Automated Monitoring for safety at level crossings

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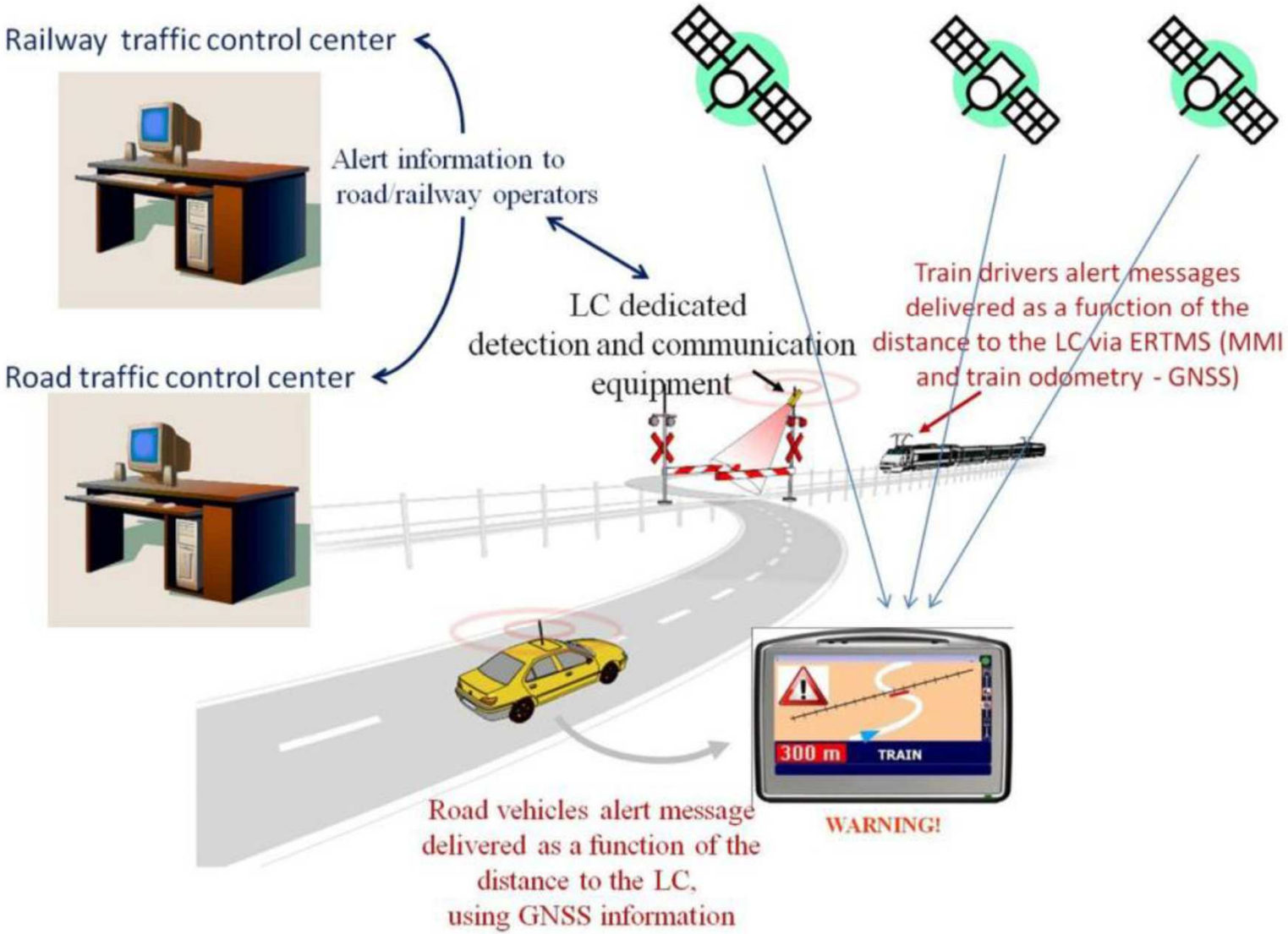
OBJECTIVES OF THE SAFER-LC PROJECT

