Journal of Digital Science

ISSN 2686-8296

Volume 2 Issue 2 December 2020

CONTENTS

Design and Evaluation of Visible Light Wireless Data Communication Models

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https://doi.org/10.33847/2686-8296.2.2_1

Abstract. The technologies based on the radio frequency used for wireless transmission indoor are more congested than ever these days, therefore several wireless communication alternatives are intensively searched. Some most promising technologies are based on the optical part of the electromagnetic spectrum. The benefits and drawbacks in optical wireless data communication models design are presented in this work. The key characteristics of the VLC systems are briefly discussed, as well. Some models developed for wireless data transfer in visible light communication and infrared are presented, and their operation related to the data rate and the length of the optical link, are briefly compared.

Keywords: Visible Light Communication, LED and PD key characteristics, Optical link, prototypes.

References

1. Riurean S.: VLC Prototypes Developed with Off-the-Shelf Components for Wireless Indoor Data Transfer. In: ICCS 2020, LNNS, Vol.186. DOI: 10.1007/978-3-030-66093-2_30.
2. Rehman, S. U.; Ullah, S.; Chong, P. H.; Yongchareon, S.; Komosny, D., Visible Light Communication: A System Perspective—Overview and Challenges. Sensors, 19 (5). (2019).
3. Leba M., Riurean S. and Ionica A., LiFi — The path to a new way of communication, 12th Iberian Conference on Information Systems and Technologies (CISTI), Lisbon, 2017, pp. 1-6, doi: 10.23919/CISTI.2017.7975997, (2017).
4. Marcu A., Dobre R. and Vlădescu M.:Investigation on available bandwidth in visible-light communications, 2016 IEEE 22nd International Symposium for Design and Technology in Electronic Packaging (SIITME), Oradea, 2016, pp. 244-247, doi: 10.1109/SIITME.2016.7777287.
5. Riurean, S., Antipova, T., Rocha, Á., Leba, M., Ionica, A.VLC, OCC, IR and LiFi Reliable Optical Wireless Technologies to be Embedded in Medical Facilities and Medical Devices. J Med Syst 43, 308 (2019).
6. Dimitrov S., Haas H.: Principles of LED Light Communications. Towards Networked Li-Fi, Cambridge University Press, (2015).
7. Riurean S., Antipova T., Rocha A., Leba M., Ionica A. (2019) Li-Fi Embedded Wireless Integrated Medical Assistance System. In: Rocha Á., Adeli H., Reis L., Costanzo S. (eds) New Knowledge in Information Systems and Technologies. WorldCIST'19 2019. Advances in Intelligent Systems and Computing, vol 931. Springer, Cham. https://doi.org/10.1007/978-3-030-16184-2_34.
8. Riurean S., Olar M., Leba M., Ionica, A.: Underground positioning system based on visible light communication and augmented reality, 17th International Technical-Scientific Conference on Modern Technologies for the 3rd Millennium, Oradea, ROMANIA, MAR 22-23, 2018, Pages: 345-350, http://orcid.org/0000-0002-5283-6374, (2018).
9. Nobelprize Homepage, https://www.nobelprize.org/prizes/physics/2014/press-release/, last accessed 2020/08/25.
10. Marcu A. E., Dobre R. A. and Vlădescu M., Flicker Free Optical Camera Communication for Cameras Capturing 30 Frames per Second, 43rd International Conference on Telecommunications and Signal Processing (TSP), Milan, Italy, 2020, pp. 166-169, (2020).
11. Ted Homepage https://www.ted.com/talks/harald_haas_wireless_data_from_every_light_bulb, last accessed 2020/08/25
12. Avătămăniței, S.A.; Căilean, A.-M.; Beguni, C.; Dimian, M.; Popa, V. Analysis concerning the usage of Visible Light Communications in Automotive Applications: achievable

