SELF-LEARNING AUTOMATED INSPECTION SOLUTIONS FOR RAILWAYS
KleinTech’s self-learning automated inspection solutions examine trains, cargo, tracks and their surrounding area faster and more precisely. KleinTech is the pioneer in combining deep learning technology with machine vision and, by doing so, creating innovative solutions for the railway industry.

With KleinTech solutions, freight carrier companies, railway asset managers and other companies which deal with railways can significantly reduce costs associated with train and cargo inspection and railway maintenance.

KleinTech has relevant experience providing inspection systems for the railway industry and is not afraid of the challenges created by the strictly-regulated and history-rich industry.

KleinTech philosophy is to create value for its customers by delivering better solutions than those originally requested by the clients.

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TrainINSPECT automates train inspection – it collects and stores freight identification numbers and visual data of the wagon and cargo, adding the advantage of training the system to recognize patterns and deviations from the norm with deep learning algorithms. TrainINSPECT significantly reduces inspection costs and time.

Each solution is customized. TrainINSPECT can be integrated with other systems in use, including KleinTech’s VehicleINSPECT and SAFEArea, for use in ports and logistic hubs.

TrainINSPECT combines proprietary deep learning technology with reliable hardware to deliver an unmatched recognition rate, create added value for the railway management business and increase safety for the railway industry.

### ADVANTAGES
- Significantly reduces train and cargo inspection costs and time
- Able to learn and improve itself
- Automates reporting and validates the received information
- Provides evidence for insurance claims
- Minimal hardware maintenance and easy-to-use system interface
- Increases safety for the railways

### FEATURES
1. Wagon & cargo number, RFID tag, special markings and cargo damages recognition
2. Detection of open wagon cargo state (empty/full/goods missing) and hatch position using deep learning and pattern comparison technology
3. High precision axle number, train speed and direction detection
4. Cargo oversize identification using 3D laser scanner technology
5. Wagon type recognition using deep learning technology
6. Detection of tank wagon hatch position using deep learning and pattern comparison technology
7. Detection of liquid level carried by tank wagon and cargo overheating using infrared camera
8. Pantograph inspection
**ADVANTAGES**

Significantly eases and reduces the costs of preventive rail maintenance

Easily installed on most locomotives

Uses unique laser scanners for rail profiling

Collects rail profiling and railway sleeper damage data, provides exact location of detected risk area

Inspects railway sleepers and their mounts for cracks and defects with a high resolution line scan camera

Easily integrated with other maintenance systems

RailVIEW scans the rail profile to detect general rail wear, level changes and damage to railways sleepers, which could threaten railway safety or performance. With deep learning technology, RailVIEW can detect deviation from the norm and provide information prior to detailed rail wear inspections thereby increasing efficiency.

**TrainVIEW**

TrainVIEW is a low-cost, preventive maintenance solution for inspecting the area surrounding the rail track and detecting potential risks to the train’s safety.

TrainVIEW creates a 3D image and 360° view of the environment around the track and uses pattern comparison technology to identify deviations from norm – damaged or lost rail infrastructure objects and objects in the area, which may pose threat to train’s safety.

TrainVIEW creates value for rail infrastructure managers automating rail track preventive maintenance.

**ADVANTAGES**

Significantly eases and reduces costs of track preventive maintenance

Easily installed on top of a regular train locomotive

Identifies potential risks to train’s safety – hazardous trees, embankment slip, sand dunes, among others, using pattern comparison technology

Detects exact GPS location of the risk area

Carries out tunnel and railway infrastructure inspections

Sends warnings about detected risks to the maintenance team

Integrates with geographic information system and asset inventory management systems

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TrainVIEW is a solution for the initial inspection of rail wear and damage to railway sleepers, which significantly reduces costs associated with detailed rail wear inspection.

**BarrierVIEW**

BarrierVIEW uses unique laser scanners with high precision even in rough weather conditions. These scanners are able to detect an object on the railroad crossing and the system promptly warns train drivers to reduce the speed to avoid an accident.

BarrierVIEW is a solution for level crossing inspection, which warns train drivers about an object on the crossing thereby helping to prevent accidents.

**ADVANTAGES**

Automates level crossing inspection process

Decreases accidents on level crossings

Sends timely warning to a train driver if an object is detected on the level crossing

Integrates with signalling system

Uses unique laser scanners that reduces false positives
SAFETrain provides intelligent video analysis of the train’s surrounding area and warns the driver of potential risks. It collects and analyses data about location, speed, direction, fuel consumption, oil level, etc. and warns of deviations from the norm. SAFETrain also provides video and audio recording from the driver’s cabin.

SAFETrain stores all maintenance and on-going system analysis data, interior and exterior camera stream and other data in a cloud based storage in real time and in the actual Black Box, assuring double security.

SAFETrain combines proprietary deep learning technology with reliable hardware to create good value for the railway management business and increase train safety.

SAFETrain is the BlackBox for trains – it is a next generation analytics and smart data system, which records the train’s activities providing real-time support to its driver and tracking the train for safety and asset management purposes.

**ADVANTAGES**

- Increases train and rail infrastructure safety
- Provides detailed information about the train’s technical condition and geographic location
- Enables train fleet management remotely through a centralized management system
- Assists the train driver while enabling the supervision of his actions

**FEATURES**

1. Video recording from multiple cameras installed on the train’s front, sides and rear
2. Video streaming for the driver to support him/her during different manoeuvres
3. Video and audio recording from the driver’s cabin
4. Data collection from multitude of devices within locomotive – temperature, moisture, flows of liquids, voltage, among others
5. Data collection on train’s location, speed, direction, acceleration
6. Warning and data transmission to central server in case of emergency
7. Identification of unknown people entering locomotive by facial recognition
8. Integration with other systems
9. Installed infrared vision, able to detect potential risks 110 m ahead
KleinTech Products

SAFE

SAFE is an intelligent security solution with deep learning technology, which can detect emergency and/or potential security risks in a specific area.

SAFE enables the complete surveillance of a freight wagon, cargo container or other object from entering an enclosed area, like a port or logistic hub, until leaving it. This solution allows the possibility to follow the object everywhere in the closed area and stores all information about any events in which the object would be involved, such as collisions, detour from a designated route, delays in shipping times.

SAFE combines intelligent video surveillance with deep learning technology to create an automated inspection solution unmatched in the market for increasing security within a designated area.

ADVANTAGES

- Increases safety of the freight wagon and cargo in high risk areas
- Automates cargo management in a logistic hub by cargo mapping/allocation
- Recognizes numbers, faces, identifies deviations from the norm and/or unattended objects
- Provides an extensive archive for events associated with each particular cargo or other defined objects in the area
- Sends automated notifications to security and/or other teams
- Can be integrated with existing CCTV cameras/systems in use

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