Safety relevant applications at level crossings by means of imaging methods

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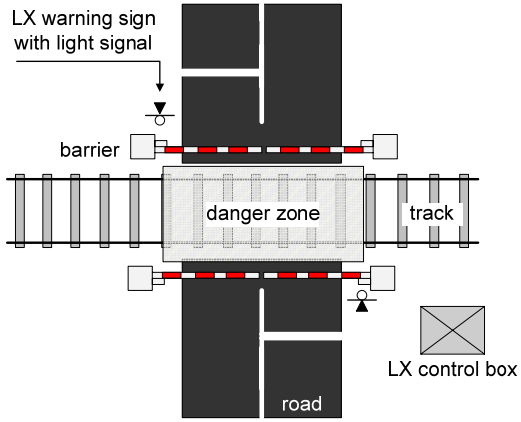
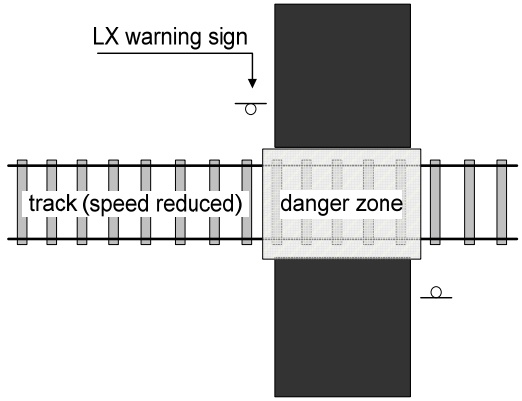
Motivation

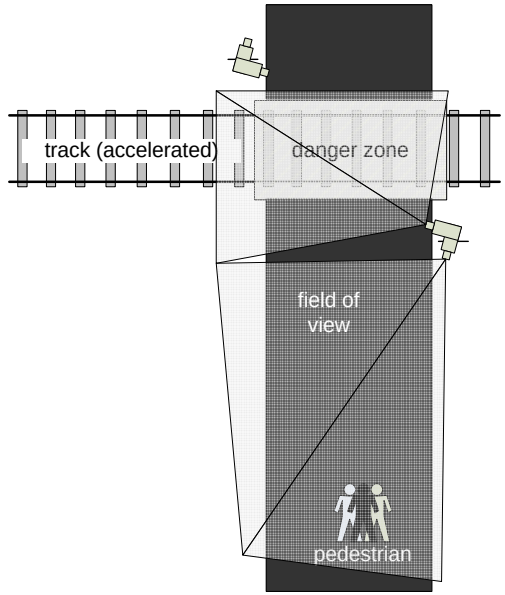
- Many level crossings (LX) exist all over Europe
- There are numerous incidents at LX with high damages to material and persons
  - The technical equipment of the LX only with flash lights or semi-barriers is not relevant for incidents
  - Many accidents occurred due to mistakes in noticing or obeying the warning signs
- **Main Problem:**
  - Safe and expensive technology vs. economic interests





Motivation

- **Main Target**:
  - New LX securing technology, which is
    - Adequate in safety
    - Affordable in investment and maintenance
    - Available and reliable during operation
    - Supporting technology to existing LX technology



- **These targets can be achieved by using imaging methods for LX securing technologies**

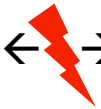
State of the art and innovative approaches

- **State of the art**
  - Monitoring of LX danger zone
  - End of train monitoring
  - Train departure dispatching by the driver