communication distances vs optical noise. International Conference on Development and Application Systems, (2020).
13. Căilean, A.M., Dimian, M., Done, A., Enhanced design of visible light communication sensor for automotive 785 applications: Experimental demonstration of a 130meters link. Global LIFI Congress (GLC), Paris, 2018, 1-4. 786 (2018).
14. IEEE Computer Society. IEEE Standard for Local and metropolitan area networks - Part 15.7: Short-Range Wireless Optical Communication Using Visible Light. Number September (2011).
15. IEEE 802.15 WPAN 15.7 Amendment Study Group (2015).
16. Huang Y.M., Singh K.J., Liu AC, et.al. Advances in Quantum-Dot-Based Displays. Nanomaterials (Basel). Jul 6;10(7):1327. (2020).
17. Liao C. et al., Light-emitting diodes for visible light communication, International Wireless Communications and Mobile Computing Conference (IWCMC), Dubrovnik, 2015, pp. 665-667, (2015).
18. Burton, et. al., Investigation into Using Compensation for the Nonlinear Effects of the Output of LEDs in Visible Light Communication Systems, 2nd West Asian Colloquium on Optical Wireless Communications (WACOWC), Tehran, Iran, 2019, pp. 80-84 (2019).
19. Qian H., Yao S. J., Cai S. Z, and Zhou T., Adaptive Postdistortion for Nonlinear LEDs in Visible Light Communications, IEEE Photonics Journal, vol. 6, pp. 1- 8, (2014).
20. Aggarwal P., Ahmad R., Bohara V. A. and Srivastava A., Adaptive predistortion technique for nonlinear LED with dimming control in VLC system, 2017 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), Bhubaneswar, (2017).
21. Ying Kai, Yu Zhenhua, Baxley Robert j., Qian H., Chang G.-K., and Zhou T. Nonlinear Distortion Mitigation in Visible Light Communications, IEEE Wireless Communications 22(2) April (2015).
22. Jie Lian, Zafer Vatansever, Mohammad Noshad and Maïté Brandt-Pearce, Indoor visible light communications, networking, and applications, Journal of Physics: Photonics, Volume 1, Number 1 (2019).
23. Riurean S.M., Nagy A.A, Leba M. and Ionic A. C.: A small step in VLC systems – a big step in Li-Fi implementation, IOP Conference Series: Materials Science and Engineering, Volume 294, International Conference on Applied Sciences (ICAS2017) 10–12 May 2017, Hunedoara, Romania (2017).
24. Swain K.P., Prasad M.V.S.V., Palai G., Sahoo J., Mohanty M.N., Exploiting VLC Technique for Smart Home Automation Using Arduino. In: Dash S., Vijayakumar K., Panigrahi B., Das S. (eds) Artificial Intelligence and Evolutionary Computations in Engineering Systems. Advances in Intelligent Systems and Computing, vol 517. Springer, Singapore. (2017).
25. Wang T. and Zhao Z., An implementation of visible light communication based on Raspberry Pi, IEEE Integrated STEM Education Conference (ISEC), Princeton, NJ, 2018, pp. 218-219, (2018)
26. Riurean S., Leba, M. Ionica A. and Nassar Y. Technical Solution for Burnout, the Modern Age Health Issue, IEEE 20th Mediterranean Electrotechnical Conference (MELECON), Palermo, Italy, 2020, pp. 350-353, (2020).
27. Duque A., Bidirectional Visible Light Communications for the Internet of Things. Networking and Internet Architecture [cs.NI]. Université de Lyon - INSA Lyon, (2018).
28. Rosca S., Riurean S., Leba M., Ionica A., An Educational Model of Graduation Project for Students at Automation and Computer Engineering, Journal of Digital Science, Vol.1, Iss. 1, Dec (2019). DOI: 10.33847/2686-8296.1.1_4.
29. Nayyar A., PuriA V.: Comprehensive Review of BeagleBone Technology: Smart Board Powered by ARM, International Journal of Smart Home 10(4):95-108 (2016).
30. Galisteo A., Juara D., Giustiniano D.: Research in Visible Light Communication Systems with OpenVLC1.3, Networking and Internet Architecture (cs.NI) arXiv:1812.06788 (2019).
31. [Online] https://github.com/openvlc/openvlc, last accessed 10.11.2020.

