

< Back to results | 1 of 2 Next >


Export Download Print E-mail Save to PDF Add to List More... >

[Full Text](#) View at Publisher

Lecture Notes in Networks and Systems  
Volume 70, 2020, Pages 1106-1122

## Bayesian signaling game based efficient security model for MANETs

(Book Chapter)

Olanrewaju, R.F.<sup>a</sup>, Khan, B.U.I.<sup>a</sup> ✉, Anwar, F.<sup>a</sup>, Mir, R.N.<sup>b</sup>, Yaacob, M.<sup>a</sup>, Mehraj, T.<sup>c</sup> 

<sup>a</sup>Department of ECE, Kulliyah of Engineering, UIAM, Gombak, Malaysia

<sup>b</sup>Department of CSE, National Institute of Technology, Srinagar, Kashmir, India

<sup>c</sup>Department of ECE, Islamic University of Science and Technology, Pulwama, Kashmir, India


### Abstract

[View references \(46\)](#)

Game Theory acts as a suitable tool offering promising solutions to security-related concerns in Mobile Ad Hoc Networks (i.e., MANETs). In MANETs, security forms a prominent concern as it includes nodes which are usually portable and require significant coordination between them. Further, the absence of physical organisation makes such networks susceptible to security breaches, hindering secure routing and execution among nodes. Game Theory approach has been manipulated in the current study to achieve an analytical view while addressing the security concerns in MANETs. This paper offers a Bayesian - Signaling game model capable of analysing the behaviour associated with regular as well as malicious nodes. In the proposed model, the utility of normal nodes has been increased while reducing the utility linked to malicious nodes. Moreover, the system employs a reputation system capable of stimulating best cooperation between the nodes. The regular nodes record incessantly to examine their corresponding nodes' behaviours by using the belief system of Bayes-rules. On its comparison with existing schemes, it was revealed that the presented algorithm provides better identification of malicious nodes and attacks while delivering improved throughput and reduced false positive rate. © Springer Nature Switzerland AG 2020.

### SciVal Topic Prominence

Topic: Mobile ad hoc networks | Routing protocols | Hole attacks

Prominence percentile: 96.378 

### Author keywords

Bayesian signaling model

Bayesian -Equilibrium game theory

MANETs

Secure routing protocol

### Funding details

Funding sponsor	Funding number	Acronym
Ministry of Higher Education, Malaysia	P-RIGS19-020-0020	

### Funding text

Acknowledgments. This work was supported by Ministry of Higher Education Malaysia (Kementerian Pendidikan Tinggi) under Research Initiative Grant Scheme number P-RIGS19-020-0020.

ISSN: 23673370

Source Type: Book series

Original language: English


DOI: 10.1007/978-3-030-12385-7\_75

Document Type: Book Chapter

Publisher: Springer

### References (46)

[View in search results format >](#)

Metrics  [View all metrics >](#)

1 Citation in Scopus

0 Field-Weighted  
Citation Impact



PlumX Metrics 

Usage, Captures, Mentions,  
Social Media and Citations  
beyond Scopus.

### Cited by 1 document

ECM-GT: Design of efficient computational modelling based on game theoretical approach towards enhancing the security solutions in MANET

Khan, B.U.I., Olanrewaju, R.F., Anwar, F.

(2019) *International Journal of Innovative Technology and Exploring Engineering*

[View details of this citation](#)

Inform me when this document is cited in Scopus:

[Set citation alert >](#)

[Set citation feed >](#)

### Related documents

ECM-GT: Design of efficient computational modelling based on game theoretical approach towards enhancing the security solutions in MANET

Khan, B.U.I., Olanrewaju, R.F., Anwar, F.

(2019) *International Journal of Innovative Technology and Exploring Engineering*

A survey on MANETs: Architecture, evolution, applications, security issues and solutions

Ul Islam Khan, B., Olanrewaju, R.F., Anwar, F.