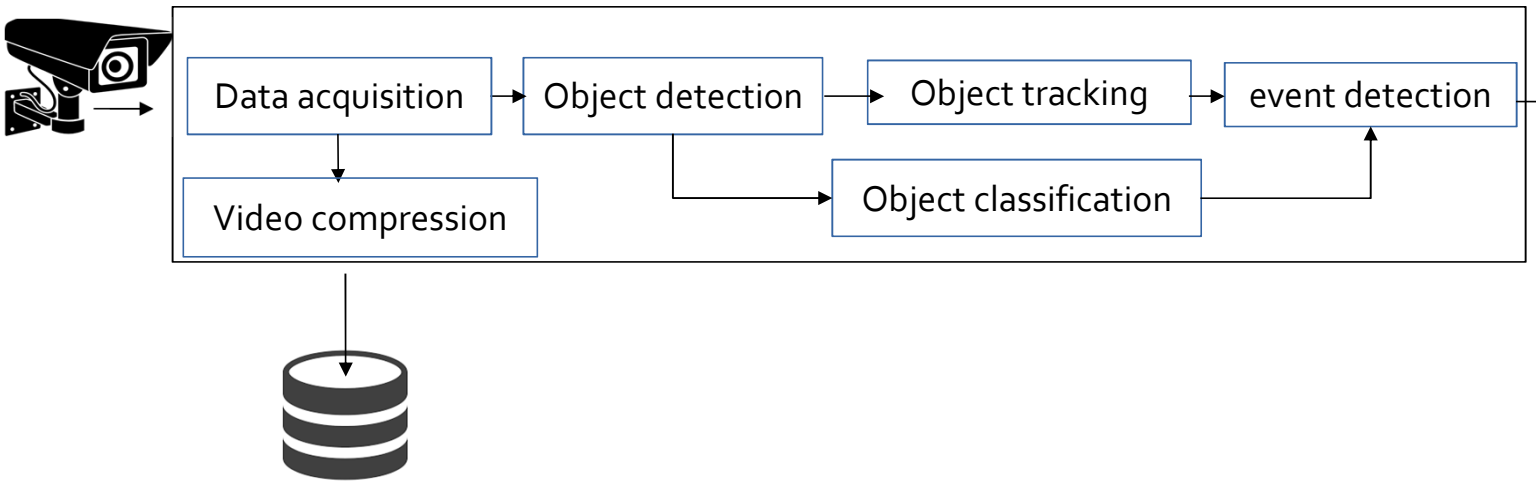
- Identification of principle factors of accident at LC.
- Real time detection, recognition and evaluation of potentially dangerous situations at level crossing
- Sharing alert messages by a communication system
- Research and experimentation of technical solutions.

INITIAL IDEA



GLOBAL SYNOPTIC OF SMART DETECTION SYSTEM

SMART DETECTION SYSTEM CHAIN



Event 1: obstacle at LC

Event 2: traffic jam

Event 3: atypical behavior

Event 4: pedestrian at LC

ALGORITHMS DEVELOPPED

-Detection

-Tracking

-- semantic classification

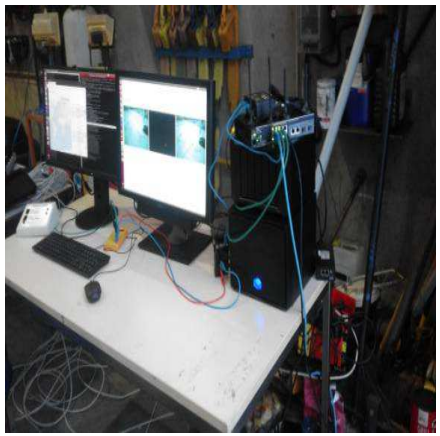
-Scene interpretation

-Evaluation of the dangerousness of the situation

-Classical methods (GMM, SVM, Codebook, etc…)

-- Deep learning methods (CNN…..)