Predicting the Signs of the Links in a Network

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https://doi.org/10.33847/2686-8296.2.2_2

Abstract. It is hard to deny the importance of graph analysis techniques, particularly the problem of link and link-sign prediction, in many real-world applications. Predicting future sign of connections in a network is an important task for online systems such as social networks, e-commerce, scientific research, and others. Several research studies have been presented since the early days of this century to predict either the existence of a link in the future or the property of the link. In this study we present a novel approach that combine both families by using machine learning techniques. Instead of focusing on the established links, we follow a new research approach that focusing on no-link relationship. We aim to understand the move between two states of no-link and link. We evaluate our methods in popular real-world signed networks datasets. We believe that the new approach by understanding the no-link relation has a lot of potential improvement in the future.

Keywords: Signed Network, Machine learning, Link Prediction.

References

1. Adamic, L.A., Adar, E.: Friends and neighbors on the web. Social Networks 25(3), 211–230 (2003)
2. Ahmadalinezhad, M., Makrehchi, M., Seward, N.: Basketball lineup performance prediction using network analysis. In: Proceedings of the 2019 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining. pp. 519–524 (2019)
3. Baraba´si, A.L., et al.: Network science. Cambridge university press (2016)
4. Benchettara, N., Kanawati, R., Rouveirol, C.: A supervised machine learning linkprediction approach for academic collaboration recommendation. In: RecSys. pp. 253–256. ACM (2010)
5. Boffey, T.: Graph theory in operations research. Macmillan International Higher Education (1982).
6. Chen, X., Guo, J., Pan, X., Zhang, C.: Link prediction in signed networks based on connection degree. J. AIHC (2019)
7. Chiang, K., Natarajan, N., Tewari, A., Dhillon, I.S.: Exploiting longer cycles for link prediction in signed networks. In: CIKM. pp. 1157–1162. ACM (2011)
8. Dang, Q.V.: Trust assessment in large-scale collaborative systems. Ph.D. thesis, University of Lorraine, France (2018)
9. Dang, Q.V.: Link-sign prediction in signed directed networks from no link perspective. In: International Conference on Integrated Science. pp. 291–300. Springer (2020). DOI: 10.1007/978-3-030-49264-9_26.
10. Dang, Q.V., Ignat, C.L.: Computational trust model for repeated trust games. In: Trustcom/BigDataSE/ISPA. pp. 34–41. IEEE (2016)
11. Dang, Q.V., Ignat, C.L.: Measuring quality of collaboratively edited documents: The case of wikipedia. In: CIC. pp. 266–275. IEEE Computer Society (2016)
12. Dang, Q.V., Ignat, C.L.: Quality assessment of wikipedia articles without feature engineering. In: JCDL. pp. 27–30. ACM (2016)
13. Dang, Q.V., Ignat, C.L.: dTrust: A simple deep learning approach for social recommendation. In: CIC. pp. 209–218. IEEE (2017)
14. Dang, Q., Ignat, C.: Link-sign prediction in dynamic signed directed networks. In: CIC (2018).
15. Gomez-Uribe, C.A., Hunt, N.: The net flix recommender system: Algorithms, business value, and innovation. ACM Transactions on Management Information Systems (TMIS) 6(4), 1–19 (2015)
16. Goyal, P., Chhetri, S.R., Canedo, A.: dyngraph2vec: Capturing network dynamics using dynamic graph representation learning. Knowledge-Based Systems 187, 104816 (2020)