(2018) *Indonesian Journal of Electrical Engineering and Computer Science*

Strategic profiling for behaviour visualization of malicious node in manets using game theory

- 1 Cheng, X., Huang, X., Du, D.Z.  
(2013) *Ad Hoc Wireless Networking*. Cited 35 times.  
Springer Science & Business Media, United States

View all related documents based on references

- 2 Ma, Y., Jia, Z.  
Evolution and trends of broadband access technologies and fibre-wireless systems  
(2017) *Fiber-Wireless Convergence in Next-Generation Communication Networks*, pp. 43-75. Cited 2 times.  
pp., Springer, Cham

Find more related documents in Scopus based on:

Authors >    Keywords >

- 3 Huang, J.-H., Wang, L.-C., Chang, C.-J.  
Architectures and deployment strategies for wireless mesh networks  
  
(2007) *Wireless Mesh Networks: Architectures and Protocols*, pp. 29-56. Cited 2 times.  
<http://www.springerlink.com/openurl.asp?genre=book&isbn=978-0-387-68838-1>  
ISBN: 978-038768838-1  
doi: 10.1007/978-0-387-68839-8\_2

[View at Publisher](#)

- 4 Olanrewaju, R.F., Khan, B.U.I., Anwar, F., Khan, A.R., Shaikh, F.A., Mir, M.S.  
MANET– A cogitation of its design and security issues  
(2016) *Middle-East J. Sci. Res.*, 24 (10), pp. 3094-3107. Cited 2 times.

- 5 Ghosekar, P., Katkar, G., Ghorpade, P.  
Mobile ad hoc networking: Imperatives and challenges  
(2010) *IJCA (Special Issue on Manets)*, 3, pp. 153-158. Cited 49 times.

- 6 Hogie, L., Bouvry, P., Guinand, F.  
An overview of MANETs simulation ([Open Access](#))  
  
(2006) *Electronic Notes in Theoretical Computer Science*, 150 (1), pp. 81-101. Cited 52 times.  
doi: 10.1016/j.entcs.2005.12.025

[View at Publisher](#)

- 7 Suri, P.R., Rani, S.  
Bluetooth network-The Adhoc network concept (non-refereed)  
  
(2007) *Conference Proceedings - IEEE SOUTHEASTCON*, art. no. 4147524, p. 720. Cited 3 times.  
ISBN: 1424410290; 978-142441029-3  
doi: 10.1109/SECON.2007.342994

[View at Publisher](#)

- 8 Khan, B.U.I., Olanrewaju, R.F., Ali, N.A., Shah, A.  
ElePSO: Energy-aware elephant swarm optimization for mobile ad-hoc network  
(2014) *Pensee J*, 76 (5), pp. 88-103. Cited 4 times.

- 9 Khan, B.U.I., Olanrewaju, R.F., Anwar, F., Shah, A.  
Manifestation and mitigation of node misbehaviour in ad-hoc networks  
(2014) *Wulfenia J*, 21 (3), pp. 462-470. Cited 5 times.

- 
- 10 Khan, B.U.I., Olanrewaju, R.F., Habaebi, M.H.  
Malicious behaviour of node and its significant security techniques in MANET—A review  
(2013) *Aust. J. Basic Appl. Sci.*, 7 (12), pp. 286-293. Cited 7 times.
- 
- 11 Khan, B.U.I., Olanrewaju, R.F., Mir, R.N., Baba, A., Adebayo, B.W.  
Strategic profiling for behaviour visualization of malicious node in manets using game theory  
(2015) *Journal of Theoretical and Applied Information Technology*, 77 (1), pp. 25-43. Cited 6 times.  
<http://www.jatit.org/volumes/Vol77No1/4Vol77No1.pdf>
- 
- 12 Khan, B.U.I., Olanrewaju, R.F., Mir, R.N., Yusoff, S.H., Sanni, M.L.  
Trust and resource oriented communication scheme in mobile ad hoc networks  
(2018) *Studies in Computational Intelligence*, 751, pp. 414-430. Cited 3 times.  
<http://www.springer.com/series/7092>  
ISBN: 978-331969265-4  
doi: 10.1007/978-3-319-69266-1\_20  
  
View at Publisher
- 
- 13 Ul Islam Khan, B., Olanrewaju, R.F., Anwar, F., Najeeb, A.R., Yaacob, M.  
A survey on MANETs: Architecture, evolution, applications, security issues and solutions (Open Access)  
(2018) *Indonesian Journal of Electrical Engineering and Computer Science*, 12 (2), pp. 832-842. Cited 4 times.  
<http://iaescore.com/journals/index.php/IJECS/issue/archive>  
doi: 10.11591/ijeecs.v12.i2.pp832-842  
  
