MAS ISW Assignment 4

Simon Deussen

30.11.2020

Task 1: 25 Paper with the most citation

1. (Derrac, García, Molina, & Herrera, 2011)
2. (Mavrovouniotis, Li, & Yang, 2017)
3. (Lynn & Suganthan, 2015)
4. (Bechar & Vigneault, 2016)
5. (Weiss & Biber, 2011)
6. (Pedersen, Fountas, Have, & Blackmore, 2006)
7. (Konur, Dixon, & Fisher, 2012)
8. (Schneider & Wildermuth, 2003)
9. (Winfield, Liu, Nembrini, & Martinoli, 2008)
10. (Chung, Paranjape, Dames, Shen, & Kumar, 2018)
11. (Vasconez, Kantor, & Cheein, 2019)
12. (Roldán et al., 2016)
13. (Liu, Mao, & Yu, 2006)
14. (Vigelius, Meyer, & Pascoe, 2014)
15. (Ball et al., 2015)
16. (Villa-Henriksen, Edwards, Pesonen, Green, & Sørensen, 2020)
17. (CORTÉS & EGERSTEDT, 2017)
18. (Oberti & Shapiro, 2016)
19. (Innocente & Grasso, 2019)
20. (Din, Jabeen, Zia, Khalid, & Saini, 2018)

21. (Gao et al., 2018)
22. (Fu, Majeed, Zhang, Karkee, & Zhang, 2020)
23. (Jones et al., 2019)
24. (Miner, 2007)
25. (Osaba, Del Ser, Iglesias, & Yang, 2020)
26. (van Herck, Kurtser, Wittemans, & Edan, 2020)

Task 3: Sort and divide paper collection into subtopics and categories

Topics

Agricultural Robots

- (Ball et al., 2015)
- (Gao et al., 2018)
- (Bechar & Vigneault, 2016)
- (Tiwari, Silver, & Karnieli, 2020)
- (Ge, Xiong, & From, 2020)
- (Fu et al., 2020)
- (Chen, Li, Liu, Bao, & Ren, 2020)
- (Raja, Nguyen, Vuong, Slaughter, & Fennimore, 2020)
- (van Herck et al., 2020)
- (Villa-Henriksen et al., 2020)
- (Oberti & Shapiro, 2016)
- (Pedersen et al., 2006)
- (Weiss & Biber, 2011)
- (Vasconez et al., 2019)
- (Jones et al., 2019)

Navigation

- (Z. Huang et al., 2020)
- (Schneider & Wildermuth, 2003)
- (Liang & Lee, 2014)
- (Liu et al., 2006)
- (Hameed, 2018)
- (Bechar & Vigneault, 2016)
- (Jones et al., 2019)

Multi Robot Systems

- (Schneider & Wildermuth, 2003)
- (Liang & Lee, 2014)
- (Liu et al., 2006)
- (Roldán et al., 2016)
- (Gao et al., 2018)
- (Hameed, 2018)
- (CORTÉS & EGERSTEDT, 2017)
- (Wu, Zeng, Pan, Wang, & Liu, 2019)
- (Wang, Liu, Li, & Prorok, 2020)

Swarms

- (Innocente & Grasso, 2019)
- (Din et al., 2018)
- (Khan, Kasmarik, & Barlow, 2020)
- (Osaba et al., 2020)
- (Alshawi & Shalan, 2017)
- (Winfield et al., 2008)
- (Konur et al., 2012)
- (Mirzaei, Pouyan, & Biglari, 2020)
- (Chung et al., 2018)

- (Mavrovouniotis et al., 2017)
- (Derrac et al., 2011)
- (Lynn & Suganthan, 2015)
- (Shi, Tu, Zhang, Liu, & Wei, 2012)
- (Miner, 2007)

Algorithms

- (Liu et al., 2006)
- (Roldán et al., 2016)
- (Ni et al., 2020)
- (Konur et al., 2012)
- (Chung et al., 2018)
- (Mavrovouniotis et al., 2017)
- (Derrac et al., 2011)
- (Lynn & Suganthan, 2015)
- (Miner, 2007)
- (Hameed, 2018)
- (Bechar & Vigneault, 2016)