17. Goyal, P., Ferrara, E.: Graph embedding techniques, applications, and performance: A survey. Knowledge-Based Systems 151, 78–94 (2018)
18. Grover, A., Leskovec, J.: node2vec: Scalable feature learning for networks. In: KDD, pp. 855–864. ACM (2016).
19. Guha, R.V., Kumar, R., Raghavan, P., Tomkins, A.: Propagation of trust and distrust. In: WWW (2004)
20. Hamilton, W.L., Ying, R., Leskovec, J.: Representation learning on graphs: Methods and applications. arXiv preprint arXiv:1709.05584 (2017)
21. Hand, D.J., Till, R.J.: A simple generalisation of the area under the ROC curve for multiple class classification problems. Machine Learning 45(2), 171–186 (2001)
22. Harary, F., Norman, R.Z.: Graph theory as a mathematical model in social science. No. 2, University of Michigan, Institute for Social Research Ann Arbor (1953)
23. Hsieh, C., Chiang, K., Dhillon, I.S.: Low rank modeling of signed networks. In: KDD. pp. 507–515. ACM (2012)
24. Jeh, G., Widom, J.: Simrank: a measure of structural-context similarity. In: KDD. pp. 538–543. ACM (2002)
25. Katz, L.: A new status index derived from sociometric analysis. Psychometrika(1953)
26. Khodadadi, A., Jalili, M.: Sign prediction in social networks based on tendency rate of equivalent micro-structures. Neurocomputing p. 10 (2017)
27. Kipf, T.N., Welling, M.: Semi-supervised classification with graph convolutional networks. In: ICLR. p. 14 (2017)
28. Leskovec, J., Huttenlocher, D.P., Kleinberg, J.M.: Signed networks in social media. In: CHI. pp. 1361–1370. ACM (2010)
29. Li, X.: Towards practical link prediction approaches in signed social networks. In: UMAP (2018)
30. Li, X., Fang, H., Zhang, J.: FILE: A novel framework for predicting social status in signed networks. In: AAAI. pp. 330–337. AAAI Press (2018)
31. Li, Z.L., Fang, X., Sheng, O.R.L.: A survey of link recommendation for social networks: Methods, theoretical foundations, and future research directions. ACM Trans. Management Inf. Syst. (2018)
32. Liben-Nowell, D., Kleinberg, J.M.: The link-prediction problem for social networks.JASIST (2007)
33. Lichtenwalter, R.N., Lussier, J.T., Chawla, N.V.: New perspectives and methods in link prediction. In: KDD. pp. 243–252. ACM (2010)
34. Likaj, R., Shala, A., Mehmetaj, M., Hyseni, P., Bajrami, X.: Application of graph theory to find optimal paths for the transportation problem. IFAC Proceedings Volumes 46(8), 235–240 (2013)
35. Ma, H., Yang, H., Lyu, M.R., King, I.: Sorec: social recommendation using probabilistic matrix factorization. In: CIKM. pp. 931–940. ACM (2008)
36. Mason, O., Verwoerd, M.: Graph theory and networks in biology. IET systems biology 1(2), 89–119 (2007)
37. McPherson, M., Smith-Lovin, L., Cook, J.M.: Birds of a feather: Homophily in social networks. Annual review of sociology 27(1), 415–444 (2001)
38. Mikolov, T., Chen, K., Corrado, G., Dean, J.: Efficient estimation of word representations in vector space. arXiv preprint arXiv:1301.3781 (2013)
39. Mutlu, E.C., Oghaz, T.A.: Review on graph feature learning and feature extraction techniques for link prediction. arXiv preprint arXiv:1901.03425 (2019)
40. O'Madadhain, J., Hutchins, J., Smyth, P.: Prediction and ranking algorithms for event based network data. ACM SIGKDD explorations newsletter (2005)
41. Pareja, A., Domeniconi, G., Chen, J., Ma, T., Suzumura, T., Kanezashi, H., Kaler,T., Schardl, T.B., Leiserson, C.E.: Evolvegcn: Evolving graph convolutional networks for dynamic graphs. In: AAAI. pp. 5363–5370 (2020)
42. Perozzi, B., Al-Rfou, R., Skiena, S.: Deepwalk: online learning of social representations. In: KDD. pp. 701–710. ACM (2014)
43. Ravasz, E., Somera, A.L., Mongru, D.A., Oltvai, Z.N., Baraba´si, A.L.: Hierarchical organization of modularity in metabolic networks. Science (2002)
44. Rossi, E., Chamberlain, B., Frasca, F., Eynard, D., Monti, F., Bronstein, M.: Temporal graph networks for deep learning on dynamic graphs. arXiv preprint arXiv:2006.10637 (2020)
45. Scarselli, F., Gori, M., Tsoi, A.C., Hagenbuchner, M., Monfardini, G.: The graph neural network model. IEEE Transactions on Neural Networks 20(1), 61–80 (2008)

