Cross docking operations: a simulation model for the validation and robustness assessment of IP-based truck schedules

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What are the cross-docking operations?

- less than 24h of temporary storage
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Assumptions for the IP-model

1. The door service mode is exclusive (inbound or outbound, not both).
2. The content of the incoming trucks (#pallets/destination) is known.
3. The door-to-door distance for the transfer is not taken into account
4. Internal operations are done in masked time, within one time unit.
5. Once unloaded, the pallets can be picked from the floor in any order.
6. Outbound trucks have a fixed capacity.
7. Outbound trucks leave only when they are fully loaded.
8. A pallet whose matching truck is not available is put into storage.
9. The storage capacity is unlimited.

Is the IP-based schedule actually applicable?

Validity range of the assumptions made in the IP-model

Check the impact on the resulting operations when varying:
- Assumption 3: transfer times
- Assumption 4: docking, unloading, scanning process times
- Assumption 5: order of the pallets inside the inbound trucks

Robustness of the schedule against stochastic events

- Truck punctuality
- Decide how to handle the trucks and pallets when the original schedule is perturbated (some trucks arrive earlier or later).
- Check the impact on the resulting operations.

- Content of the inbound trucks (assumption 2)
- Check the impact on the resulting operations when the content of the inbound truck differs from what was expected.

Simulation model using FlexSim

Input of the simulation: truck schedule from the IP-model

We compare the outputs of the IP model and the simulation for:

- trucks arrival and departure time
- amount in storage
- pallet transfers

Results and conclusion

Current results

- Validation phase ongoing
- Sensitivity to variability in transfer time
- Importance of the policy chosen for the pallet transfer

Perspectives

- Refine the IP model to improve its robustness
- Combine this work with a employee scheduling model

References