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Optimization Strategies for In-Store Order Picking in Omnichannel Retailing

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Abstract

The COVID-19 pandemic is changing consumer behavior and accelerating the interest for online grocery purchases. Hence, traditional brick-and-mortar retailers are developing omnichannel solutions enabling online purchases in parallel to normal activities. Buy-Online-Pick-up-in-Store

concepts are flourishing in this context, and they are the topic of this work.

In this paper we propose a novel application of the sequential ordering problem to model products picking throughout the store shelves. The result is an optimized picking sequence that however takes also into account the characteristics of the goods (fragility, weight, etc.). The aim is to preserve goods integrity while allowing the pickers to optimize their route through the shop. The approach is exemplified on historical online orders of a real German shop.

Keywords

In-store order picking

Omnichannel Grocery Retailing

Sequential ordering problem

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References

1. Hübner, A., Kuhn, H., Sternbeck, M.G.: Demand and supply chain planning in grocery retail: an operations planning framework. *Int. J. Retail Distrib. Manage.* **41**(7), 512–530 (2013)
 2. Pires, M., Camanho, A., Amorim, P.: Solving the grocery backroom sizing problem. *Int. J. Prod. Res.* **58**(18), 5707–5720 (2020)
 3. Reiner, G., Teller, C., Kotzab, H.: Analyzing the efficient execution of in-store logistics processes in grocery retailing. The case of dairy products. *Prod. Oper. Manage.* **22**, 924–939 (2013)
 4. Hübner, A., Kuhn, H., Wollenburg, J.: Last mile fulfilment and distribution in omni-channel grocery retailing. *Int. J. Retail Distrib. Manage.* **44**(3), 228–247 (2016)
-

5. Wang, Y., Xu, R., Schwartz, M., Chen, X.: COVID-19 and retail grocery management: insights from a broad-based consumer survey. *IEEE Eng. Manage. Rev.* **48**(3), 202–211 (2020)

6. Boysen, N., Koster, R. de, Füßler, D.: The forgotten sons. Warehousing systems for brick-and-mortar retail chains. *Eur. J. Oper. Res.* **288**(2), 361–381 (2021)

7. Wollenburg, J., Hübner, A., Kuhn, H., Trautrim, A.: From bricks-and-mortar to bricks-and-clicks. *Int. J. Phys. Distrib. Logist. Manage.* **48**(4), 415–438 (2018)

8. Li, Z., Yang, W., Jin, H.S., Wang, D.: Omnichannel retailing operations with coupon promotions. *J. Retail. Consum. Serv.* **58**, 102324 (2021)

9. Kim, K., Han, S.-L., Jang, Y.-Y., Shin, Y.-C.: The effects of the antecedents of “Buy-Online-Pick-up-In-Store” service on consumer’s BOPIS choice behaviour. *Sustainability* **12**(23), 9989 (2020)

10. Kong, R., Luo, L., Chen, L., Keblis, M.F.: The effects of BOPS implementation under different pricing strategies in omnichannel retailing. *Transp. Res. Part E Logist. Transp. Rev.*

141, 102014 (2020)

11. Chou, X., Loske, D., Klumpp, M., Gambardella, L.M., Montemanni, R.: In-store picking strategies for online orders in grocery retail logistics (2021, Submitted)

 12. Matusiak, M., de Koster, R., Saarinen, J.: Utilizing individual picker skills to improve order batching in a warehouse. *Eur. J. Oper. Res.* **263**(3), 888–899 (2017)

 13. Ogasawara, A., Ishigaki, A., Yasui, S.: Adaptive storage reassignment in order picking systems to picker learning and change of demand. *Procedia Manuf.* **39**, 1623–1632 (2019)

 14. Grosse, E.H., Calzavara, M., Glock, C.H., Sgarbosssa, F.: Incorporating human factors into decision support models for production and logistics. *Curr. State Res. IFAC-PapersOnLine* **50**(1), 6900–6905 (2017)

 15. Pardines, I., Lopez, V.: Shop&Go: TSP heuristics for an optimal shopping with smartphones. *Sci. China Inf. Sci.* **56**(11), 1–12 (2013).
<https://doi.org/10.1007/s11432-013-5013-4>
-

16. Liebmann, H.P., Zentes, J.:
Handelsmanagement. Vahlen, Munich (2001)

17. Ozgormusa, E., Smith, A.E.: A data-driven
approach to grocery store block layout.
Comput. Ind. Eng. **139**, 105562 (2020)

18. Filipe, S., Henriques Marques, S., Fátima
Salgueiro. M. de: Customers' relationship with
their grocery store: direct and moderating
effects from store format and loyalty
programs. J. Retail. Consum. Serv. **37**, 78–88
(2017)

19. Mojana, M., Montemanni, R., Di Caro, G.,
Gambardella, L.M.: A branch and bound
approach for the sequential ordering problem.
Lect. Notes Manage. Sci. **4**(1), 266–27 (2012)

20. Montemanni, R., Smith, D.H., Rizzoli, A.E.,
Gambardella, L.M.: Sequential ordering
problems for crane scheduling in port
terminals. Int. J. Simul. Process Model. **5**(4),
348–361 (2009)

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