46. Scellato, S., Noulas, A., Mascolo, C.: Exploiting place features in link prediction on location-based social networks. In: KDD. pp. 1046–1054. ACM (2011)
47. Sharma, A., Hofman, J.M., Watts, D.J.: Estimating the causal impact of recommendation systems from observational data. In: Proceedings of the Sixteenth ACM Conference on Economics and Computation. pp. 453–470 (2015)
48. Shen, D., Sun, J., Yang, Q., Chen, Z.: Latent friend mining from blog data. In: ICDM. pp. 552–561. IEEE Computer Society (2006)
49. Smith, B., Linden, G.: Two decades of recommender systems at amazon. com. Ieee internet computing 21(3), 12–18 (2017)
50. Song, D., Meyer, D.A.: Link sign prediction and ranking in signed directed social networks. Social Netw. Analys. Mining 5(1), 52:1–52:14 (2015)
51. Song, W., Xiao, Z., Wang, Y., Charlin, L., Zhang, M., Tang, J.: Session-based social recommendation via dynamic graph attention networks. In: Proceedings of the Twelfth ACM International Conference on Web Search and Data Mining. pp. 555–563 (2019)
52. Tai, K.S., Socher, R., Manning, C.D.: Improved semantic representations from tree-structured long short-term memory networks. arXiv preprint arXiv:1503.00075 (2015)
53. Tang, J., Qu, M., Wang, M., Zhang, M., Yan, J., Mei, Q.: LINE: large-scale information network embedding. In: WWW. pp. 1067–1077. ACM (2015)
54. Tang, J., Chang, Y., Aggarwal, C., Liu, H.: A survey of signed network mining in social media. ACM Comput. Surv. (2016)
55. Tong, H., Faloutsos, C., Pan, J.Y.: Fast random walk with restart and its applications. In: ICDM. pp. 613–622. IEEE (2006)
56. Veli ˇckovi ´c, P., Cucurull, G., Casanova, A., Romero, A., Lio, P., Bengio, Y.: Graph attention networks. arXiv preprint arXiv:1710.10903 (2017)
57. Wang, D., Pedreschi, D., Song, C., Giannotti, F., Baraba ´si, A.: Human mobility, social ties, and link prediction. In: KDD. pp. 1100–1108. ACM (2011)
58. Wang, X., He, X., Cao, Y., Liu, M., Chua, T.S.: Kgat: Knowledge graph attention network for recommendation. In: Proceedings of the 25th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining. pp. 950–958 (2019)
59. Wang, X., Ji, H., Shi, C., Wang, B., Ye, Y., Cui, P., Yu, P.S.: Heterogeneous graph attention network. In: The World Wide Web Conference. pp. 2022–2032 (2019)
60. Xu, Y., Rockmore, D.N.: Feature selection for link prediction. In: PIKM. pp. 25–32. ACM (2012)
61. Yang, Y., Chawla, N.V., Sun, Y., Han, J.: Predicting links in multi-relational and heterogeneous networks. In: ICDM. pp. 755–764. IEEE Computer Society (2012)
62. Yao, Y., Zhang, R., Yang, F., Tang, J., Yuan, Y., Hu, R.: Link prediction in complex networks based on the interactions among paths. Physica A: Statistical Mechanics and its Applications 510, 52–67 (2018)
63. Yuan, G., Murukannaiah, P.K., Zhang, Z., Singh, M.P.: Exploiting sentiment homophily for link prediction. In: RecSys. pp. 17–24. ACM (2014)
64. Yuan, W., He, K., Guan, D., Zhou, L., Li, C.: Graph kernel based link prediction for signed social networks. Information Fusion 46, 1–10 (2019)
65. Yuan, W., Li, C., Han, G., Guan, D., Zhou, L., He, K.: Negative sign prediction for signed social networks. Future Generation Computer Systems 93, 962–970 (2019)
66. Yuan, W., Pang, J., Guan, D., Tian, Y., Al-Dhelaan, A., Al-Dhelaan, M.: Sign prediction on unlabeled social networks using branch and bound optimized transfer learning. Complexity 2019, 4906903:1–4906903:11 (2019)
67. Zayats, V., Ostendorf, M.: Conversation modeling on reddit using a graph structured lstm. Transactions of the Association for Computational Linguistics 6, 121–132 (2018)
68. Zhang, J., Shi, X., Xie, J., Ma, H., King, I., Yeung, D.Y.: Gaan: Gated attention networks for learning on large and spatiotemporal graphs. arXiv preprint arXiv:1803.07294 (2018)
69. Zhou, T., Lu¨, L., Zhang, Y.C.: Predicting missing links via local information. The European Physical Journal B 71(4), 623–630 (2009).