Categories

Conference Paper

- (Schneider & Wildermuth, 2003)
- (Liang & Lee, 2014)
- (Liu et al., 2006)
- (Hameed, 2018)

Journal Paper

- (Innocente & Grasso, 2019)
- (Osaba et al., 2020)
- (Alshawi & Shalan, 2017)
- (Vigelius et al., 2014)
- (Mirzaei et al., 2020)
- (CORTÉS & EGERSTEDT, 2017)

Survey Paper

- (Chung et al., 2018)
- (Mavrovouniotis et al., 2017)
- (Derrac et al., 2011)
- (Shi et al., 2012)
- (Miner, 2007)
- (CORTÉS & EGERSTEDT, 2017)
- (Vasconez et al., 2019)

Task 6: Create a one page summary of two given papers

Summary: *How to Read an Engineering Research Paper*

In the given paper (Griswold, 2009), the author suggests several tips on how two effectively read a research paper. He starts by encouraging the reader and then begins with analyzing the structure of typical research paper. Following items are mentioned:

- Abstract
- Introduction
- Related work
- Background
- System or model
- Contribution

- Performance or evaluation
- Conclusions
- References.

The author emphasizes to read the paper out of order and to start with the important parts like Abstract, Introduction, Contribution and Conclusion. One of the key things he suggested is a series of eight question a reader should be able to answer after reading or skimming through a research paper. After reading a paper, the reader should ideally immediately annotate it with answers to those question as well as key take aways.

1. What are *motivations* for this work?
2. What is the proposed *solution*?
3. What is the work's *evaluation* of the proposed solution?
4. What is your analysis of the identified problem,idea and evaluation?
5. What are the *contributions*?
6. What are *future directions* for this research?
7. What questions are you left with?
8. What is the main take away message of this paper?

A suggestion is to use a standard form for every paper to keep track of the own thoughts and to be fast able to find ideas again. Another important point to remember is to check the papers context. For this it is important to find out if the read paper classifies as a generalization of a topic, if its a new research direction or if its contradicts existing research. Further the author suggest to read everything twice, first to get a general big picture of the content and a second time to get all the details. He wraps up the guide with the important question: *Are you convinced that the paper proposed a viable solution?*

Summary: *How to read a research paper*

This paper (W. Huang, 2000) is a similar how-to about effective paper reading. The authors first writes about where to get papers. He mentioned two main sources: conferences and archival journals. The difference between them is the length of the content. Conference papers tend to be shorter and newer and journal paper are longer and stronger reviewed writes the author.

Further he recommends those specific sources for research in robotics:

- IEEE Transactions on Robotics and Automation
- International Journal of Robotics Research

- Autonomous Robots
- IEEE Conference on Robotics and Automation (ICRA)
- IEEE/RSJ Conference on Robots and Systems (IROS)

As a next thing he suggests citeseer and google scholar for discovering papers. The last two sections are quite similar to the first one (Griswold, 2009). The first section contains question the reader should answer after reading the paper, and the second contains tips for the order of the read sections.

- What problems are they solving?
- What did they really do?
- What is the contribution?
- What methods did they use?
- Would you have solved the problem differently?
- Do all pieces fit together logically?
- What were the results? Did they do what they set out to do?

One of the final tips if the author is to point out how important the references are if you want to research yourself, because they will point to similar work worth studying.

References

Alshawi, M. A., & Shalan, M. B. (2017). Minimal time dynamic task allocation for a swarm of robots. *International Journal of Mechanical Engineering and Robotics Research*.