View at Publisher
- 
- 14 Olanrewaju, R.F., Khan, B.U.I., Najeeb, A.R., Zahir, K.N., Hussain, S.  
Snort-based smart and swift intrusion detection system  
(2018) *Indian J. Sci. Technol.*, 11 (4), pp. 1-9. Cited 4 times.
- 
- 15 Rath, M., Panigrahi, C.R.  
Prioritization of Security Measures at the Junction of MANET and IoT  
(2016) *ACM International Conference Proceeding Series*, 04-05-March-2016, art. no. a127. Cited 2 times.  
<http://portal.acm.org/>  
ISBN: 978-145033962-9  
doi: 10.1145/2905055.2905187  
  
View at Publisher
- 
- 16 Bellavista, P., Cardone, G., Corradi, A., Foschini, L.  
Convergence of MANET and WSN in IoT urban scenarios  
(2013) *IEEE Sensors Journal*, 13 (10), art. no. 6552998, pp. 3558-3567. Cited 157 times.  
doi: 10.1109/JSEN.2013.2272099  
  
View at Publisher
- 
- 17 Olanrewaju, R.F., Khan, B.U.I., Mir, R.N., Shah, A.  
Behaviour visualization for malicious-attacker node collusion in MANET based on probabilistic approach  
(2015) *Am. J. Comput. Sci. Eng.*, 2 (3), pp. 10-19. Cited 7 times.
-

- 18 Olanrewaju, R.F., Mechraoui, A.L., Khan, B.U.I.  
Game theory probabilistic application to detect misbehaving nodes in ad-hoc networks  
*In: Proceedings of the 2Nd IEEE International Conference on Intelligent Systems Engineering (ICISE), Kuala Lumpur, Malaysia, 20.*
- 
- 19 Tantubay, N., Gautam, D.R., Dhariwal, M.K.  
A review of power conservation in wireless mobile ad-hoc network (MANET)  
(2011) *Int. J. Comput. Sci. Issues (IJCSI)*, 8 (4), pp. 378-383. Cited 11 times.
- 
- 20 Arulanandam, K., Parthasarathy, B.  
A new energy level efficiency issues in MANET  
(2009) *Int. J. Rev. Comput.*, 1 (5), pp. 104-109. Cited 10 times.
- 
- 21 Singh, G., Singh, J.  
MANET: Issues and behavior analysis of routing protocols  
(2012) *Int. J. Adv. Res. Comput. Sci. Softw. Eng.*, 2 (4), pp. 219-227. Cited 9 times.
- 
- 22 Parvez, J., Peer, M.A.  
A comparative analysis of performance and QoS issues in MANETs  
(2010) *World Acad. Sci. Eng. Technol.*, 48, pp. 937-948. Cited 8 times.
- 
- 23 Khan, B.U.I., Olanrewaju, R.F., Baba, A.M., Mir, R.N., Lone, S.A.  
DTASR: Dual threshold-based authentication for secure routing in mobile ad-hoc network  
(2016) *World Eng. Appl. Sci. J.*, 7 (2), pp. 68-73. Cited 3 times.
- 
- 24 Khan, B.U.I., Zulkarnain, N.F., Olanrewaju, R.F., Nissar, G., Baba, A.M., Lone, S.A.  
JIR2TA: Joint invocation of resource-based thresholding and trust-oriented authentication in mobile ad-hoc network  
(2016) *Proceedings of SAI Intelligent Systems Conference*, pp. 689-701. Cited 3 times.  
pp., Springer, Cham
- 
- 25 Khan, B.U.I., Olanrewaju, R.F., Mattoo, M.U., Aziz, A.A., Lone, S.A.  
Modeling malicious multi-attacker node collusion in MANETs via game theory  
(2017) *Middle-East J. Sci. Res.*, 25 (3), pp. 568-579. Cited 4 times.
- 
- 26 Khan, B.U.I., Olanrewaju, R.F., Baba, A.M., Zulkarnain, N.F., Lone, S.A.  
STCM: Secured trust-based communication method in vulnerable mobile adhoc network  
  
(2017) *Lecture Notes in Electrical Engineering*, 398, pp. 149-161. Cited 3 times.  
<http://www.springer.com/series/7818>  
ISBN: 978-981101719-3  
doi: 10.1007/978-981-10-1721-6\_17  
  
View at Publisher
-

- 27 Ilavendhan, A., Saruladha, K.  
Comparative study of game theoretic approaches to mitigate network layer attacks in VANETs ([Open Access](#))  
  