  - **All applications are only supporting tools without safety relation**

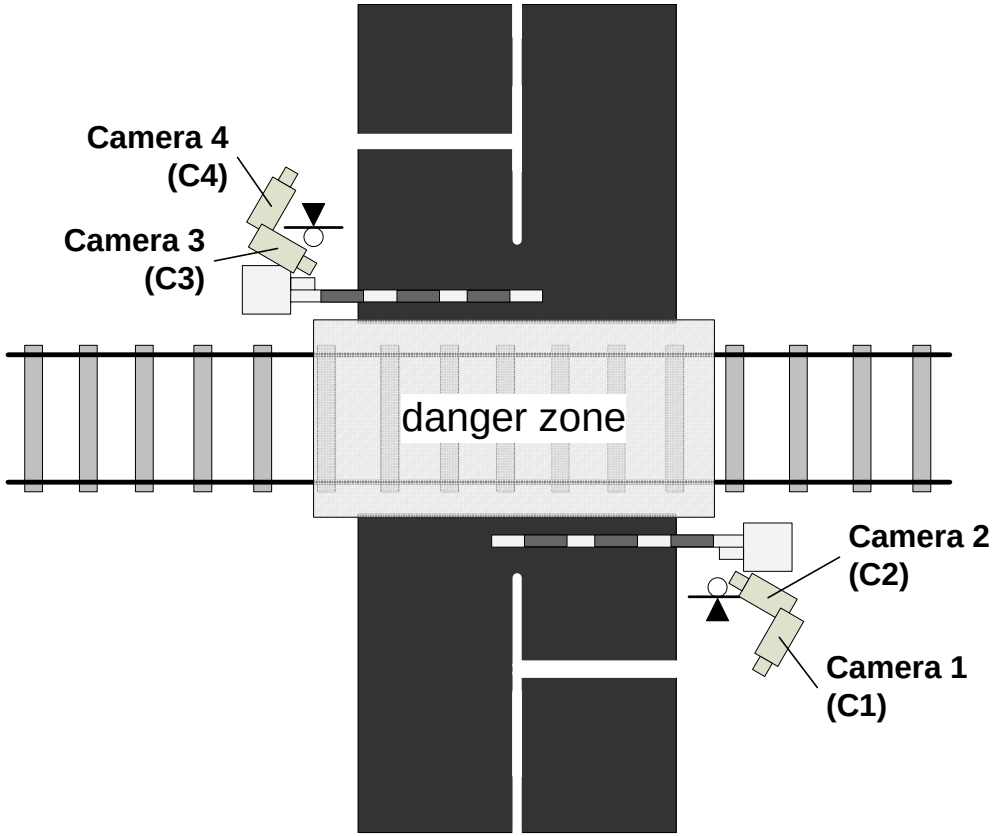
- **Innovative approaches**
  - Catenary monitoring
  - Obstacle detection

Imaging based concept

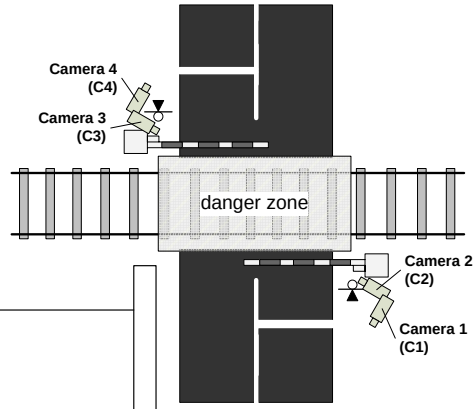
- **Technical system requirements**
  - High availability and reliability
  - Designed for rough environment
  - Available in day and night times → object detection must be available under all light conditions
  - Replacement and/or assistance of human and/or technical operations
  - At least same safety ←  → Affordable safety
- **Alternatives of realization**
  - Support of existing control and safety technology
  - Replacement and extension of existing operational functionalities by using imaging sensors (like video or infrared) combined with analyzing software

