DIFCAM

Consortium partners

DIFCAM is delivered by an experienced scientific and engineering consortium with competence across the complete supply chain from research to infrastructure operations.

- **Omnicom Engineering** is a software and systems engineering company focussed on the geopositioning, surveying, recording, inspecting and mapping of assets in infrastructure networks.
- **Atkins** is one of the world's leading engineering, design and project management consultancies. It has wide-ranging technical expertise and experience in major asset management and monitoring regimes across many industries in the UK and globally.
- **NPL** is the UK's National Measurement Institute (NMI), a leading global scientific facility with over 30 years of experience in research and application of optical imaging for precision measurements for many types of infrastructure.
- The DIFCAM demonstrator is supported by the national innovation agency, the **Technology Strategy Board**, which accelerates UK economic growth by stimulating and supporting business-led innovation.

www.DIFCAM.co.uk

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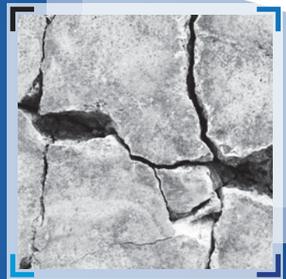

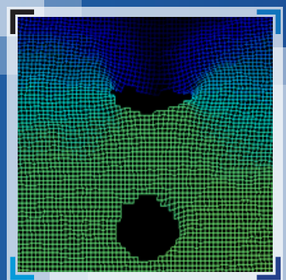

NPL
www.npl.co.uk

Omnicom Engineering Limited
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Atkins
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NPL National Physical Laboratory

Omnicom

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What is DIFCAM?

Digital Imaging for Condition Asset Management (DIFCAM) has been developed to meet the need for a fast, efficient, automated method for the basic visual inspection of structures. It reduces or eliminates the need for costly, dangerous track access and subjective factors associated with human visual inspections over time.

The system captures a complete visual record of the structure as well as a 3D model. Using a high-grade inertial guidance platform, these datasets combine to produce a high quality 3D representation of the asset as well as indexing the raw data for later analysis.

The data can be compared to previously captured data, to identify potential new defects or the deterioration of previously discovered defects , for example cracks, spalling or bulging.

The DIFCAM platform demonstrates world-class capability in the use of optical techniques to rapidly monitor and assess asset condition. It is initially designed for rail tunnels using a vehicle based capture system, but intended for eventual use in other unsafe, hostile or remote asset management environments.

Technical architecture

The DIFCAM platform comprises three modules:

- **Acquisition module** - operational interface, profiling, recording, indexing,stitching pre-processing, transmission and storage,
- **Processing module** - profile change detection and visualisation processing algorithms, and
- **Inspection module** - inspection software with visualisation and schematic presentation functionality for end users, controls and navigation, as well as output into downstream maintenance workflows.

Potential applications

Inspection, examination and assessment of defects and changes in condition of:

- Rail tunnels
- Road tunnels
- Rail bridges
- Road bridges
- Remote structures (e.g. wind turbines)
- Hazardous structures (e.g. nuclear facilities)
- Complex structures (e.g. power station piping)

Benefits of the DIFCAM approach

- **Rapid data capture:** depending on the asset or structure, the acquisition system functions at speed to collect data as it passes the structure, unlike a site inspection.
- **Direct inspection-to-inspection comparison:** the system can highlight differences down to 1mm.
- **Full record of the structure:** the system creates a reusable time history of appearance and shape to support further inspection or other purposes.
- **Frees up the time of experienced inspectors:** reduced need for inspectors to attend on site, as assessment of defects can take place remotely.
- **Reduction in cost and improvement in workforce safety:** Autonomous control of the system can be used for hazardous or difficult-to-access environments. Earlier detection of defects enables more proactive tunnel maintenance strategies.
- **Richer, more detailed spatial data:** 3D measurements of the structure can be produced e.g. area or length of a defect.
- **Modular architecture:** individual or combined elements of the platform can be adapted for numerous further application areas.

Key features of the DIFCAM system

- **Speed of measurement:** measurements taken at 1m per second plus 30 mins alignment of the vehicle compared with 1-2 shifts for a long tunnel.
- **Super high resolution imagery:** measurements are approximately 1mm per pixel.
- **Combined shape and appearance measurements:** combined data on the same area.
- **Automated data generation:** can be shared with and assessed by multiple colleagues, allowing for crosschecking.
- **Automated screening capability:** digital image correlation used for imagery and surface profiling.
- **Automated defect report generation:** various output formats available to suit present and future requirements.
- **Forward compatibility:** the platform can scale to cope with higher resolution data and faster measurements as it becomes technically possible to approach line speed.