The origins of severe software defects method

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https://doi.org/10.33847/2686-8296.2.2_3

Abstract. Identifying the causes which may potentially generate high financial damage was the goal of our research. To reach this goal, we conducted a case study on a system in the field of education. We studied the software defects of this system over several months and classified them based on two classification concepts: the EVOLIS and their severity. These defects prevent any essential operation or activity to be conducted through the concerned system or other systems connected to it. In fact, the occurrence of these failures causes a double financial cost to organizations: one in fixing them and the other one because of the unavailability of the system or systems. We targeted three types of software defects as sources of these failures. We conducted this study by classifying 665 software defects of a school management system and we found that the top two trigger groups are the technology and the IS architecture groups. This result led us to propose a method to identify the origins of severe software defects.

Keywords: Severe software defect, Software defect triggers, Software defect classification.

References

1. R. N. Charette, "Why software fails [software failure]," *Ieee Spectr.*, vol. 42.9, pp. 42–49, 2005.
2. R. Kaur and D. J. Sengupta, "Software Process Models and Analysis on Failure of Software Development Projects," *Int. J. Sci. Eng. Res.*, vol. 2, no. 2, p. 4.
3. *1044-2009 IEEE Standard Classification for Software Anomalies.* 2009.
4. A. Métrailler and T. Estier, "EVOLIS Framework: A Method to Study Information Systems Evolution Records," in *System Sciences (HICSS), 2014 47th Hawaii International Conference on*, 2014, pp. 3798–3807.
5. A. A. Alshazly, A. M. Elfatatry, and M. S. Abougabal, "Detecting defects in software requirements specification," *Alex. Eng. J.*, vol. 53, no. 3, pp. 513–527, Sep. 2014.
6. G. K. Rajbahadur, S. Wang, Y. Kamei, and A. E. Hassan, "The impact of using regression models to build defect classifiers," in *Proceedings of the 14th International Conference on Mining Software Repositories*, 2017, pp. 135–145.
7. R. Binder, *Testing object-oriented systems: models, patterns, and tools*. Reading, Mass: Addison-Wesley, 2000.
8. D. Vallespir, F. Grazioli, and J. Herbert, "A framework to evaluate defect taxonomies," in *XV Congreso Argentino de Ciencias de La Computación*, 2009.
9. M. Leszak, P. Dewayne E., and D. Stoll, "Classification and evaluation of defects in a project retrospective," *Elsevier*, no. 61, pp. 173–187, 2002.
10. N. Mellegård, *Improving Defect Management in Automotive Software Development, LiDeC—A Light-weight Defect Classification Scheme*. Chalmers University of Technology, 2013.
11. R. Chillarege *et al.*, "Orthogonal defect classification-a concept for in-process measurements," *IEEE Trans. Softw. Eng.*, vol. 18, no. 11, pp. 943–956, 1992.
12. S. Wagner, "Defect classification and defect types revisited," in *Proceedings of the 2008 workshop on Defects in large software systems*, 2008, pp. 39–40.
13. J. T. Huber, "A Comparison of IBM's Orthogonal Defect Classification to Hewlett Packard's Defect Origins, Types, and Modes." Hewlett Packard Company, 1999.

14. L. Yu and S. R. Schach, "Applying association mining to change propagation," *International Journal of Software Engineering and Knowledge Engineering*, vol. 18, no. 08, pp. 1043–1061, 2008.
15. G. Murphy and D. Cubranic, "Automatic bug triage using text categorization," in *Proceedings of the Sixteenth International Conference on Software Engineering & Knowledge Engineering*, 2004.
16. W. Dickinson, D. Leon, and A. Fodgurski, "Finding failures by cluster analysis of execution profiles," in *Proceedings of the 23rd International Conference on Software Engineering. ICSE 2001*, Toronto, Ont., Canada, 2001, pp. 339–348.
17. Atlassian, "Jira | Logiciel de suivi des tickets et des projets," *Atlassian*. [Online]. Available: https://fr.atlassian.com/software/jira. [Accessed: 06-Apr-2020].

