SECURCRANE

Project Synopses

Abstract

Project focuses on port cranes to increase performances, safety and human operator working conditions, eliminating the gap between theoretical and real productivity (lifts/hour) of cranes. Core problem of crane productivity is loss of efficiency of human operator due to his stressing working conditions inside crane cabin. SECURCRANE realises a remote crane control, possible now thanks to very innovative antisway device, safeguarding for the operator all information physically "sensed" and seen in his position onboard so that a 3D TV image supplies the driver standing in a remote site with same information/functions of crane cabin seat. Retrieval of additional info on handled containers completes SECURCRANE functions. SECURCRANE will allow Terminal Operators to capitalise on their crane drivers' skill with limited investments.

Background

In port cranes manufacturing field, due to highly detailed bids from buyers and severe price competition, manufacturers usually neglect risks for research & innovations. Current anti-sway devices are mainly based on several physical/electrical principles (combining sensors/actuators to re-balance sway and damp oscillations). Their performance rates and cost/benefit ratios are not satisfactory, and many crane operators declare to work switching off the antisway. The absence of efficient and cost effective antisway systems refrained introduction of remote crane control, as many past experiences showed worldwide. SECURCRANE addresses 2 specific problems, distinct but deeply interconnected, which affect crane operator's behaviour (thus, productivity & pay out of container cranes):

1. the stressing working conditions of cranes operators due to both physical stress (shocks, vibrations, accelerations due to cabin position suspended to trolley and cabin constrained movement along crane boom), and psychological stress (sway of spreader/container and time needed to engage corner casting holes with spreader twistlocks or into the "cones", which considerably frustrate drivers while average handling time per movement increases);
2. the potential damages caused to intermodal units (and/or goods inside them), relevant causes of resource-burning legal actions and, often, financial disbursements (insurance costs or direct refunding to Clients).

The project cares even social aspects of innovation, involving crane drivers since start and focussing on re-qualification of their future job position after remote crane cabin adoption.

Objectives

SECURCRANE 2 objectives are reached by realising, installing and testing on a port crane in Le Havre the Remote Control (RCM), Anti-Sway (ASM), and Cargo Monitoring (CMM) Modules prototypes. Furthermore, SECURCRANE builds wide consensus within crane drivers' community, inviting them to trials where they may touch with their hands the innovation in practice, not in theory. RCM originates from past expertise developed in defence field applications now transferred into this civil application subject to different constraints, environment, needs. Imagery system is innovative too, based on a patented system promising to overcome negative aspects of past 3D imagery systems. ASM originates from successful past experience in other science domains (mostly cognitive sciences & artificial intelligence devices design). HW simplicity, fast response to external inputs, positive past applications of the same know-how, and reduced HW costs promise efficiency coupled with very interesting cost/benefit ratio. CMM raises commercial attractiveness of SECURCRANE system reducing insurance costs & providing added-value services to Terminal Operators. CMM acquires many container images performing functions like container identification (to avoid misoperations), extraction of geometric features (early detection of damages avoiding refunding Clients for damages made outside terminal premises), and other functions. CMM adopts technologies able to limit optic/geometric distortion and environmental/light adverse condition, while keeping HW costs low.

Working methods

Excluding Management, the project is organised in 5 workpackages.

WP 1 (Users' needs vision, Functional Requirements & Architecture). Users needs vision (through interviews, questionnaires & advisory of key field experts/end user), is "translated" into proper functional requirements to draw up the SECURCRANE system architecture.

WP 2 (Design, development & tests). Design and development of modules runs separately because their applications are logically "installed" in different allocations on crane controls.

WP 3 (Integration, Testing and Validation). Modules are integrated & tested to verify functionalities & performances of each module as well as of global system. Final results are validated.

WP 4 – "Evaluation & Assessment". Identification of impacts (notably socio-economic) of introduction of SECURCRANE's technologies and associated organisational concepts, and "road map" for implementation.

WP 5 – "Dissemination and Workshops". Major instruments are SECURCRANE INTEREST OPERATORS CLUB (SIOC), distribution of brochures, update of project web page, and validation workshops.

