meet another mobile node i on the path with rate rki=rik per unit of point in time and the numberof encounters between mobile node k and mobile node i during a period of time is nki= nik. Let rk0 and r0k bethe rates that mobile node k assembles the base station and vice versa. Note that "0" is used as the index of anybase station and its transmission range is g0. The encounter method for every couple of nodes is implicit topursue a Poisson process and the encounter rate is used as the matching constraint. For the encounter process,that the stochastic properties can be characterized by the Poisson hypothesis, was acceptable in [23], [24]. It wasgiven away that the encounters between a couple of mobile nodes pursue a Poisson distribution if the nodesmove in a narrow region. every mobile node k is preparing to help other mobile nodes to deliver packets withprobability pk (i.e., pk = 1 if mobile node i always receives information packets, bring, and forwards them toother mobile nodes). Any mobile node k receives packet(s) from a BS or from other mobile node i in the similarcoalition at the cost of crki per packet. Mobile node k then forwards the packet(s) to its destination or to anothermobile node i'in the similar coalition at the cost of c^{f}_{ki}' per packet We suppose that every mobile is capable toidentify whether the other mobile nodes have the similar packet(s)

Algorithms 1 under recognizes the collection of mobile nodes.

The nodes in such a collection are the players in the bargaining model game and the coalitional game. In thisalgorithm, IN denotes the location of all mobile nodes and XK is a vector denoting the relationship of mobilenode k with other mobile nodes.

Algorithm 1.NSA-based mobile node grouping algorithm.

1: Exchange profile information (i.e., encounter information) among mobile nodes. Set S = // a temporary variable.

2: Initialize locate of associations for all mobile nodes, i.e.,X_K = , k IN

3: for each mobile node k IN ={1……..N}

4: S=S {k}

5: for each mobile node I IN \ S

6: if($P_{ki}(T_{0k} + T_{ki} < T_i) \geq w_k$ and $Pik(T_{0k} + T_{ki} < T_i) \geq w_i$ and $n_{ki} > n_{th}$)

7: Add mobile node i to mobile node k's set of relationships and vice versa

8: $S_k = S_k$ *( )+

9: $S_i = S_j$ *( )+

10: end

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

11: end
12: end
13: Use the sets of relationships X_k of all the mobile nodes to build a graph G(A,I)
14: Set the vertices of the graph A=IN (i.e., vertices are the mobile nodes)
15: Set the edges of the graph $I = U^{N}_{k=1}x_k$(i.e., edges are the mobile nodes' relationships)
16: Identify each group k of mobile nodes,
IMj where jIMj =IN, which is a maximal complete clique or subgraph in the graph G(A,I) obtained byusing algorithms such as those in [20].
.

IV. CONCLUSION

We have provided a coalitional game framework for bring-and-ahead-based cooperative packetdelivery to cellular nodes in a community. The mobile nodes are coherent to form coalitions to maximise theirindividual payoffs. First, a continuous-time Markov chain version has been evolved to obtain the packetdelivery put off and the predicted value of cell nodes for cooperative packet delivery. The packet delivery waitand the predictable fee rely on the opportunity that each mobile node will assist other mobile nodes inside thesame coalition. Then, a bargaining model game has been formulated to locate the finest supporting possibilities forall the mobile nodes. Based on the packet delivery put off and expected value, a coalitional recreation has beenformulated to model the selection making the technique of mobile nodes, that is, whether or not they will cooperativelydeliver packets to different mobile nodes or no longer. A solid coalitional shape (i.e., set of coalitions) has beenconsidered as the answer of this coalitional sport. Using the coalitional game version, the performance ofcooperative packet shipping has been analyzed in terms of common packet delivery delay.

REFERENCES

[1] KhajonpongAkkarajitsakul, EkramHossain And DusitNiyato," Cooperative Packet Delivery In Hybrid Wireless MobileNetworks: A Coalitional Game Approach," IEEE Transactions On Mobile Computing, Vol. 12, No. 5, May 2013.

[2] T. Yamada, R. Shinkuma, and T. Takahashi, "Connectivity and Throughput Enhancement by Inter-Vehicle Packet Relay in RoadVehicle Comm. Systems," Proc. IEEE Global Telecomm. Conf., pp. 1-5, Nov./Dec. 2006.

[3] Y. Yamao and K. Minato, "Vehicle-Roadside-Vehicle Relay Communication Network Employing Multiple Frequencies andRouting Function," Proc. Sixth Int'l Symp. Wireless Comm. Systems, pp. 413-417, Sept. 2009.

[4] H. Su and X. Zhang, "Clustering-Based Multichannel MAC Protocols for QoSProvisionings over Vehicular Ad HocNetworks,"IEEE Trans. Vehicular Technology, vol. 56, no. 6, pp. 3309-3323, Nov. 2007.