Ball, D., Ross, P., English, A., Patten, T., Upcroft, B., Fitch, R., ... Corke, P. (2015). Robotics for sustainable broad-acre agriculture. , 439–453. doi: https://doi.org/10.1007/978-3-319-07488-7_30

Bechar, A., & Vigneault, C. (2016). Agricultural robots for field operations: Concepts and components. *Biosystems Engineering*, *149*, 94 - 111. Retrieved from `http://www.sciencedirect.com/science/article/pii/S1537511015301914` doi: https://doi.org/10.1016/j.biosystemseng.2016.06.014

Chen, C., Li, B., Liu, J., Bao, T., & Ren, N. (2020, aug). Monocular positioning of sweet peppers: An instance segmentation approach for harvest robots. *Biosystems Engineering*, *196*, 15–28. doi: https://doi.org/10.1016/j.biosystemseng.2020.05.005

Chung, S., Paranjape, A. A., Dames, P., Shen, S., & Kumar, V. (2018, Aug). A survey on aerial swarm robotics. *IEEE Transactions on Robotics*, *34*(4), 837-855. doi: 10.1109/TRO.2018.2857475

CORTÉS, J., & EGERSTEDT, M. (2017). Coordinated control of multi-robot systems: A survey. *SICE Journal of Control, Measurement, and System Integration*, *10*(6), 495–503. doi: https://doi.org/10.9746/jcmsi.10.495

Derrac, J., García, S., Molina, D., & Herrera, F. (2011). A practical tutorial on the use of nonparametric statistical tests as a methodology for comparing evolutionary and swarm intelligence algorithms. *Swarm and Evolutionary Computation*, *1*(1), 3 - 18. Retrieved from `http://www.sciencedirect.com/science/article/pii/S2210650211000034` doi: https://doi.org/10.1016/j.swevo.2011.02.002

Din, A., Jabeen, M., Zia, K., Khalid, A., & Saini, D. K. (2018). Behavior-based swarm robotic search and rescue using fuzzy controller. *Computers & Electrical Engineering*, *70*, 53 - 65. Retrieved from `http://www.sciencedirect.com/science/article/pii/S0045790618314216` doi: https://doi.org/10.1016/j.compeleceng.2018.06.003

Fu, L., Majeed, Y., Zhang, X., Karkee, M., & Zhang, Q. (2020, sep). Faster r–CNN–based apple detection in dense-foliage fruiting-wall trees using RGB and depth features for robotic harvesting. *Biosystems Engineering*, *197*, 245–256. doi: https://doi.org/10.1016/j.biosystemseng.2020.07.007

Gao, T., Emadi, H., Saha, H., Zhang, J., Lofquist, A., Singh, A., ... Bhattacharya, S. (2018, sep). A novel multirobot system for plant phenotyping. *Robotics*, *7*(4), 61. doi: https://doi.org/10.3390/robotics7040061

Ge, Y., Xiong, Y., & From, P. J. (2020, sep). Symmetry-based 3d shape completion for fruit localisation for harvesting robots. *Biosystems Engineering*, *197*, 188–202. doi: https://doi.org/10.1016/j.biosystemseng.2020.07.003

Griswold, W. (2009). *How to read an engineering research paper.* Retrieved from `http://weibel.ucsd.edu/download/cse118/How_to_Read_an_Engineering_Research_Paper.pdf`

Hameed, I. A. (2018, Aug). A coverage planner for multi-robot systems in agriculture. In *2018 ieee international conference on real-time computing and robotics (rcar)* (p. 698-704). doi: 10.1109/RCAR.2018.8621801

Huang, W. (2000). *How to read a research paper.* Retrieved from `https://www.cs.cmu.edu/~motionplanning/reading/howtoread.pdf`

Huang, Z., Jacky, T. L., Zhao, X., Fukuda, H., Shiigi, T., Nakanishi, H., ... Kondo, N. (2020). Position and orientation measurement system using spread spectrum sound for greenhouse robots. *Biosystems Engineering*, *198*, 50 - 62. Retrieved from `http://www.sciencedirect.com/science/article/pii/S1537511020301999` doi: https://doi.org/10.1016/j.biosystemseng.2020.07.006

Innocente, M. S., & Grasso, P. (2019). Self-organising swarms of firefighting drones: Harnessing the power of collective intelligence in decentralised multi-robot systems. *Journal of Computational Science*, *34*, 80 - 101. Retrieved from `http://www.sciencedirect.com/science/article/pii/S1877750318310238` doi: https://doi.org/10.1016/j.jocs.2019.04.009

