



AUTOMATED TERMINALS AND SELF-DRIVING CARS



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Development of autonomous cars has progressed rapidly in recent years, while at selected container terminals, automation has increasingly gained ground. This paper outlines the key differences and similarities between the two fields and examines the influence that development of autonomous road vehicles is expected to have on the future of container terminal automation.

Autonomous cars and automated terminals share several common aims. Both areas are considered applicable in levels of increasing functionality or sophistication, but they also differ markedly in several respects. The underlying operating differences of autonomous control of road vehicles versus a centralised control of terminal operations will remain for the foreseeable future. Arguably the single most important long-term enablers for autonomous road vehicles will be artificial intelligence (AI) and especially machine learning, which are the core technologies required for accurate real-time situation analysis and safe decision making in complex open traffic environments. It is the view of the authors that the exponential growth of these

technologies in the car and Information & Communication Technology (ICT) industries will create significant openings for adapting and integrating new capabilities into terminal automation, thus speeding-up the development of our industry.

THE CAR INDUSTRY AND SOCIETY

Over the last few years, manufacturers have been introducing progressively more advanced driver assistance features into mass produced cars. The purpose of these technical features is to aid drivers in their journey from A to B while making driving a more comfortable and safer experience. In this way, car manufacturers develop their products incrementally in order to keep the industry and their business evolving.

The next goal is to increase the productivity of the driver or society. At advanced levels of automation where no driver is needed, people will be able to spend their time on something more productive or interesting during the journey. Once the majority of cars are self-driving, this can be expected to have a major societal impact. An even more

significant effect on society and global business may result from various kinds of mobility as a service (MaaS) offerings. For example, driver salaries are often the single biggest expense for taxi and truck companies. Once equipped with self-driving fleets, their business is expected to get a major boost.

KEY OPPORTUNITIES

The rapid mass-market development of supporting technologies for autonomous cars (AI, sensors, guidance technology, et cetera) has presented a major opportunity from which container terminal automation providers can benefit today and in the near future. Instead of needing to develop proprietary technologies from scratch, or systems based on expensive industrial components, the industry can adapt and reuse many of these new solutions for its own specific applications. This opportunity is particularly powerful if it can be combined with open standards and interfaces that allow for the creation of wider business and technology ecosystems beyond the borders of individual companies.



Within the terminal industry, Kalmar has taken the first steps to facilitate this kind of development with its Kalmar Key initiative. The ability of automotive companies and technology providers to converge on a workable set of open standards for self-driving cars will likely hold the key to success for the wider industry in years to come. The future of self-driving cars requires:

- Continued development of new driver assist features
- MaaS services with autonomous vehicles, in limited areas initially
- Development of support infrastructure
- Communications network development
- HD maps and crowdsourcing
- Eventual global deployment of autonomous cars, perhaps area by area

THE GLOBAL LOGISTICS CHAIN

Currently, automation is accepted as the primary way for terminals to develop their competitiveness in the future. The benefits of automation include safety, reliability, predictability and improved operations. Terminal automation as such does not radically change the current business models of the logistics industry, but the ever-growing software and service business, as well as the development of open and transparent global logistics chains will do.

The increasing levels of automation at container terminals parallels the automatization that has taken place in many other industries over the last few decades. In addition to the obvious safety improvements that arise from keeping people out of the operating area of heavy machinery, automation enables terminals to perform more container moves with a set number of personnel. Combined with the rapid advance of digitalisation and new developments

such as blockchain, terminal automation sets the stage for a fully transparent global logistics supply chain; one that can be expected to have a major disruptive impact on how goods and materials are transported worldwide and how businesses can prosper.

SUMMARY

Autonomous cars and the automation of container handling equipment share many common objectives and driving forces, but they differ markedly in several respects. In both fields, development proceeds in steps towards full automation, but the global mass market of vehicle manufacturing can benefit from greater economies of scale in technology development than a comparatively specialized industry such as our own. The underlying differences in basic technical approach (autonomous control of self-driving cars versus centralised control of terminal automation) will remain for the foreseeable future.

Approaches to system safety are also different in the two fields. The container terminal business needs to adhere to a strict set of pre-existing industrial safety regulations, whereas a high-volume market led by the world's largest major industrial and software companies might simply forge ahead with the development of self-driving cars and expect legislation to catch up. For better or for worse, the terminal business does not have this option. The general trend is towards increasing autonomy, which introduces increased chances of error. Problems related to AI safety are most likely to manifest in scenarios in which the AI system exerts direct control over its physical and/or digital environment without a human in the loop, for example, in automated industrial processes, self-driving cars or cleaning robots.

Container terminal operators were among the first to introduce automated machines and they have since been able to build extremely reliable and well-performing solutions with relatively simple technology in the closed environment of a port. Now, terminals have the unique opportunity of cherry-picking the best of new technologies being developed by the mass market car industry and harnessing them for their own purposes. However, due to significantly different operational business logic, the key challenge will be learning to adapt and customize these capabilities to the port environment. As for what kinds of next-generation solutions we are able to create, the only limits will be in our imagination and our capability to apply these technologies in our own field.

ABOUT THE ORGANIZATION

Kalmar, part of Cargotec, offers the widest range of cargo handling solutions and services to ports, terminals, distribution centres and to heavy industry. Kalmar is the industry forerunner in terminal automation and in energy efficient container handling, with one in four container movements around the globe being handled by a Kalmar solution. Through its extensive product portfolio, global service network and ability to enable a seamless integration of different terminal processes, Kalmar improves the efficiency of every move.

ENQUIRIES

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