

SURFACE IMAGING SYSTEM



High-resolution Surface Images for Crack Detection

The Surface Imaging System (SIS) is a high-resolution pavement imaging system based on linescan camera technology. SIS records the road pavement as one continuous uninterrupted image that can be exported in image blocks with a user selected length.

While recording at traffic speeds the road is illuminated by a high-power efficient LED based light system. The light is in the red wavelengths and is many times stronger than sunlight, which eliminates unwanted image disturbances such as shadow casts from road side objects and bridges. The light is adjusted to give a completely homogeneous illumination profile for the absolute best quality images possible.

SIS can be configured for user needs with up to 4.5m measuring width and pixel resolutions down to 1mm. Images are tagged with travelled distance from a DMI and GPS coordinates if available on the vehicle, for precise co-location with data from other measurement systems.

The LED lamp light used in SIS is eye-safe.

**The high-resolution Surface Imaging System
detects even the smallest cracks early,
enabling timely repairs and reducing overall costs**



SIS system mounted on the Traffic Speed Deflectometer.



SIS system can be mounted on any vehicle.



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Features

- Continuous undistorted image of the road surface, exported to user defined image sizes
- Eye safe light system
- Homogeneous illumination with less than ± 5 DN variation over entire image width, i.e. no lines/areas with brighter or darker illumination
- Independent of sunlight illumination, hence, no shadow casts from road signs, bridges, etc.
- Include Greenwood Engineering's own LED based lamps for strong image illumination, several times stronger than sunlight
- Driving speed as high as undisturbed traffic

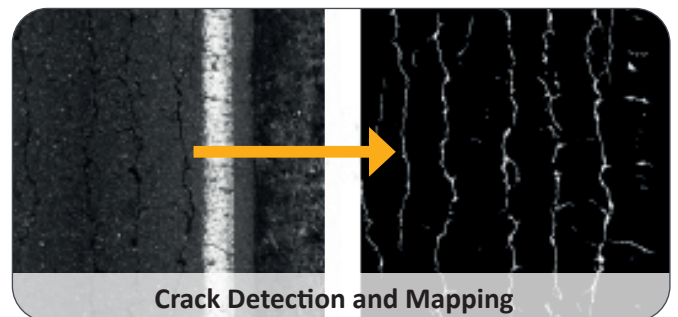
Typical Configuration

- 4 meter measuring width
- 1 x 1 mm pixel resolution
- 2 linescan cameras (images automatically stitched to one image covering the measuring width)
- Camera casing with climatization
- 64 individually adjustable lamps



Crack detection

The high quality of SIS images serve as the best possible foundation for analysis of surface defects, for example with Greenwood's new AI based crack detection algorithm.



AI Crack Detection and Mapping

- Developed on a large dataset of 1.5M Image tiles of appr. 1.3m x 1m, approximately 500 km of mixed types of roads
- All visible cracks, down to ~ 1 mm, were marked by human analysts
- 25% of images were double checked by several analysts
- Labels - Crack, Pothole, Open-joint, Edge-crack
- $>94\%$ accuracy, tested on more than 150 000 out-of-sample images
- Multi-label classification (non-exclusive classes), i.e. several damage types in the same grid cell
- The AI pipeline consists of a fast screening stage where tiles with surface defects are found. They are then drawn up to pixel level crack maps by the Crackmapper software and then analysis of the cracks are performed to deduct various information, such as: types, width, orientation and more

Crack detection workflow

BlockClassifier

Fast screening of 1m x 1m tiles for cracks, joints, potholes. Processing speeds > 700 kmh for full width images.

CrackMapper

Detailed mapping of cracks on pixel level accuracy for geometric measurements.

CrackMap Analyzer

Advanced analysis of cracks, geometry, types, orientation and more.



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