References

- [1] P. Dittmar, "Timber train being unloaded onto a truck in finland," 2006, [CC BY-SA 2.0 https://creativecommons.org/licenses/by-sa/2.0, via Wikimedia Commons]. [Online]. Available: https://commons.wikimedia.org/wiki/File:Timber_train_unloaded_Finland.jpg
- [2] E. Gregersen, "Lidar," *Encyclopaeida Britannica*, 2011. [Online]. Available: https://www.britannica.com/technology/lidar
- [3] P. McManamon, *LiDAR Technologies and Systems*. Bellingham: Society of Photo-Optical Instrumentation Engineers, 2019. ISBN 1510625399
- [4] G. Brooker, *Introduction to Sensors for Ranging and Imaging*. Raleigh, NC: Scitech Publishing Inc., 2011. ISBN 978-1-901121-74-6
- [5] M. I. Skolnik, "Radar," *Encyclopaeida Britannica*, 1999 (Updated 2020). [Online]. Available: https://www.britannica.com/technology/radar
- [6] L. S. Jayashree and G. Selvakumar, Getting Started with Enterprise Internet of Things: Design Approaches and Software Architecture Models. Springer, 2020. ISBN 3030309444
- [7] E. Gregersen, "Lidar," *Encyclopaeida Britannica*, 2011. [Online]. Available: https://www.britannica.com/technology/lidar
- [8] Z. Ranjbar and M. Joborn, "Framtidens flexibla processindustriella logistik," *SICS Technical Report*, May 2015. [Online]. Available: https://www.diva-portal.org/smash/get/diva2:1043550/FULLTEXT01.pdf
- [9] B. Mitrovic, "The effects of emerging technologies in rail yards and intermodal terminals," Master's thesis, KTH Royal Institute of Technology, Stockholm, SE, 2019.

- [10] B. Smakic, "Hinderdetektering på den svenska järnvägen," Master's thesis, Lunds Tekniska Högskola, Lund, SE, 2019.
- [11] A. Håkansson, "Portal of research methods and methodologies for research projects and degree projects," in *International Conference on Frontiers in Education: Computer Science and Computer Engineering*, 2013.
- [12] A. Mukaru, M. Lenman, S. Olsson, H. Graf, D. Müller, L. Andersson *et al.*, "Rfid in rail guideline for the identification of railway assets using gs1 standards," GS1, Guideline, 2012.
- [13] S. Javadi, M. Dahl, and M. I. Pettersson, "Vehicle speed measurement model for video-based systems," *Computers Electrical Engineering*, vol. 76, pp. 238–248, 2018.
- [14] How does gps work? [Online]. Available: https://spaceplace.nasa.gov/gps/en/
- [15] F. Remondino and D. Stoppa, Eds., *TOF Range-Imaging Cameras*. Springer Berlin Heidelberg, 2013. ISBN 3-642-27523-0
- [16] P. McManamon, *Field Guide to Lidar*. Bellingham: Society of Photo-Optical Instrumentation Engineers, 2015. ISBN 9781628416541
- [17] D. M. Tratt, "Emerging technologies, lidar," in *Encyclopedia of Remote Sensing*, 1st ed., E. G. Njoku, Ed. Springer, NY, 2014.
- [18] R. Menzies, "Lidar systems," in *Encyclopedia of Remote Sensing*, 1st ed., E. G. Njoku, Ed. Springer, NY, 2014.
- [19] D. S. Dwarampudi and V. S. V. Kakumanu, "Efficiency of a lidar speed gun," *International Journal of Electrical, Electronics and Data Communication*, vol. 1, no. 9, pp. 27–31, 11 2013.
- [20] J. Schneider and A. Caracas, "Robust speed measurements with standard wireless devices," *IET wireless sensor systems*, vol. 7, pp. 35–43, 4 2017.
- [21] A. Drumea and C. Popescu, "Finite state machines and their applications in software for industrial control," in 27th International Spring Seminar on Electronics Technology: Meeting the Challenges of Electronics Technology Progress, 2004., vol. 1, 2004. doi: 10.1109/ISSE.2004.1490370 pp. 25–29 vol.1.

- [22] A. M. Zungeru, J. M. Chuma, C. K. Lebekwe, P. Phalaagae, and J. Gaboitaolelwe, Green Internet of Things Sensor Networks: Applications, Communication Technologies, and Security Challenges. Cham: Springer International Publishing AG, 2020. ISBN 9783030549824
- [23] S. Al-Sarawi, M. Anbar, K. Alieyan, and M. Alzubaidi, "Internet of things (iot) communication protocols: Review," in *8th International Conference on Information Technology (ICIT)*, 2017, pp. 685–690.
- [24] (2020) Zigbee faq. [Online]. Available: https://zigbeealliance.org/zigbee-faq
- [25] M. Muzal, Z. Mierczyk, M. Zygmunt, J. Wojtanowski, and W. Piotrowski, "Measurement of vehicles speed with full waveform lidar," in *SPIE Proceedings*, vol. 10159, 2016.
- [26] D. Stein, M. Spindler, J. Kuper, and M. Lauer, "Rail detection using lidar sensors," *International Journal of Sustainable Development and Planning*, vol. 11, pp. 65–78.
- [27] G. Ryan, "Introduction to positivism, interpretivism and critical theory," *Nurse Researcher*, 2018.
- [28] Y. Gidron, "Reliability and validity," in *Encyclopedia of Behavioral Medicine*, M. Gellman and J. Turner, Eds. Springer, NY, 2013.
- [29] H. E. Boysen, "The fran-scan hi-cube intermodal corridor," in *Proceedings of the 7th SoNorA University Think Tank Conference*, 2011.
- [30] Tfmini plus documentation. [Online]. Available: https://www.robotshop.com/media/files/content/b/ben/pdf/sj-gu-tfminiplus-01-a04-datasheet_en.pdf
- [31] B. Nour, K. Sharif, F. Li, S. Biswas, H. Moungla, M. Guizani, and Y. Wang, "A survey of internet of things communication using icn: A use case perspective," *Computer Communications*, vol. 142-143, pp. 95–123.
- [32] D. Gatziolis and H.-E. Andersen, "A guide to lidar data acquisition and processing for the forests of the pacific northwest," 7 2008.
- [33] J. Marietta and B. Chandra Mohan, "A review on routing in internet of things," *Wireless Personal Communications*, vol. 111(1), pp. 209–233.

- [34] J. Walrand, S. Parekh, and R. Srikant, *Communication Networks: A Concise Introduction, Second Edition*. Morgan Claypool, 2017. ISBN 1681736152
- [35] S.-H. Yang, Wireless Sensor Networks Principles, Design and Applications. Springer London, 2014. ISBN 1-4471-5505-X
- [36] United Nations, "Transforming our world: The 2030 agenda for sustainable development," 2015. [Online]. Available: https://sdgs.un.org/2030agenda

Appendix A

Numerical Values for the Three Speed Settings of the Model Train

Table A.1 – Number of video frames it took for the model train to pass a distance of 80 cm using a 60 Frames per second (FPS) camera, and the calculated velocities thereof.

Speed	Number of		Velocity	Velocity
setting	frames	seconds	[m/s]	[km/h]
A	249	4.15	0.19	0.69
В	113	1.88	0.42	1.53
С	68	1.13	0.71	2.54