The development of a classification model of accounting in the digital economy

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https://doi.org/10.33847/2686-8296.2.2_4

Abstract. A multidimensional classification scheme and a semantic multidimensional accounting data model are defined in this article. Instead of accounts, multidimensional accounting uses categories of economic activity. The proposed multidimensional data model is more flexible than the traditional account model and allows you to expand the capabilities of accounting, taking into account the different needs of users of accounting information. The multidimensional data model allows you to expand the capabilities of accounting, taking into account the different needs of users of accounting information. To create a multidimensional accounting system, the categories of economic activity registered in accounting have been determined, the concept of double entry and balance in a multidimensional representation (probalance) has been formulated. The features of planning in a multidimensional accounting system have been described and the implementation of the financial results plan has been considered.

Keywords: Bookkeeping, Accounting, Semantic data model of accounting, Multidimensional accounting, Multidimensional data model, Hierarchical classification scheme, Categories of economic activity, Commercial activity, multidimensional classification scheme, OLAP, Internal area of accounting, External area of accounting, Pro-balance, Digital economy.

References

1. Lev, B., Gu, F.: The End of Accounting and the Path Forward for Investors and Managers. Wiley, Hoboken (2016)
2. Gu, J., Zhang, L.: Data, DIKW, Big data and data science. In: 2nd International Conference on Information Technology and Quantitative Management, ITQM (2014)
3. http://www.systems-thinking.org/dikw/dikw.htm. Accessed 21 Sept 2019
4. http://indico.cern.ch/event/276139/contribution/59/attachments/501004/691997/DWH_and_ BI_Improve_strategic_decision_making.pdf. Accessed 21 Sept 2019
5. Drury, C.: Management and Cost Accounting, 8th edn. Cengage Learning (Emea) Ltd., Andover (2012)
6. Van Der Poll, H.M.: Towards a classification framework for accounting information. Submitted in fulfilment of the requirements for the degree doctor commercii (financial management sciences). University of Pretoria. Republic of South Africa (2007)
7. Van der Poll, H.M., Gouws, D.G.: Issues surrounding the classification of accounting information. S. Afr. J. Econ. Manage. Sci. (SAJEMS) 12(3), 353–369 (2009)
8. Fairfield, P.M., Sweeney, R.J., Yohn, T.: Accounting classification and the predictive content of earning. Acc. Rev. 71(3), 337–355 (1996)
9. Hedish, N.D.: Account classification and principle codification. Acc. Rev. 34(4), 660–662 (1959)
10. Bedford, N.M.: The foundations of accounting measurement. J. Acc. Res. 6(2), 270–282 (1968)
11. Kolitz, D.: Financial Accounting. A Concepts-Based Introduction. Routledge, New York(2017)
12. Maciuca, G., Socoliuc, M.: The role of accounting system classification in the optimization of international harmonization process. USV Ann. Econ. Public Adm. 2(18), 200–206 (2013)

