Process Mining towards Big data analytics in logistics environments: RORO Terminals

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Due to its convenience in the maritime industry, Roll on/Roll off (RORO) ships are very important for offering smooth and flexible services required by the modern world of trade. RORO shipping engenders an enormous mass of data generated from a set of processes, deriving from diverse sources and arranged in different structures. The management and analysis of this big data is extendedly important and possessing a greater impact on an ample range of industries including maritime transportation that serves as the engine fuelling global economic development. Therefore, It will impact on vessel performance monitoring and provide performance prediction, real-time transparency as well as decision-making support.

Several research studies have been conducted on RORO terminals, (Morales-Fusco et Saurí, 2009) runed a study about capacity calculation and determination of some quality indicators and integrated the developed model on an terminal in Spain. (Özkan et al., 2016) proposed methodology to establish the main quality indicators to be taken into account for a pure RORO terminal and evaluated using a RORO terminal in the Port of Barcelona. (Arof, 2018) developed a decision-making model for determining the potential of interstate RoRo operations in Archipelagic Southeast Asia supported by the Analytic Hierarchy Process (AHP). To our knowledge, no prior studies have examined RORO terminals using process mining. To fill this literature gap, this paper elaborates process mining as an analytics tool for RORO event data processing. Exploring process mining in accordance with complex event processing as big data analytics tools to simulate RORO terminals will have plenty of advantages for RORO shipping.

Considering the modeling objective that defines the simulation, the system should be able to relieve congestion and confront the future demand volume flows estimated at RORO port terminal. This simulation will help to identify the bottlenecks and deadlocks conditions as well as construct a clear picture of latency in the system.
Process Mining techniques will help us picture the reality of what is hidden in RORO event for each model by gathering process statistics.

Corporate performance depends profoundly on operational effectiveness, and the expanded business, the more complicated it becomes to optimize operations especially in a domain as port logistics. Moreover, RORO shipping engenders an enormous mass of data deriving from diverse sources and arranged in different structures (traffic data, cargo data, and process data...). Thus, the investigation of RORO event data is becoming increasingly important and having a greater impact on enhancing the effectiveness of operational scheduling of RORO terminals. Furthermore, process mining coupled with complex event processing as big data analytics tools for RORO events has become a necessity to identify significant events in large event streams. Consequently, various advantages could be gained. For instance, port authorities will have a real-time intercession to monitor the congestion and improve cargo handling performance due to the instant access events generated.

1 Conclusion and future work

This work addressed process mining for RoRo terminals. It proposes process mining as a novel technique for big data analytics and aims at handling RoRo event big data using this technique in accordance with complex event processing on the one hand. On the other hand, as the demand for RORO shipping services increases, RORO terminals are driven to expand their existing infrastructure in order to satisfy the needs of increasing demand volume. For this, we intend to address the described problem with a discrete event simulation model representing the RoRo terminal system.

References

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Summary

Maritime logistics has not completely absorbed the potential advantages to be gained from big data analytics while the constantly growing data volume is exploding leading to several challenges to the port terminal trying to gain control over complex business processes. This paper exploites process mining with complex event processing as an analytics technique for RORO event data as a prime source of big data.