Jones, M. H., Bell, J., Dredge, D., Seabright, M., Scarfe, A., Duke, M., & MacDonald, B. (2019, nov). Design and testing of a heavy-duty platform for autonomous navigation in kiwifruit orchards. *Biosystems Engineering*,

187, 129–146. doi: https://doi.org/10.1016/j.biosystemseng.2019.08.019

Khan, M. M., Kasmarik, K., & Barlow, M. (2020). Autonomous detection of collective behaviours in swarms. *Swarm and Evolutionary Computation*, *57*, 100715. Retrieved from http://www.sciencedirect.com/science/article/pii/S2210650220303680 doi: https://doi.org/10.1016/j.swevo.2020.100715

Konur, S., Dixon, C., & Fisher, M. (2012). Analysing robot swarm behaviour via probabilistic model checking. *Robotics and Autonomous Systems*, *60*(2), 199 - 213. Retrieved from http://www.sciencedirect.com/science/article/pii/S0921889011001916 doi: https://doi.org/10.1016/j.robot.2011.10.005

Liang, J., & Lee, C. (2014, June). Self-navigation of multi-robot system using artificial bee colony algorithm. In *11th ieee international conference on control automation (icca)* (p. 243-248). doi: 10.1109/ICCA.2014.6870927

Liu, S., Mao, L., & Yu, J. (2006, June). Path planning based on ant colony algorithm and distributed local navigation for multi-robot systems. In *2006 international conference on mechatronics and automation* (p. 1733-1738). doi: 10.1109/ICMA.2006.257476

Lynn, N., & Suganthan, P. N. (2015). Heterogeneous comprehensive learning particle swarm optimization with enhanced exploration and exploitation. *Swarm and Evolutionary Computation*, *24*, 11 - 24. Retrieved from http://www.sciencedirect.com/science/article/pii/S2210650215000401 doi: https://doi.org/10.1016/j.swevo.2015.05.002

Mavrovouniotis, M., Li, C., & Yang, S. (2017). A survey of swarm intelligence for dynamic optimization: Algorithms and applications. *Swarm and Evolutionary Computation*, *33*, 1 - 17. Retrieved from http://www.sciencedirect.com/science/article/pii/S2210650216302541 doi: https://doi.org/10.1016/j.swevo.2016.12.005

Miner, D. (2007). Swarm robotics algorithms: A survey. *Report, MAPLE lab, University of Maryland*.

Mirzaei, F., Pouyan, A. A., & Biglari, M. (2020, sep). Automatic controller code generation for swarm robotics using probabilistic timed supervisory control theory (ptSCT). *Journal of Intelligent & Robotic Systems*, *100*(2), 729–750. doi: https://doi.org/10.1007/s10846-020-01201-4

Ni, J., Wang, X., Tang, M., Cao, W., Shi, P., & Yang, S. X. (2020). An improved real-time path planning method based on dragonfly algorithm for heterogeneous multi-robot system. *IEEE Access*, *8*, 140558-140568. doi: 10.1109/ACCESS.2020.3012886

Oberti, R., & Shapiro, A. (2016, jun). Advances in robotic agriculture for crops. *Biosystems Engineering*, *146*, 1–2. doi: https://doi.org/10.1016/j.biosystemseng.2016.05.010

Osaba, E., Del Ser, J., Iglesias, A., & Yang, X.-S. (2020). Soft computing for swarm robotics: New trends and applications. *Journal of Computational Science*, *39*, 101049. Retrieved from http://www.sciencedirect.com/science/article/pii/S187775031931172X doi: https://doi.org/10.1016/j.jocs.2019.101049

Pedersen, S. M., Fountas, S., Have, H., & Blackmore, B. S. (2006, jul). Agricultural robots—system analysis and economic feasibility. *Precision Agriculture*, *7*(4), 295–308. doi: https://doi.org/10.1007/s11119-006-9014-9

