Simulating new logistics of Le Havre port

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Presentation

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Introduction

• Maritime Transport 80 % world share
• Vessel capacity increase involves:
  – The need for storage in maritime terminal
  – Efficiency
  – Punctuality
• Sustainability (green transport, modal shift)
DCAS Project

- Promote rail transport through the introduction of new logistics organizations
- Remotely operated railway coupon, automatic un/∼coupling for maneuvering in the ITE
Current logistic System

MT : Maritime-Terminals
Multimodal terminal design
Motivation

- Understanding the new system:
  - Cost
  - Number of containers in time
  - Filling rate of shuttle
  - Number of handling per container

- Communicate pedagogically with stakeholders
Methodology

1. UML approach
2. Management rules definition
3. Build a hybrid model in AnyLogic tool:
   - Multi-agent system
   - Discrete Event system
4. Performance evaluation
INTRODUCTION

LE HAVRE PORT LOGISTICS

SIMULATION SCENARIO

MANAGEMENT RULES

RESULTS

CONCLUSION AND PERSPECTIVES

Shuttle 1

Shuttle 2

Shuttle 3

11/05/2015
Handling rules in rail yard

Left to left

Less distance

Less distance without come-back

11/05/2015
Parameters optimization progress

Freight trains assignment by:

\[ P_i = \frac{\alpha_1}{ed_i} + \frac{\alpha_2}{dt_i} + \frac{\alpha_3}{\sum nc_i} \]

\[ \alpha_i / i \in \{1,2,3\} \quad \sum \alpha_i = 1 \]

\[ \alpha_1 \quad \text{Export deadline} \]

\[ \alpha_2 \quad \text{Import deadline} \]

\[ \alpha_3 \quad \text{Number of container} \]
Optimization approach

Objective function

OptQuest Optimizer

Simulation Model

Stopping criteria

Best Solution
Objective function progress
Output generation

Evaluation with Simulation Model → replication

Robustness

Stochastic variation

New parameters test

Acceptable transfer rate

Stopping criteria

Stopping criteria
Number of handling per container

- **RAIL**
  - Export
  - Import

- **RIVER**
  - Export
  - Import

11/05/2015
Shuttle filling progress
Cost per container

Less distance

Less distance without come-back  Left to left
Conclusion

• Test different management mode of future logistic pattern with multimodal terminal

• Simulation results were used to validate the economic equation

• Performance indicators given by the simulation are a valuable source for the Port Authority to make good predictive study of operations management
perspectives

• optimize management rules of simulation model

• seek improvements and more efficient exploitation

• adapt the simulation tool to use it in operation:
  – as a tool for resource reservation on the horizon of a week
  – transform the simulation model to a decision support tool in the real-time operational decision.
Thank you for your attention!

Questions?