Sustainable and Resilient Infrastructure – Key to Economic Growth

Dr. Dirk Ebersbach
Infrastructure asset management is the integrated, multidisciplinary set of strategies in sustaining public infrastructure assets such as water treatment facilities, sewer lines, roads, utility grids, bridges, and railways.

Asset management specifically uses software tools to organize and implement these strategies with the fundamental goal to preserve and extend the service life of long-term infrastructure assets which are vital underlying components in maintaining the quality of life in society and efficiency in the economy.
Why new technologies?
Why new technologies?

What is needed?

• High density data of infrastructure
• Safety during measurement
• Fast delivery
• Accurate data
• 3D Visualisation
• Ready for GIS (need attributes)
• Fusion of geometry and conditions
Why new technologies?
Why new technologies?
State of the art LiDAR

Pavement Profile Scanner PPS+

Corridor Profile Scanner CPS+
State of the art LiDAR

Pavement Profile Scanner PPS+

- Accuracy 0.15 mm
- 800 Hz
- 65 Mio. Points per Second
- Cover 1 Lane 4.50 m width
- IP 67
- Cooling system (or heating)

Corridor Profile Scanner CPS+

- Accuracy 3 mm
- 200 Hz
- 2 Mio. Points per Second
- Cover 300 m corridor
- Cooling system (or heating)
- IP 67
LiDAR +

Shape
Inventory
Condition
PiDAR

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LiDAR

Vectra Measurement vehicle during Rishikesh survey
LiDAR

Deliverables:
Points, Lines, Areas, Attributes, Condition ....
LiDAR

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PPS+
Pavement Profile Scanner  PPS+

Deliverables from PPS +

• 3D point cloud of Pavement along the Corridor
• 3D road surface model (compatible with OpenCRG Format)
Pavement Profile Scanner  PPS+

**Deliverables from PPS +**

- IRI - International Roughness Index
Pavement Profile Scanner  PPS+

Deliverables from PPS+

- Rutting depth
- Water depth
Pavement Profile Scanner  PPS+

Deliverables from PPS +

- Cracks less than 1 mm width are visible
Deliverables from PPS+

- Cracks less than 1 mm width are visible
How it is done at the moment?

lots of manual effort, different labels
• Deep Learning Approaches
Convolutional Neural Network used

- 11 Layers
- 4 Mio. free parameter
- Regularization technique: Dropout (avoids co-adaptation)
How did the Deep Learning approaches perform? **Visual results**
Results in numbers

$F_1$-Score

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<th>RCD 99x99</th>
<th>LP ASINVOS 64x64</th>
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Deep Learning outperforms classical approaches
Mapping to Report With **PaveCracks**
PaveCracks+ Interface
How to work with the data
How to work with the data
How to work with the data
Next steps

We will be glad to offer indepth information at our booth: -
Boot Number B6