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Satellites collect and transmit a variety of data, also for maritime applications.

USE OF UNMANNED SURFACE VESSELS - UNREALISTIC HYPE OR FEASIBLE SOLUTION?

Autonomous shipping is a topic of increasing relevance. For years, researchers at CML have been addressing its challenges and have set new standards in autonomous control as well as in digital information acquisition and analysis. As yet, no Unmanned Surface Vessel (USV) has been deployed that can reliably withstand the harsh conditions at sea over the long term. But intensive effort is being done on its development. Together with Raytheon Anschütz, CML has been working on the development of potential applications for small USV within the scope of a feasibility study. While the technical concept development was carried out by Raytheon Anschütz, the CML evaluated the economic efficiency of

possible areas of application for USV and also identified user requirements for these services.

Decisive for the further development work is the acceptance of the market: Interviews of CML researchers with maritime stakeholders have shown that the collection of data and information about vessels, maritime infrastructures or the marine environment can be an important application area for USV. With their support, maintenance processes can be made more efficient and maritime and environmental safety can be increased. The use of USV as a launch and landing platform for drones is also a way to expand the operational circle of flight systems in the maritime environment. Last but not least, USV

can perform transport tasks „on demand", for example to offshore facilities. The USV could be monitored from land, an offshore facility or a mother ship.

The concept development was supported by ESA's ARTES program, which promotes the development, implementation and pilot operation of integrated applications that should lead to sustainable services. The general approach of the program is to develop services that rely on space data (e.g. satellite images, satellite AIS or satellite communication data).

VISUALIZING POWER CONSUMPTION ON TERMINALS AND REDUCING ENERGY COSTS AND EMISSIONS

Electricity consumption at cargo handling terminals is high and varies greatly depending on the operation. It has financial and environmental implications and challenges for network operators and users. This is reason enough to analyze the situation in detail and improve it with the help of digital solutions.

In the dashPORT project - short for „Port Energy Management Dashboard" - the companies Niedersachsen Ports and the transhipment company J. Müller in Brake are now supported by Fraunhofer CML and OFFIS - Institute for Information Technology in setting up an energy consumption monitoring system. In order to record the consumption of all
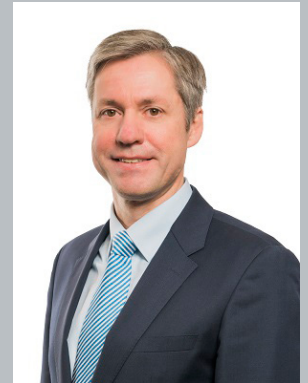
relevant consumers in the entire port environment in detail and in real time on the terminal, about 500 digital remotely readable electricity meters will be installed. Their readings can be continuously evaluated and processed using machine learning. One focus lies on the largest consumers, e.g. the grain handling of J. Müller AG and the operation of crane systems and lighting through Niedersachsen Ports.

The aim of dashPORT is the more conscious use of energy-intensive consumers and the saving of avoidable energy consumption. In addition, dashPORT will predict power consumption and consumption peaks resulting from the knowledge of upcoming ship

arrivals and the associated handling activities.

With the implementation of dashPORT, the Port of Brake can actively contribute to environmental protection, make energy consumption and thus emissions more efficient and participate in relieving the electricity market by reducing peak loads. This also pays off financially for the companies: Savings of 10% are expected in the area of electricity consumption. DashPORT is funded over three years by the German Federal Ministry of Transport and Digital Infrastructure's IHA-TEC funding program for innovative port technologies.

Staff Planning 2.0 optimizes work processes *and* the associated personnel deployment.

STAFF PLANNING 2.0:
AT THE RIGHT PLACE, AT THE RIGHT TIME

Shipping and maritime logistics are highly efficient and sophisticated systems. Many formerly very labor-intensive processes in maritime transport and goods handling have now been digitized and automated. As a result, many workplaces look completely different and many employees are now responsible for extensive and complex tasks. To coordinate them efficiently is the task of staff planning 2.0.

Technological progress makes us forget many of the hardships of the old days of shipping, but also creates new challenges. Over the years, ship crews have become smaller and smaller due to efficiency requirements and technical innovations of the ships. One example: HMM Algeciras, a cargo ship with a length of about 400 meters and a capacity of 23,964 TEU, has a crew of only 23 persons. These few officers and sailors must be optimally deployed to ensure trouble-free ship operation. Perfect planning is essential here in order to distribute the workload evenly among the crew members, in compliance with legal requirements, and to ensure that the right person with the right training is optimally deployed at the right time.

Challenges in staff planning and workforce management
Reduced crew resources on the ships may pose compliance risks for shipping companies, for example, when it comes to observing the prescribed rest periods. In addition, large handling volumes and short lay times of merchant ships have led to a higher workload for the crew in recent decades.
These new conditions, in combination with legal regulations and administrative efforts, make it difficult to assess staff requirements based on knowledge and experience alone. Added to this is the special circumstance that the crew on board is responsible for both operation and maintenance of the ship. Consequently, maintenance management is closely intertwined with staff deployment planning. The challenge is to consider the interdependencies between maintenance, operation and crew management in ship management.
Even small unforeseen incidents, not to mention a pandemic, quickly throw everything back into confusion. A flexible system is needed to be able to react agilely to such developments without spending a lot of time on planning alone.

Smart support
Paper-based planning processes are no longer suitable for meeting these challenges. Today, computer-based information management systems play a key role. Therefore, Fraunhofer CML has developed the software tool SCEDAS®, which calculates mathematically optimized schedules and calculates voyage and ship specific crew requirements. It is already in use on container ships and bulk carriers worldwide and is constantly being further developed. It covers various areas of application in staff deployment planning. Among other things, it supports planners with the help of mathematical optimization techniques in calculating detailed work plans for each individual seafarer and takes into account the imponderables typical for the industry by using sophisticated planning algorithms to constantly update the work plan in real time during the voyage.
To better manage the simultaneity of maintenance and operations for the crew, the latest development of SCEDAS® includes a data-based decision support system for maintenance and management. It helps to plan maintenance work efficiently and in accordance with regulations, taking into account the voyage-specific workload of the crew and taking into account the requirements of company policy, classification societies and legal regulations. CML develops the exact requirements for the software solution individually tailored to the needs of each customer. Thus, with SCEDAS®, every user receives a company-specific taff planning system.

Application in other industries
SCEDAS® was developed for maritime applications, but is also suitable for staff management in other areas. The question of the correct deployment of employees, especially in highly specialized fields, is familiar to many companies. The program can be used where personnel scheduling must take into account factors such as availability, skills and authority of employees, right up to legal regulations. More information about SCEDAS® can be found at www.scedas.de.