

intention sequence patterns under the condition that $Min_Support$ is 40% and 50%. Hence, the $Min_Support$ of User #2 is 30%. Similarly, the intention sequence patterns of other users and final selection of $Min_Support$ in MSNs can be concluded.

6 CONCLUSIONS

The existing MSNs environment increasingly requires situation awareness. Users' environment and behavior are dynamic, and an individual's intention is also to change. In order to adapt to the dynamic changes of user identities in the social domain, this paper extends and enriches the *Situ* theory, and builds a *SocialSitu* framework for the social media networks. We design and achieve the intention serialization algorithm in multimedia social networks. The user's frequent intention sequence mode is obtained through the intention serialization algorithm. When the user's identify changes, we conclude his behavior pattern with different ID, and prove that different *SocialSitu(t)* sequences are acquired in the same $Min_Support$ with the same intention when his role and group change. In the future works, the existing intention sequence patterns of the user could be adopted to predict the user's more and deeper intentions. Besides, we will employ the *SocialSitu* and the proposed algorithm to improve multimedia recommendation system and some killer applications in MSNs.

7 ACKNOWLEDGMENTS

We give thanks to Fangyun Liu, Cheng Li and Peining Shi for their technical assistances on CyVOD MSN and its mobile app prototypes, and also would like to thank the reviewers and editor for their valuable comments, questions, and suggestions. The work was sponsored by National Natural Science Foundation of China Grant No.61370220, Plan For Scientific Innovation Talent of Henan Province Grant No.174200510011, Program for Innovative Research Team (in Science and Technology) in University of Henan Province Grant No.15IRTSTHN010, Program for Henan Province Science and Technology Grant No.142102210425, Natural Science Foundation of Henan Province Grant No.162300410094, and Project of the Cultivation Fund of Science and Technology Achievements of Henan University of Science and Technology Grant No.2015BZCG01.