(2018), 4 (1), pp. 46-50. Cited 5 times.  
<https://www.journals.elsevier.com/jict-express/>  
doi: 10.1016/j.jicte.2017.12.002  
  
[View at Publisher](#)
- 
- 28 Javidi, M.M., Aliahmadipour, L.  
Game theory approaches for improving intrusion detection in MANETs  
  
(2011) *Scientific Research and Essays*, 6 (31), pp. 6535-6539. Cited 7 times.  
<http://www.academicjournals.org/sre/PDF/pdf2011/16Dec/Javidi%20and%20Aliahmadipour.pdf>  
doi: 10.5897/SRE11.1479  
  
[View at Publisher](#)
- 
- 29 Janzadeh, H., Fayazbakhsh, K., Dehghan, M., Fallah, M.S.  
A secure credit-based cooperation stimulating mechanism for MANETs using hash chains  
  
(2009) *Future Generation Computer Systems*, 25 (8), pp. 926-934. Cited 45 times.  
doi: 10.1016/j.future.2008.12.002  
  
[View at Publisher](#)
- 
- 30 Panaousis, E.A., Politis, C.  
A game theoretic approach for securing AODV in emergency mobile ad hoc networks  
  
(2009) *Proceedings - Conference on Local Computer Networks, LCN*, art. no. 5355020, pp. 985-992. Cited 20 times.  
ISBN: 978-142444488-5  
doi: 10.1109/LCN.2009.5355020  
  
[View at Publisher](#)
- 
- 31 Wang, K., Wu, M.  
Nash equilibrium of node cooperation based on metamodel for MANETs  
  
(2012) *Journal of Information Science and Engineering*, 28 (2), pp. 317-333. Cited 17 times.  
[http://www.iis.sinica.edu.tw/page/jjise/2012/201203\\_05.pdf](http://www.iis.sinica.edu.tw/page/jjise/2012/201203_05.pdf)
- 
- 32 Li, F., Yang, Y., Wu, J.  
Attack and flee: Game-theory-based analysis on interactions among nodes in MANETs  
  
(2010) *IEEE Transactions on Systems, Man, and Cybernetics, Part B: Cybernetics*, 40 (3), art. no. 5357462, pp. 612-622. Cited 50 times.  
doi: 10.1109/TSMCB.2009.2035929  
  
[View at Publisher](#)
- 
- 33 Liu, Y., Comaniciu, C., Man, H.  
A Bayesian game approach for intrusion detection in wireless ad hoc networks  
(2006) *Proceeding from the 2006 Workshop on Game Theory for Communications and Networks*, 4. Cited 90 times.  
ACM
-

- 34 Marchang, N., Tripathi, R.  
A game theoretical approach for efficient deployment of intrusion detection system in mobile ad hoc networks  
*(2007) Proceedings of the 15th International Conference on Advanced Computing and Communications, ADCOM 2007*, art. no. 4426012, pp. 460-464. Cited 14 times.  
ISBN: 0769530591; 978-076953059-8
- 
- 35 Li, Z., Shen, H.  
Game-theoretic analysis of cooperation incentive strategies in mobile ad hoc networks  
*(2012) IEEE Transactions on Mobile Computing*, 11 (8), art. no. 5963685, pp. 1287-1303. Cited 109 times.  
doi: 10.1109/TMC.2011.151  
[View at Publisher](#)
- 
- 36 Manshaei, M.H., Zhu, Q., Alpcan, T., Basar, T., Hubaux, J.-P.  
Game theory meets network security and privacy  
*(2013) ACM Computing Surveys*, 45 (3), art. no. 25. Cited 324 times.  
doi: 10.1145/2480741.2480742  
[View at Publisher](#)
- 
- 37 Theodorakopoulos, G., Baras, J.S.  
Malicious users in unstructured networks  
*(2007) Proceedings - IEEE INFOCOM*, art. no. 4215690, pp. 884-891. Cited 26 times.  
ISBN: 1424410479; 978-142441047-7  
doi: 10.1109/INFOCOM.2007.108  
[View at Publisher](#)
- 
- 38 Wang, B., Ji, Z., Liu, K.J.R.  
Self-learning repeated game framework for distributed primary-prioritized dynamic spectrum access  
*(2007) 2007 4th Annual IEEE Communications Society Conference on Sensor, Mesh and Ad Hoc Communications and Networks, SECON*, art. no. 4292875, pp. 631-638. Cited 19 times.  
ISBN: 1424412684; 978-142441268-6  
doi: 10.1109/SAHCN.2007.4292875  
[View at Publisher](#)
- 
- 39 Hamdi, M., Abie, H.  
Game-based adaptive security in the Internet of Things for eHealth  
*(2014) 2014 IEEE International Conference on Communications, ICC 2014*, art. no. 6883437, pp. 920-925. Cited 38 times.  
ISBN: 978-147992003-7  
doi: 10.1109/ICC.2014.6883437  
[View at Publisher](#)
- 
- 40 Abegunde, J., Xiao, H., Spring, J.  
A dynamic game with adaptive strategies for IEEE 802.15.4 and IoT  
*(2016) Proceedings - 15th IEEE International Conference on Trust, Security and Privacy in Computing and Communications, 10th IEEE International Conference on Big Data Science and Engineering and 14th IEEE International Symposium on Parallel and Distributed Processing with Applications, IEEE TrustCom/BigDataSE/ISPA 2016*, art. no. 7846982, pp. 473-480. Cited 3 times.  
ISBN: 978-150903205-1  
doi: 10.1109/TrustCom.2016.0099  
[View at Publisher](#)
-