Expected (or delivered) results

The major expected result is that the first prototype of SECURCRANE system installed on a port crane in Le Havre will prove being able to practically eliminate the effects of the sway when the driver put the control joystick to idle, to allow the remote control of the crane by means of CCTV 3D images and to monitor the handled cargo extracting and storing useful information. If this research challenge is won, first positive applications will not only involve the port cranes field

where safer working conditions and more efficient drivers performance may be reached. Further application fields, in a medium term future, may benefit from the achievements of this research, such as the civil construction industry, just to mention the widest.

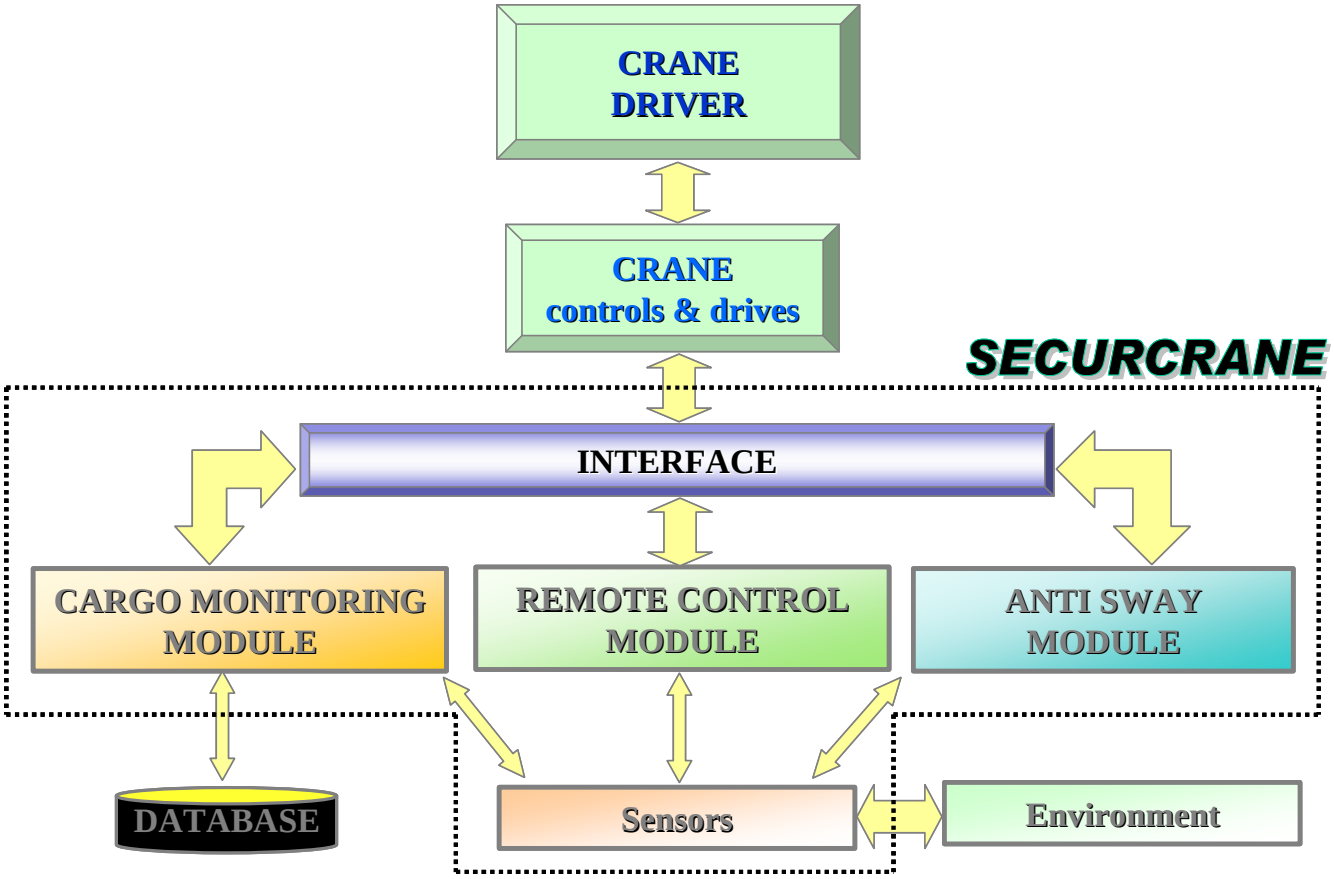

Figure 1: General relationships among the involved entities, where the Crane Driver is the Leader of the process of container handling (top of the pyramidal representation)