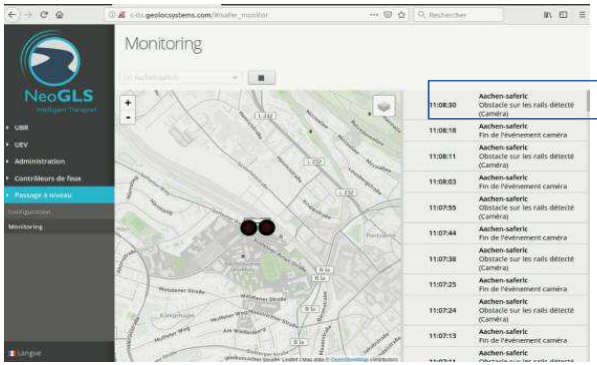
Tests Aachen



Equipment installed inside the garage

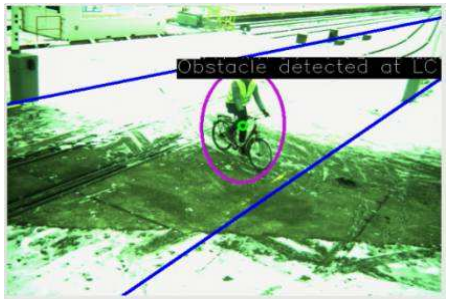
Level crossing

Test 1 (Aachen) (results)



RSU interface

Event sent to the



Example of detection of cyclist

Datasets

Four different datasets were used : the global datasets recorded at Cerema (2 sessions)
and the two datasets recorded in Aachen Germany. This represents more than 4 hours of events to detect : obstacles, pedestrians presence, atypical behaviour, traffic jam

- 41 videos including 1038 events whatever the scenario.

We have kept
- 24 videos coming from Cerema datasets (523 events),
    - 8 videos from the first session of Aachen (118 events)
    - and 9 videos of the Aachen second session (397 events).

Performance indicators for the SDS

Perf_Detect *=(number of events detected by the SDS)/ (number of the events correctly detected by the SDS + number of events non detected)*

	Perf_Detect
Global datasets	83,7%
Cerema datasets	78,83%
Aachen datasets	88%

The indicator ***Perf_Detect_Weather*** is used to calculate the ability of the SDS to detect events according to the weather conditions

Weather	Perf_Detect_Weather
High sun with shadows created by objects, wind	80,17%
Sun and shadow on the LC	100%
Cloudy and low illumination	73,54%
Snow and low illumination	93,65%
Cloudy with low average illumination with small rain	87,78%
Snow with very low illumination	100%
Cloudy with higher illumination	88,89%

We recall that our scenarios are including cars, pedestrians, bicycles, etc….
So in this case it could be useful to calculate a second indicator that we call *Perf_Detect_Recog*. It is calculated like that

Perf_Detect_recog *=(number of events recognized by the SDS) /(number of the events correctly recognized by the SDS + number of events not correctly recognized)*

	Perf_Detect_ Recog
Global datasets	71,84%
Cerema datasets	75,46%
Aachen datasets	68,56%

Weather	**Perf_Detect_Recog_ Weather**
High sun with shadows created by objects, wind	68,56%
Sun and shadow on the LC	100%
Cloudy and low illumination	72%
Snow and low illumination	77,54%
Cloudy with low average illumination with small rain	70,21%
Snow with very low illumination	38,82%
Cloudy with higher illumination	100%

PERSPECTIVES

- The dangerous occurrence detection system at the level crossing is coupled with a communication system so that the alert information are sent to motorists, to the train, to the control center. That's what was carried out within the framework of the European project Safer-LC

- More intensive evaluation on real data coming from LC

Thank you

Safer-lc.eu
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its
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TOULOUSE
30 May - 1 June 2022

Thank you!