Data-Driven Road Quality Monitoring and Prediction

Regional Workshop on The Development of Transport Statistics and Transport Related Sustainable Development Indicators in the Arab Countries – 17.09.19

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Predictive Maintenance

- Lack of Expertise
- Lack of Tools
- Lack of Big Data
A Global Road Quality Monitoring and Prediction Platform

- Maintenance savings up to 15%
- Improved road comfort & safety
- Reduced CO2 emissions and traffic congestions

Data
- Collection
- Analysis
- Visualization
Data Collection

- Reliable
- Frequent

- Affordable
- Globally available
1. Smartphones

- Turning smartphones into smartsensors
- Utilisation of accelerometer, camera and microphone
- Detection of potholes, cracks as well as the roughness of roads
- Utilisation of Galileo for more accurate pothole detection and road segmentation
- Crowdsourcing by customers and partners through cars, trucks and bikes
Testing in Belgium on drain hatch
• Camera at 720p @ 30fps

• Acceleration monitored:

![Acceleration graph](image)

Bump

# sensor Vendor: STMicroelectronics
# sensor Name: LSM6DS3 Accelerometer
# sensor Resolution: 0.0023956299m/sec^2; Max Range: 78.4532; Min Delay: 5 ms
# The sensor’s attributes are the result hardware and the Android capabilities.
# It means that the Android may not utilize all features provided by the hardware.

• Using the Smart Phone Microphone the bumps are audible
2. In-Car Data

- Turning cars into smartsensors
- Using CAN bus readers to access a variety of signals relating to position, speed, vibration and wheel movement
- Detection of potholes as well as the roughness of roads
- Suitable for cars and trucks
- Partnerships with research institutes and CAN bus suppliers
3. Satellite Imagery

- Optical satellite imagery to detect changes in road reflection
- Globally available with short revisit times and affordable prices
- Investigation on highways and wider provincial roads
- Partnership with European Space Agency and CloudEO
- Next step is to utilize radar satellites to detect shifts and subsidence of roads
Reflectance (x10,000)

Spectral signature of road conditions in some areas of the Netherlands 2018

Bad roads

Good roads

Pixels that correspond as road

Reduce noise (vegetation)
Example roads from the German highway A3 close to Frankfurt and Wiesbaden
Data Analysis

- Damage Detection
- Change Detection
- Time Series Analysis
- Risk Assessments

Data Fusion and AI

Actionable Insights
Data Visualisation
Dwarsonvlakheid: GOOD
Oneffenheid: GOOD
Rafeling: GOOD
Scheurvorming: GOOD
Randschade: GOOD
The Business Model

Software-as-a-Service (SaaS)
- Consultancy & Set-Up
- Access to data and analysis

Customers:
- B2B: Commercial construction & engineering companies
- B2G: Public road authorities (municipalities, provinces, ministries)
The Vision & Success

“Improve Road Safety and Comfort Worldwide”

- Incorporated 2017
- Incubated at ESA BIC Netherlands
- Three paid pilots
- > €100,000 in accumulated revenue and grants
- Tax-recognized as highly innovative company
- Member of international consortia, mobility and research programs
- Winner or finalist of several startup competitions and programs
The Impact

Accidents
- More than 1.35 million road fatalities and 50 million serious injuries every year
- Driver behavior is the main cause which among others is directly linked to road conditions
- Goal to reduce fatalities and injuries by 5%

Environment
- Road maintenance activities emit around 2.5 tCO2e/km/year
- Potential to avoid 162.5 ktCO2e/year (NL) and 6037.5 ktCO2e/year (EU) through data-driven maintenance
- Improved road conditions further reduce car emissions up to 10%
The Core Team

Alexander Gunkel – Business
- Serial impact entrepreneur
- Business and engineering
- European Space Agency (ESA)

Liliana Gonzalez – EO & GIS
- Remote sensing and geo-information
- Conservation change detection
- Space4Good

Martijn Nanne – Software & Data
- Experienced software engineer
- Data science and machine learning
- Booking.com

Pilots

Partners
The Roadmap

1. Pilots Netherlands 2019
2. Europe Expansion 2020/2021
4. Developing Countries 2022/2023

Next Pilots
- 2 NL
- 1 Germany
- 1 US
- 1 Arab countries?
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Thank you!

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