13. https://www.researchgate.net/publication/327217155_Classification_and_Factors_Influencing_Accounting_Systems 2018. Accessed 21 Sept 2019
14. Foskett, D.J.: Construction of a faceted classification for a special subject. In: Proceedings of the International Conference on Scientific Information. National Science Foundation, pp. 867–888 (1959)
15. Schmalenbach, E.: Der Kontenrahmen. Leipzig, G.A. Gloeckner (1927)
16. McCarthy, W.E.: The REA accounting model: a generalized framework for accounting system in a shared data environment. Acc. Rev. (3), 554–578 (1982). https://www.msu.edu/*mccarth4/McCarthy.pdf. Accessed 21 Sept 2019
17. Shaposhnikov, A.A.: Classification models in accounting. Finance and Statistics (1982)
18. Kovalev A.E. Multidimensional Model of Accounting. In: Advances in Intelligent Systems and Computing. Digital Science 2019. Springer. pp. 314-324. https://doi.org/10.1007/978-3-030-37737-3.
19. Shvetsov, V.I.: Database. Internet University of Information Technologies. Moscow (2009)
20. https://www.cfin.ru/vernikov/kias/vest.shtml. Accessed 21 Sept 2019
21. Thomsen, E.: OLAP Solutions. Building Multidimensional Information Systems, 2nd edn.Wiley Computer Publishing, Hoboken (2002)
22. Schär, J.F.: Buchhaltung und Bilanz: auf wirtschaftlicher, rechtlicher und mathematischer Grundlage, für Juristen, Ingenieure, Kaufleute und Studierende der Privatwirtschaftslehre mit anhängen über "Bilanzverschleierung" und "Teuerung geldentwertung und bilanz". Springer, Heidelberg (1922)
23. Sokolov, V.Ya.: Accounting as the sum of the facts of economic life. Master, INFRA M., Moscow (2010)
24. Tsygankov, K.Y.: Double entry, Ledger accounts and their alternatives. Siberian FinancialSchool, no. 2, pp. 123–136 (2008)
25. Civil code of the Russian Federation, part 1., in the edition of the Federal law of 2010/05/08. N 83-FZ.

Development principles for preparing financial reporting in the context of digitalization

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https://doi.org/10.33847/2686-8296.2.2_5

Abstract. The information technology development and the digital economy have a significant impact on the business units' information system. The impact has resulted in a significant increase in the amount of business data used. With increased information availability, development of new processing methods and algorithms, the approaches to financial reporting need to be adjusted and modified. All changes to the basic principles of financial reporting have been included in the new version of the Conceptual Framework for Financial Reporting. It will come into force on January 1, 2020 for all business units developing their reporting policies under IFRS. The paper overviews the amendments and innovations introduced by the new version of this document. The Conceptual Framework dialectics has been reviewed based on all document versions since 1989. We analyzed the impact of digital technology on the transformation of accounting methods and principles and on the preparation of financial statements. The paper is of practical importance and helps to assess various areas of system development of the IFRS methodology in the context of digital economy.

Keywords: Conceptual Framework, Financial reporting, Digitalization, Principles.

References

1. Henderson S. et al. Issues in financial accounting. Pearson Higher Education AU (2015)
2. Kachkova, O. E., Vakhrushina, M. A., Demina, I. D., Krishtaleva, T. I., Sidorova, M. I., Dombrovskaya, E. N., Klepikova, L. V. Developing the Accounting Concept in the Public Sector// European Research Studies Journal, 21(1), 636-649, (2018)
3. Flower J., Ebbers G. Global financial reporting. Macmillan International Higher Education (2018)
4. Efimova, O., Rozhnova, O.: The corporate reporting development in the digital economy. In: Antipova, T., Rocha, A. (eds.) Digital Science. DSIC18 2018. Advances in Intelligent Systems and Computing, vol. 850, pp. 71–80. Springer, Cham (2019)
5. Alexander, D., Bonaci, C., Mustata, R.: Fair value measurement in financial reporting. Procedia Econ. Financ. 3, 84–89 (2012)
6. Macve R. A Conceptual Framework for Financial Accounting and Reporting: Vision, Tool, Or Threat?. Routledge (2015)
7. Hendriksen, E., van Breda, M.: Accounting theory. Richard D. Irwin. Homewood, IL (1992)
8. Needles, B., Powers, M.: Principles of Financial Accounting. South-Western, Cengage Learning (2011)
9. Tassadaq F., Malik Q. A. Creative Accounting & Financial Reporting: Model Development & Empirical Testing //International Journal of Economics and Financial Issues, 2, 544-551, (2015)
10. Dombrovskaya E. Development of the conceptual framework for financial reporting in the context of digitalization. In: Antipova, T., Rocha, A. (eds.) Digital Science. DSIC 2019. Advances in Intelligent Systems and Computing, vol. 1114, pp. 334–344. Springer, Cham (2020)

Aims and Objectives
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Publisher
Institute of Certified Specialists (ICS)
95a-12 Lunacharskogo str., Perm, Russian Federation

Journal URL: https://ics.events/journal-of-digital-science/

Email: conf@ics.events