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Spanish initiative for fully automated stowage on roll-on/roll-off operations

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Abstract

In the past decades, social development has motivated a notable growth on transportation necessities. In 2020, higher tendencies are expected, so transportation demand will grow about a 20%. Besides, one of the foundations of the UE's Green Policy initiative for freight is the transportation sea-to-ground through the so-called „Short sea shipping" or „Motorways of the sea". Facing this scenario, it is needed the development of technologies and solutions which contribute to raise the profitability, flexibility and efficiency of marine transportation. This will lead to more competitive freight, so investing on such technologies is a guarantee of success. On this basis, within the framework of the Innterconecta 2013 programme, funded by the Spanish Ministry of Economy and Competitiveness through the Centre for Industrial Technological Development (CDTI), the project AUTOPORT is being developed, which objectives are here detailed. The main objective of the project is to develop the technologies needed for a fully automated stowage on roll-on/roll-off ships in order to improve the logistic flow, reduce stowage times and maximize the efficiency of the space occupation in hold. This will be accomplished by both the automation of logistic processes and terminal trucks. Automation of processes aims for obtaining a stowage plan which reduces to the minimum the obstructions between cargo and trucks in the process and also the imbalance of the hold, in order to allow easy and smooth load operations even in rough sea conditions. Automation of terminal trucks consist in the efficient use of localization, path planning

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and control for taking a specifically designated roll trailer and stowing it on the exact hold location pointed by the stowage plan, all without human intervention.

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Keywords: Autonomous vehicle; vehicle automation; Dynamic Routing System; cargo transportation; Ro-Ro Transshipment; Artificial Intelligence

1. Introduction

Transport in all its forms is subjected for years to extraordinary pressure drastically in order to reduce inefficiencies and environmental impact, which is enhanced with the uncertain economic outlook.

Within the new „Green Policy" it has identified transportation as one of the main pollutants, which is why through the new directives are encouraging strategies and actions to reduce the gas emissions from the consumption of the fossil fuels and noise emissions in the transport of goods and people. The transfer of freight from road to other modes of transport such as sea appears as an option with great potential for reducing emissions. Also one of the pillars on which the „Green Policy" is based on transport is the modal shift of goods from land to sea through the so-called „Short Sea Shipping" or motorways of the sea.

Taking into account this scenario, the development of solutions and technologies that help ensure greater profitability, flexibility and efficiency and thus more competitive maritime freight transport is a necessity, and investment in these technologies guarantee success.

In this context, the overall objective of the project is the development and demonstration of new technological concepts and oriented towards full deployment of automated cargo transport port terminals Ro-Ro (Roll on-Roll of).

1.1. Main objectives

- The development of a novel Port Operation Management System (POMS) and tools combining functionalities of Transport and Inventory Management for enterprise communities operating in ports and intermodal freight terminals. Such tools will incorporate real-time operational logistics planning among others.
- The development of a new easy to use and affordable tool for RoRo enterprise communities based on a semantic approach to improve connectivity in order to facilitate the communication between different systems from different companies providing complimentary services and/or information regarding the logistic process.
- The development of Automatic stowage and lashing through novel Automatic Guided Vehicles (AGV) based on terminal tractors for Ro-Ro (Roll-on Roll-off) transshipment tailored to the specific needs.
- The improvement of infrastructures for ports and the related freight terminals through the innovative communications and positioning technologies oriented to support and manage the previously mentioned Automatic Guided Vehicles.
- The development of a new logistic concept and ICT-based control center to be applied by shippers, based on the integration of the AGVs into the POMS for real time planning optimization. The AGVs will be linked to the information flow incurred by logistic operation and thus to the whole supply chain.
- The generation of a new ecosystem of integrated tools to increase the visibility and transparency of information for stakeholders in the RoRo transport value chain due to mobile connectivity and real-time localisation, identification, and tracking of goods and resources, and also based on the availability of all the previous elements.