Container Port Automation

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Patrick Cooperation

1 Introduction

Patrick is a focused transport logistics company specialised in the loading and unloading of ships and the efficient land based collection, distribution and storage of cargo for import, export and within Australia.

Patrick began as a one-time small stevedore and now leader in port related transport and logistics. We’ve evolved into a major transport operator and our background in the deployment and adaptation of technology gives us the understanding of how to apply technology to the efficient movement of freight across the whole supply chain whether it is at the port, on rail, air, and road or at the warehouse.

2 Background

In 1995 Patrick began collaboration with the Australian Centre for Field Robotics (ACFR) at the University of Sydney with the objective of improving waterfront efficiency. An initial project was undertaken to improve quay-crane cycle times through the design of new reeving systems and application of advanced high-speed estimation and control techniques. This was followed in 1996 with a project to design an autonomous straddle carrier. Patrick and ACFR worked with straddle carrier manufacturers
Kalmar Industries to deliver a fleet of new “fly-by-wire” straddle carriers to Patrick terminals in Australia. In 1997, with the help of a START grant, the ACFR undertook a programme to automate one of these straddle carriers. This included the development of control algorithms, navigation and positioning methods, path planning and safety systems. The development was completed in 2000 with the demonstration of a fully autonomous straddle carrier in a restricted area at Port Botany. The system was handed over to a new company, Patrick Technology & Systems (PTS), whose objective was to take this demonstration system through to a production container terminal. The company engaged personnel from both Patrick and the ACFR involved in the development phase, together with new employees skilled in production engineering and terminal operations.

A container terminal at Fisherman’s Island in Brisbane was acquired and redesigned to be automated. Systems engineering, component and software production engineering, port planning and traffic management systems were designed.

Five new automated straddle carriers were produced and the system was put into initial operation in 2002. The automated container terminal was opened for public inspection and to trade media at the General Stevedoring Council Meeting held in Brisbane in April 2002. Since this time the system has been handling ships docking at the terminal and has also undergone further development in readiness for deployment at larger terminals.

3 Operating Principle

The vehicle control system allows for the planning and execution of free-ranging paths over the port area. The autonomous straddle carrier fleet is controlled by the Terminal Operating System which coordinates the motion of all vehicles on the terminal, and which schedules container movement to get best throughput from the terminal. Paths and container movement tasks are generated remotely by the Terminal Operating System. These tasks are interpreted into control actions by the central Traffic Manage-