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FRAUNHOFER INSTITUTE FOR FACTORY OPERATION AND AUTOMATION IFF, MAGDEBURG

1 *Virtual bird's-eye view in Magdeburg's Hanse Terminal – one of the Saxony-Anhalt Galileo Test Bed's facilities.*
Image: Fraunhofer IFF

"VIRTUAL BIRD'S-EYE VIEW" FOR IMAGE-BASED ANALYSIS OF LARGE PREMISES

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Keeping an Overview

Assessing situations and detecting unusual ones at an early stage on large premises in logistics hubs, passenger terminals or on event grounds is generally problematic. While such premises can be nearly fully monitored with a large number of cameras, the multitude of image sources and different installation locations and viewing angles make it difficult to represent information for operators, which is user-friendly and meets their needs. Control centers, however, depend on having all information available at a glance.

The virtual bird's-eye view, a new technology developed by the Fraunhofer IFF, compresses video images from distributed camera views into one virtual aerial image of large premises and thus provides an overview of all events in real time. This makes it possible to detect spatially complex problems at an early stage and develop potential solutions.

Advantages at a Glance

- Live representation of large premises in their overall context
- Aggregation of various camera perspectives and thus no masking of areas under surveillance
- Real-time capable frame rate
- Linkage with other data sources and sensors into hybrid systems, e.g. for equipment localization
- Integration in existing video surveillance systems
- Flexible upgradability of the system with more camera views

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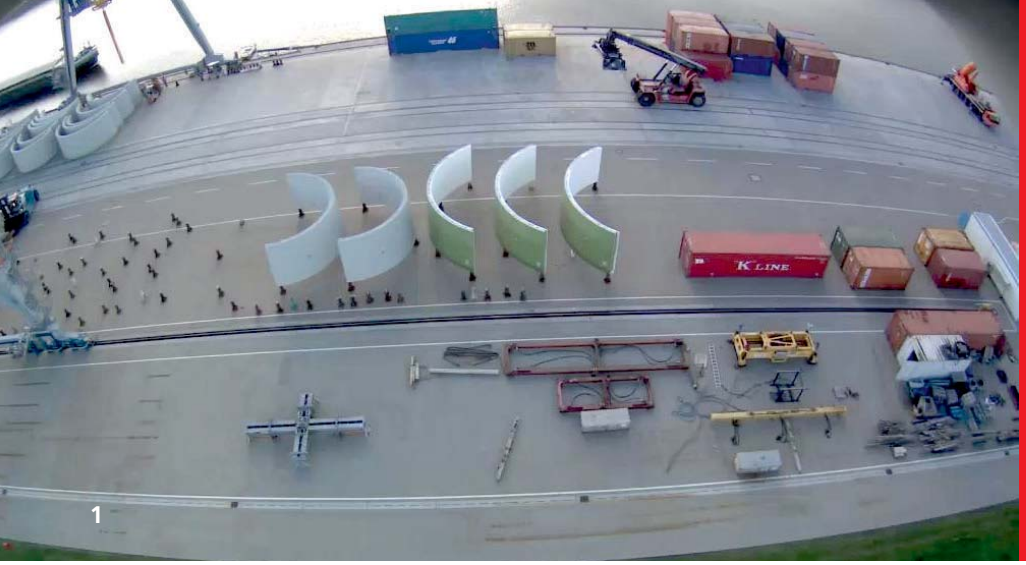

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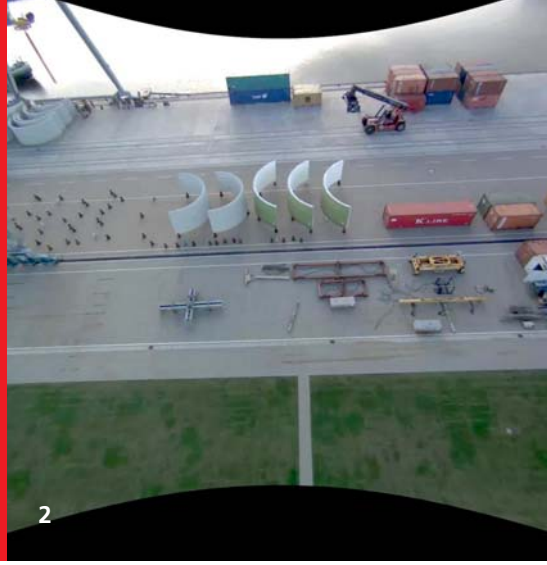
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Principle of Operation

The virtual bird's-eye view is a form of video data visualization, which generates a time-synchronized overview from many individual views with distorted perspectives and thus places individual views in a spatial relationship. Combining individual camera views produces a metric composite that can also be used to reference other sensor data.

The system operates with standard IP cameras and can upgrade existing camera systems. The Fraunhofer IFF has extensive 3D planning tools to plan camera locations optimally and create the resultant virtual bird's-eye view.

The cameras installed in infrastructures under surveillance deliver the image data needed for the virtual bird's-eye view. The images are sent through the network to a server where they are rectified by algorithms (lens correction, homography), put in one plane and assembled. This efficiently compensates the cameras' perspective errors caused by installation.

The virtual bird's-eye view produced is subsequently supplied to users in a control center. Standard communications protocols are employed to transmit data so that the virtual bird's-eye view can be easily integrated in existing control center systems where it can be combined with other sensor data (e.g. positioning data) and analysis functions.

Fields of Application

The virtual bird's-eye view can be used to develop a status map refreshed in real time by video cameras installed throughout the premises. For instance, an overview of free and full storage areas is always transmitted to managers in the control center even when storage in the area is extremely dynamic. Abstract data, otherwise only available in an inventory management system, are visualized so that they are intuitively comprehensible.

In addition to providing an easily understandable overview map in real time, its software interfaces can upgrade the virtual bird's-eye view with data from other sources. The integration of positioning data on individual dynamic objects is particularly interesting. This can be done with the MarLO® video positioning system developed by the Fraunhofer IFF, which directly builds upon the virtual bird's-eye view and thus uses the same camera infrastructure.

As visualization module, the virtual bird's-eye view additionally opens options for augmented reality applications. The virtual bird's-eye view and equipment positioning systems can be used to monitor work areas defined for individual pieces of equipment. Such applications, for instance in areas of operation with forklift traffic, are relevant for occupational safety.

Our Services

With the Saxony-Anhalt Galileo Test Bed, the Fraunhofer IFF has an advanced testing and development environment at its disposal for the development of custom solutions that monitor and optimize operations.

Together with our clients, we develop solutions that integrate analysis, positioning and identification technologies in internal logistics processes. As a research and development provider, we can provide you holistic support from business analysis compliant with standards to the design and development of methods of resolution up through the integration of technical solutions in your process environments.

1 *Single view with distorted perspectice.*
2 *Rectified single view for conversion into a virtual bird's-eye view.*
Images: Fraunhofer IFF.