8 REFERENCES

- [1] Y. G. Jiang and J. J. Wang, "Partial Copy Detection in Videos: A Benchmark and an Evaluation of Popular Methods," *IEEE Trans. Big Data*, vol. 2, no. 1, pp. 32-42, Jan/Mar 2016, doi:10.1109/TBDDATA.2016.2530714.
- [2] B. De Meester, R. Verborgh, P. Pauwels, W. De Neve, E. Mannens, and R. Van de Walle, "Towards robust and reliable multimedia analysis through semantic integration of services," *Multimedia Tools Appl.*, vol. 75, no. 22, pp. 14019-14038, Nov. 2016.
- [3] Z. Zhang and K. Wang, "A Trust Model for Multimedia Social Networks," *Soc. Netw. Anal. Min.*, vol. 3, no. 4, pp. 969-979, Dec. 2013.
- [4] Z. Zhang and B. B. Gupta, "Social Media Trustworthiness and Security: Overview and New Direction," *Future Generation Computer Systems*, submitted for publication.
- [5] W. Feng, Z. Zhang, J. Wang, and L. Han, "A Novel Authorization Delegation for Multimedia Social Networks by using Proxy Re-encryption," *Multimedia Tools Appl.*, vol. 75, no. 21, pp. 13995-14014, Nov. 2016.
- [6] Z. Zhang and K. Wang, "A Formal Analytic Approach to Credible Potential Path and Mining Algorithms for Multimedia Social Networks," *Comput J.*, vol. 58, no.4, pp. 668-678, Sep. 2015.
- [7] Z. Zhang, Z. Wang, and D. Niu, "A Novel Approach to Rights Sharing-Enabling Digital Rights Management for Mobile Multimedia," *Multimedia Tools Appl.*, vol. 74, no. 16, pp. 6255-6271, Aug. 2015.
- [8] A. Azfar, K.-K. R. Choo, and L. Liu, "Forensic Taxonomy of Android Social Apps," *J. Forensic Sci.*, preprint, Nov. 2016, doi: 10.1111/1556-4029.13267.
- [9] D. Quick and K.-K. R. Choo, "Big forensic data management in heterogeneous distributed systems: quick analysis of multimedia forensic data," *Softw. Pract. Exper.*, preprint, 2016, doi: 10.1002/spe.2429.
- [10] N. H. Ab Rahman, W. B. Glisson, Y. Yang, and K.-K. R. Choo, "Forensic-by-design framework for cyber-physical cloud systems," *IEEE Cloud Comput.*, vol. 3, no. 1, pp. 50-59, Feb 2016.
- [11] P. Cui, W. Zhu, T. S. Chua, and R. Jain, "Social-Sensed Multimedia Computing," *IEEE Multimedia*, vol. 23, no. 1, pp. 92-96, Jan/Mar 2016.
- [12] B. N. Schilit and M. M. Theimer, "Disseminating Active Map Information to Mobile Hosts," *IEEE Network*, vol. 8, no. 5, pp. 22-32, Sep/Oct 1994.
- [13] K. Srinivasan, P. Agrawal, R. Arya, N. Akhtar, D. Pengoria, and T. A. Gonsalves, "Context-aware, QoE-driven adaptation of multimedia services," *5th International Conference on Mobile Wireless Middleware, Operating Systems, and Applications*, pp. 236-249, Nov. 2012, doi: 10.1007/978-3-642-36660-4_17.
- [14] C. Tekin and M. Van Der Schaar, "Contextual online learning for multimedia content aggregation," *IEEE Trans. Multimedia*, vol. 17, no. 4, pp. 549-561, Apr. 2015, doi: 10.1109/TMM.2015.2403234.
- [15] D. C. A. Bulterman, P. Cesar, and R. L. Guimaraes, "Socially-aware multimedia authoring: Past, present, and future," *ACM Trans. Multimedia Comput. Commun. Appl.*, vol. 9, no. 1 SUPPL, Oct. 2013, doi: 10.1145/2491893.
- [16] C. K. Chang, H. Y. Jiang, H. Ming, and K. Oyama, "Situ: A situation-theoretic approach to context-aware service evolution," *IEEE Trans. Serv. Comput.*, vol. 2, no. 3, pp. 261-275, 2009, doi: 10.1109/TSC.2009.21.
- [17] J. Huang, F. Nie, H. Huang, Y. C. Tu, and Y. Lei, "Social trust prediction using heterogeneous networks," *ACM Trans. Knowl. Discov. Data*, vol. 7, no. 4, 2013, doi: 10.1145/2541268.2541270.
- [18] Y. G. Shen, G. S. Guo, and J. J. WU, "A Context-aware Collaborative Filtering Algorithm on Mobile Recommendation," *Science Technology and Engineering*, vol. 8, pp. 49-52+64, Aug. 2014.
- [19] C. K. Chang, "Situation Analytics-A foundation for a new software engineering paradigm," *Computer*, vol. 49, no. 1, pp. 24-33, Jan. 2016.

