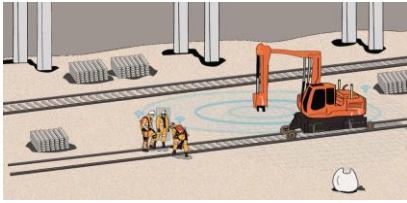


R&D PROJECT



Title of the project

Smart Tools for Railway work safety and performAnce iMprovement

Acronym

STREAM

Project motivation

The rail industry is facing important challenges as the average age of the workforce keeps growing while less young workers are interested in the physically demanding work required. Smart technologies can help to reduce work demands, avoid incidents and accidents, and support workers during heavy activities. STREAM aims to develop two smart technologies employing environment perception and human intention principles enabling prevention and risk mitigation.

General objectives

Firstly, STREAM develops an On-Track Autonomous Multipurpose Mobile Manipulator (OTA3M) adapted to existing rail excavators, by exploiting sensors, hydraulic actuators and software which will allow excavators to conduct multi-purpose autonomous operations enabling safe worker-machine collaboration. The OTA3M controls the excavator motion autonomously along tracks and introduces the autonomous capacity of manipulating heavy components relying on motion/force controls, obstacle detection and collision avoidance.

Secondly, STREAM develops a Modular Multitasking Powered Exoskeleton (MMPE) to reduce the risk of injury by assisting workers in heavy activities. The MMPE is tailored to track workers to reduce the risk of injury at the lumbar area by reducing biomechanical loading for a vast variety of manual handlings. MMPE understands human intention by exploiting human-activity recognition, proprioceptive sensors, and control strategies, and reducing worker's efforts by applying specific forces, synchronized with the musculoskeletal system.

Results and conclusions

For the OTA3M, the main results can be summed up as follows:

- Reduction by 30% in operative task and quality assessment average time
- Reduction by 83% in number of failures of the obstacles' detection
- Reduction by 92% in in exceeding of the working gauge
- Reduction by 66% in overload forces
- Reduction by 40% in task execution precision and accuracy
- Reduction by 26% in load-time carried by workers

For the MMPE the main results can be summed up as follows:

- Reduction by 52.5% in ergonomic risk
- Reduction by 31.7% (in inter-vertebral compression L5/S1)
- Reduction by 22% in muscular activity
- Reduction by 16.6% in metabolic consumption
- Reduction by 34% in perceived exertion level at the trunk
- Reduction by 100% in delay of the onset of fatigue

In conclusion, two technologies have been successfully developed to improve safety and performance in the construction and maintenance of railway infrastructures.



BUSINESS AREA

Technical and Innovation Area
R&D Department
COMSA

DURATION

2020 – 2023

BUDGET CONSORTIUM

2.700.000€

BUDGET COMSA

200.750€

KEYWORDS

Control platform, smart technologies,
modular active exoskeleton

COORDINATOR COMSA

Miquel Morata

CALL

H2020-S2RJU-2020