Raja, R., Nguyen, T. T., Vuong, V. L., Slaughter, D. C., & Fennimore, S. A. (2020, jul). RTD-SEPs: Real-time detection of stem emerging points and classification of crop-weed for robotic weed control in producing tomato. *Biosystems Engineering*, *195*, 152–171. doi: https://doi.org/10.1016/j.biosystemseng.2020.05.004

Roldán, J., Garcia-Aunon, P., Garzón, M., de León, J., del Cerro, J., & Barrientos, A. (2016, jul). Heterogeneous multi-robot system for mapping environmental variables of greenhouses. *Sensors*, *16*(7), 1018. doi: https://doi.org/10.3390/s16071018

Schneider, F. E., & Wildermuth, D. (2003, Oct). A potential field based approach to multi robot formation navigation. In *Ieee international conference on robotics, intelligent systems and signal processing, 2003. proceedings. 2003* (Vol. 1, p. 680-685 vol.1). doi: 10.1109/RISSP.2003.1285656

Shi, Z., Tu, J., Zhang, Q., Liu, L., & Wei, J. (2012). A survey of swarm robotics system. In Y. Tan, Y. Shi, & Z. Ji (Eds.), *Advances in swarm intelligence* (pp. 564–572). Berlin, Heidelberg: Springer Berlin Heidelberg.

Tiwari, A., Silver, M., & Karnieli, A. (2020, oct). Developing object-based image procedures for classifying and characterising different protected agriculture structures using LiDAR and orthophoto. *Biosystems Engineering*, *198*, 91–104. doi: 10.1016/j.biosystemseng.2020.07.017

van Herck, L., Kurtser, P., Wittemans, L., & Edan, Y. (2020, apr). Crop design for improved robotic harvesting: A case study of sweet pepper harvesting. *Biosystems Engineering*, *192*, 294–308. doi: https://doi.org/10.1016/j.biosystemseng.2020.01.021

Vasconez, J. P., Kantor, G. A., & Cheein, F. A. A. (2019, mar). Human–robot interaction in agriculture: A survey and current challenges. *Biosystems Engineering*, *179*, 35–48. doi: https://doi.org/10.1016/j.biosystemseng.2018.12.005

Vigelius, M., Meyer, B., & Pascoe, G. (2014, 11). Multiscale modelling and analysis of collective decision making in swarm robotics. *PLOS ONE*, *9*(11), 1-19. Retrieved from `https://doi.org/10.1371/journal.pone.0111542` doi: 10.1371/journal.pone.0111542

Villa-Henriksen, A., Edwards, G. T., Pesonen, L. A., Green, O., & Sørensen, C. A. G. (2020, mar). Internet of things in arable farming: Implementation, applications, challenges and potential. *Biosystems Engineering*, *191*, 60–84. doi: https://doi.org/10.1016/j.biosystemseng.2019.12.013

Wang, B., Liu, Z., Li, Q., & Prorok, A. (2020, Oct). Mobile robot path planning in dynamic environments through globally guided reinforcement learning. *IEEE Robotics and Automation Letters*, *5*(4), 6932-6939. doi: 10.1109/LRA.2020.3026638

Weiss, U., & Biber, P. (2011, may). Plant detection and mapping for agricultural robots using a 3d LIDAR sensor. *Robotics and Autonomous Systems*, *59*(5), 265–273. doi: https://doi.org/10.1016/j.robot.2011.02.011

Winfield, A. F. T., Liu, W., Nembrini, J., & Martinoli, A. (2008, sep). Modelling a wireless connected swarm of mobile robots. *Swarm Intelligence*, *2*(2-4), 241–266. doi: https://doi.org/10.1007/s11721-008-0018-0

Wu, C., Zeng, R., Pan, J., Wang, C. C. L., & Liu, Y. (2019, Oct). Plant phenotyping by deep-learning-based planner for multi-robots. *IEEE Robotics and Automation Letters*, *4*(4), 3113-3120. doi: 10.1109/LRA .2019.2924125