- [20] H. Ming, C. K. Chang, and J. Yang, "Dimensional Situation Analytics: from Data to Wisdom," *Proc Int Comput Software Appl Conf*, vol. 1, pp. 50-59, Jul. 2015, doi: 10.1109/COMPSAC.2015.199.
- [21] M. A. Rahman, H. N. Kim, A. El Saddik, and W. Gueaieb, "A context-aware multimedia framework toward personal social network services," *Multimedia Tools Appl.*, vol. 71, no. 3, pp. 1717-1747, Aug. 2014.
- [22] E. D. Tong, Q. Shen, J. Lei, Y. Liu, and H. Tang, "Study on Context-aware Technologies for Internet of Things," *Computer Science*, vol. 4, no. 38, pp. 9-14+20, Apr. 2011.
- [23] F. Amato, F. Gargiulo, V. Moscato, F. Persia, and A. Picariello, "Recommendation of multimedia objects for social network applications," *CEUR Workshop Proc.*, pp. 288-293, Mar. 2014.
- [24] X. Liu, "Towards context-aware social recommendation via trust networks," *14th International Conference on Web Information Systems Engineering (WISE 2013)*, pp. 121-134, Oct. 2013, doi: 10.1007/978-3-642-41230-1_11.
- [25] Y. Zhang, T. J. Lv, and H. Q. Li, "Improved N-gram Prediction Model Research Based on Context-Aware Environment," *Microcomputer Applications*, vol. 30, no. 9, 2009.
- [26] R. Bar-David and M. Last, "Context-aware location prediction," *5th International Workshop on Mining Ubiquitous and Social Environments (MUSE 2014)*, pp. 165-185, Sep. 2014.
- [27] W. P. Lee and K. H. Lee, "Making smartphone service recommendations by predicting users' intentions: A context-aware approach," *Inf. Sci.*, vol. 277, pp. 21-35, Sep. 2014.
- [28] X. L. Shen, M. K. O. Lee, and C. M. K. Cheung, "Exploring online social behavior in crowdsourcing communities: A relationship management perspective," *Comput. Hum. Behav.*, vol. 40, pp. 144-151, Nov. 2014.
- [29] Y. Chen, F. Li, J. Chen, B. Du, K.-K. R. Choo, and H. Hassanand, "EPLS: A novel feature extraction method for migration data clustering," *J. Parallel Distr. Com.*, submitted for publication.
- [30] V. Radhakrishna, S. A. Aljawarneh, P. V. Aljawarneh, and K.-K. R. Choo, "A novel fuzzy gaussian-based dissimilarity measure for discovering similarity temporal association patterns," *Soft Comput.*, preprint, 18 Nov. 2016, doi: 10.1007/s00500-016-2445-y.
- [31] Z. Zhang, R. Sun, C. Zhao, C. K. Chang, and B. B. Gupta, "CyVOD: A Novel Trinity Multimedia Social Network Scheme," *Multimedia Tools Appl.*, 26 Nov. 2016, doi: 10.1007/s11042-016-4162-z.

interests include multimedia social networks, digital rights management, trusted computing and usage control. Recent years, he has published over 100 scientific papers and edited 5 books in the above research fields, and also holds 10 authorized patents. He is IEEE Senior Member (06'M, 11'S), ACM Senior Member (08'M, 13'S), IEEE Systems, Man, Cybernetics Society Technical Committee on Soft Computing, World Federation on Soft Computing Young Researchers Committee, Membership for Digital Rights Management Technical Specialist Workgroup Attached to China National Audio, Video, Multimedia System and Device Standardization Technologies Committee. And also, he is editorial board member, associate editor for numerous international journals on social multimedia computing, soft computing and security.



R. Sun, born in December 1991, is currently a postgraduate majoring in computer science, College of Information Engineering, Henan University of Science & Technology. Her research interest focuses on multimedia social networks architectures and applications.



X. Wang, born in June 1993, is currently a postgraduate majoring in computer science, College of Information Engineering, Henan University of Science & Technology. Her research interest focuses on crowd computing and crowdsourcing for social media networks.



C. Zhao, born in October 1972, received his Ph.D. degree in Computer Science at Xi'an Jiaotong University, P. R. China. He is an associate professor at College of Information Engineering, Henan University of Science & Technology. His research interests include machine learning and social network analytics.

Author Biographies



Z. Zhang, born in October 1975, earned his Master, Ph.D. degrees in Computer Science from Dalian University of Technology and Xidian University, P. R. China, respectively. He was ever post-doctoral fellowship at School of Management, Xi'an Jiaotong University, China. Nowadays, he is a full-time Henan Province Distinguished Professor and Dean with Department of Computer Science,

College of Information Engineering, Henan University of Science & Technology. He is also a Visiting Professor of Computer Science Department of Iowa State University. Prof. Zhang and research