- 41 La, V.H., Cavalli, A.R.  
A Misbehavior Node Detection Algorithm for 6LoWPAN Wireless Sensor Networks

(2016) *Proceedings - 2016 IEEE 36th International Conference on Distributed Computing Systems Workshops, ICDCSW 2016*, art. no. 7756208, pp. 49-54. Cited 3 times.  
ISBN: 978-150901482-8  
doi: 10.1109/ICDCSW.2016.11

[View at Publisher](#)

- 42 Das, D., Majumder, K., Dasgupta, A.  
Selfish Node Detection and Low Cost Data Transmission in MANET using Game Theory ([Open Access](#))

(2015) *Procedia Computer Science*, 54, pp. 92-101. Cited 16 times.  
<http://www.sciencedirect.com/science/journal/18770509>  
doi: 10.1016/j.procs.2015.06.011

[View at Publisher](#)

- 43 Taheri, Y., Garakani, H.G., Mohammadzadeh, N.  
A game theory approach for malicious node detection in MANETs

(2016) *Journal of Information Science and Engineering*, 32 (3), pp. 559-573. Cited 5 times.  
[http://www.iis.sinica.edu.tw/page/jjise/2016/201605\\_03.pdf](http://www.iis.sinica.edu.tw/page/jjise/2016/201605_03.pdf)

- 44 Rajkumar, B., Narsimha, G.  
Trust Based Certificate Revocation for Secure Routing in MANET ([Open Access](#))

(2016) *Procedia Computer Science*, 92, pp. 431-441. Cited 11 times.  
<http://www.sciencedirect.com/science/journal/18770509>  
doi: 10.1016/j.procs.2016.07.334


[View at Publisher](#)

- 45 Sengathir, J., Manoharan, R.  
Security algorithms for mitigating selfish and shared root node attacks in MANETs  
(2013) *Int. J. Comput. Netw. Inf. Secur.*, 5 (10), pp. 1-10. Cited 6 times.

- 46 Paramasiva, B., Pitchai, K.M.  
Modeling intrusion detection in mobile ad hoc networks as a non cooperative game

(2013) *Proceedings of the 2013 International Conference on Pattern Recognition, Informatics and Mobile Engineering, PRIME 2013*, art. no. 6496490, pp. 300-306. Cited 9 times.  
ISBN: 978-146735845-3  
doi: 10.1109/ICPRIME.2013.6496490

[View at Publisher](#)

 Burhan ul Islam Khan, ; Department of ECE, Kulliyah of Engineering, UIAM, Gombak, Malaysia;  
email:burhan.iium@gmail.com

© Copyright 2019 Elsevier B.V., All rights reserved.

[< Back to results](#) | 1 of 2 [Next >](#)

[^ Top of page](#)

## About Scopus

[What is Scopus](#)  
[Content coverage](#)  
[Scopus blog](#)  
[Scopus API](#)  
[Privacy matters](#)

## Language

[日本語に切り替える](#)  
[切换到简体中文](#)  
[切换到繁體中文](#)  
[Русский язык](#)

## Customer Service

[Help](#)  
[Contact us](#)