[5] W. Saad, Z. Han, M. Debbah, A. Hjørungnes, and T. Basar, "Coalitional Game Theory for Communication Networks: A Tutorial,"IEEE Signal Processing Magazine, vol. 26, no. 5, pp. 77-97, Sept. 2009.

[6] D. Niyato, P. Wang, W. Saad, and A. Hjørungnes, "Coalition Formation Games for Bandwidth Sharing in Vehicle-to-RoadsideCommunications," Proc. IEEE Wireless Comm. and Networking Conf.(WCNC), pp. 1-5, Apr. 2010.

[7] W. Saad, Z. Han, A. Hjørungnes, D. Niyato, and E. Hossain,"Coalition Formation Games for Distributed Cooperation AmongRoadside Units in Vehicular Networks," IEEE J. Selected Areas in Comm., vol. 29, no. 1, pp. 48-60, Jan. 2011.

[8] W. Gao, Q. Li, B. Zhao, and G. Cao, "Multicasting in Delay Tolerant Networks: A Social Network Perspective," Proc. ACMMobiHoc, pp. 299-308, May 2009.

[9] E. Daly and M. Haahr, "Network social analysis for Routing in Disconnected Delay-Tolerant MANETs," Proc. ACM MobiHoc,pp.32-40, Sept. 2007.

[10] S. Pai, T. Roosta, S. Wicker, and S. Sastry, "Using Social Network Theory Towards Development of Wireless Ad Hoc NetworkTrust,"

e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 04 Issue14
November 2017

Proc. 21st Int'l Conf. Advanced Information Networking and Applications Workshops, pp. 443-450, May 2007.

[11] S.-L. Hew and L. White, "Cooperative Resource Allocation Games in Shared Networks: Symmetric and Asymmetric FairBargaining model Models," IEEE Trans. Wireless Comm., vol. 7, no. 11, pp. 4166-4175, Nov. 2008.

[12] D. Li, Y. Xu, X. Wang, and M. Guizani, "Coalitional Game Theoretic Approach for Secondary Spectrum Access in CooperativeCognitive Radio Networks," IEEE Trans. Wireless Comm., vol. 10, no. 3, pp. 844-856, Mar. 2011.

[13] K.R. Apt and A. Witzel, "A Generic Approach to Coalition Formation," Proc. First Int'l Workshop Computational Social Choice(COMSOC), pp. 21-34, Dec. 2006.

[14] D. Krajzewicz, G. Hertkorn, C. Ro¨ ssel, and P. Wagner, "SUMO (Simulation of Urban MObility): An Open-Source TrafficSimulation,"Proc. Fourth Middle East Symp. Simulation and Modelling (MESM '02), pp. 183-187, Sept. 2002.

[15] R.J. Aumann and J.H. Dr_eze. Cooperative games with coalition structures.International Journal of Game Theory, 3:217{237, 1974.

[16] J. Greenberg. Coalition structures. In R.J. Aumann and S. Hart, editors,Handbook of Game Theory with Economic Applications,volume 2 of Handbook of Game Theory with Economic Applications, chapter 37, pages1305{1337. Elsevier, 1994.

[17] S.S. Yi. Stable coalition structures with externalities. Games and Economic Behavior, 20:201{237, 1997.

[18] D. Ray and R. Vohra. Equilibrium binding agreements. Journal of Economicn Theory, (73):30{78, 1997.

[19] A. Bogomolnaia and M. Jackson. The stability of hedonic coalition structures.Games and Economic Behavior, 38(2):201230,2002.

[20] X. Cao, "Preference functions and bargaining model solutions," in Proc. CDC-21, Orlando, FL., Dec. 1982.

[21] T. Spyropoulos, A. Jindal, and K. Psounis, "An Analytical Study of Fundamental Mobility Properties for Encounter-BasedProtocols," Int'l J. Autonomous and Adaptive Comm. Systems, vol. 1, no. 1, pp. 4-40, July 2008.

[22] W. Gao and G. Cao, "On Exploiting Transient Contact Patterns for Data Forwarding in Delay Tolerant Networks,"Proc. IEEE 18thInt'l Conf. Network Protocols (ICNP), pp. 193-202, Oct. 2010.

[23] Z. Xinjuan and X. Bo, "A Traffic Resource Diffusion Scheme in Vehicular Networks," Proc. Int'l Forum onInformationTechnology and Applications, pp. 318-321, May 2009.

[24] R. Groenevelt, P. Nain, and G. Koole, "The Message Delay in Mobile Ad Hoc Networks," Elsevier J. Performance Evaluation, vol.62, nos. 1-4, pp. 210-228, Oct. 2005.

BIODATA

Golla Saidulu working as Assistant Professor, Dept of CSE, in CMR College of Engineering And Technology with Experience of 3.6 years.

Masku Naveen Kumar working as Assistant Professor, Dept of CSE, in SCIENT Institute of Technology with Experience of 2 years.