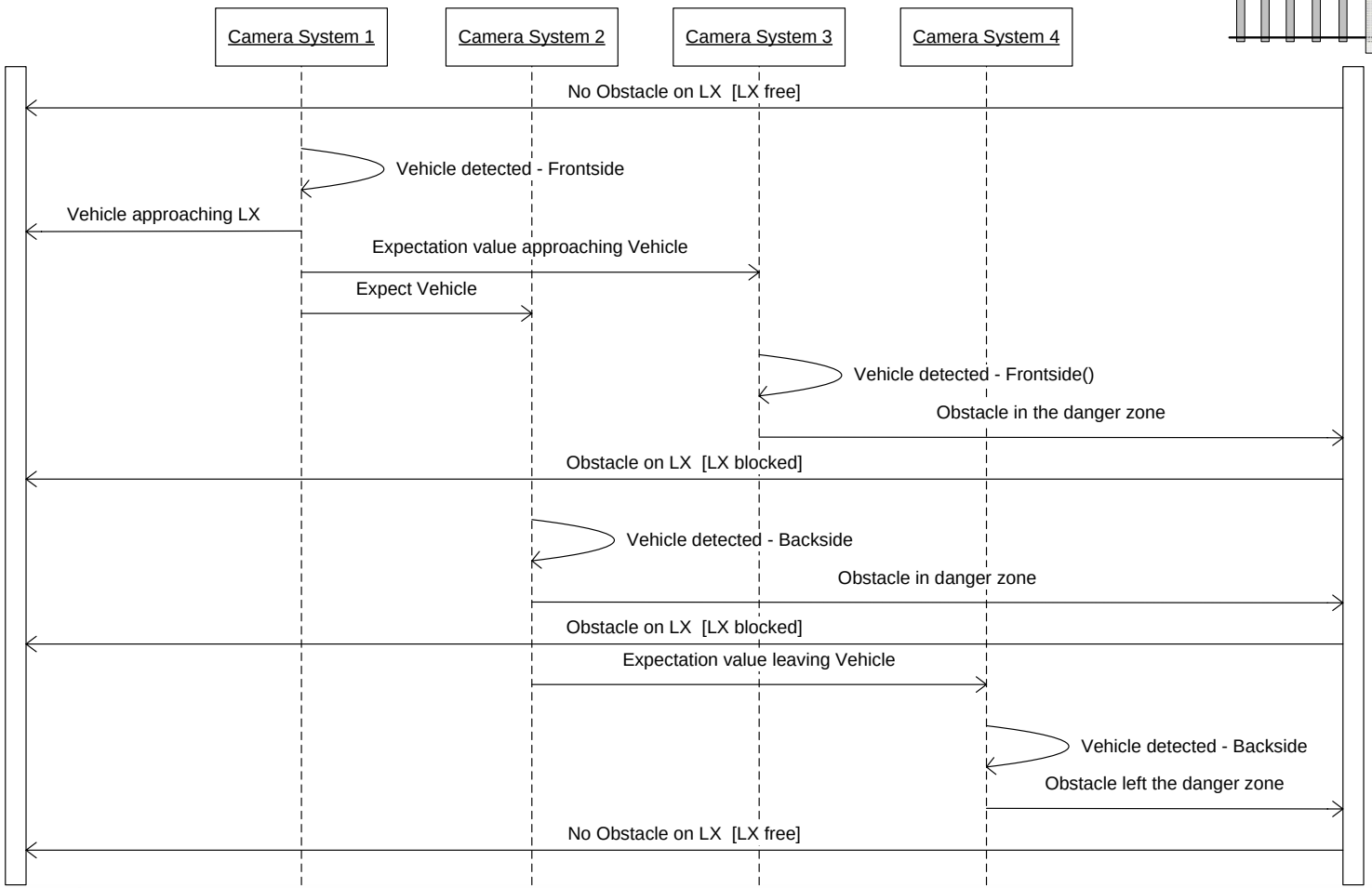
Imaging based concepts

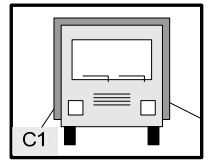
- Level crossing secured with half-barriers and flash lights.
- Four camera systems, two at each barrier.
- Each camera systems consists of one camera for visible ranges and one for non-visible ranges, such as Infra Red camera.

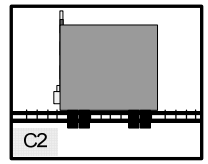


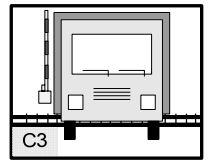
Imaging based concepts

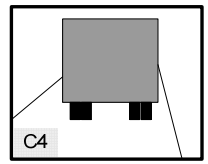












Demonstration

- Because of a wide operational area of such a technology, it is necessary to perform realistic tests.
- Especially with regards to the safety criticality of such an application, first tests will be done in a non-public area.
- For the field tests, a road-rail vehicle and a minivan will be used, in the first steps.
- After an initial phase of tests, a demonstration unit will be developed, that can be mounted at an LX in a non-public area.

Conclusion

- The implementation of imaging methods using camera based technology can help increasing the safety of railways especially at level crossings.
- To implement such an innovative system, intensive test campaigns are necessary in which the multiple requirements regarding safety targets, availability, maintainability and security can be evaluated.
- Innovative systems using camera based technology form an economical advantageous alternative to existing track-fixed monitoring units still reaching the required safety regulations formulated by standard books, laws or other official documents all over Europe.
- The Institute of Transportation Systems of the German Aerospace Center in Braunschweig will develop such a system and evaluates it in different field tests. First results could be presented in the next year.

Thank you for your attention

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