

# ARVIKA – Augmented Reality for Development, Production and Service

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Augmented Reality (AR) is a form of human-machine interaction where information is presented in the field of view of an individual. ARVIKA<sup>1</sup> funded by the German Ministry of Education and Research develops this technology and applications in the fields of development, production, and service in the automotive and aerospace industries, for power and processing plants and for machine tools and production machinery.

Up to now, AR has only been a subject of individual research projects and a small number of application-specific industrial projects on a global scale. The current state of the art and the available appliances do not yet permit a product-oriented application of the technology. However, AR enables a new, innovative form of human-machine interaction that not only places the individual in the center of the industrial workflow but also offers a high potential for process and quality improvements in production and process workflows.

ARVIKA is primarily designed to implement an Augmented Reality system for mobile use in industrial applications. The report presents the milestones that have been achieved after a project duration of a full three years: A basic system for Augmented Reality systems was developed based on a specially designed software architecture. Initial application-specific prototypes have been created on this basis and have been evaluated in usability tests. The solutions that can be demonstrated today indicate a good progress of the project in terms of the basic technologies such as Augmented Reality, human machine interaction as well as the AR-oriented information delivery and workflow,

but they also show the challenges for further development.

The main topics development, production and service are embedded in a *user centered system design* that accompanies the project in all phases using ergonomic methods. The basis for all development work in the various fields of application are the *Augmented Reality Base Technologies* that support high-end / power applications in design in the same way as the low-end use of the technology as a belt-mounted appliance by a skilled worker in real-world production or service environments.

The vision of the project is the provision of user centered stationary and mobile AR systems for industrial applications. The consortium partners have implemented their visions, in the field of **development** by the comparison of test and calculation of a crash test, the ergonomic layout design and flow visualization of pilot and passenger seats and the design and layout of automobiles.

In the field of **production/assembly** ARVIKA presents results in “the Electrical troubleshooting in vehicles”, “AR-assisted quality assurance along the production chain”, “Assembly of the fresh water system in the Airbus”, “Manual assembly in one-off and small batch production” and started implementations with AR assisted cable loom manufacturing at the Airbus and Eurofighter.

AR will play a dominant role in **service** applications but will be also very exacting in terms of mobility, robustness in an industrial environment. The application scenario “Troubleshooting and service on production systems” is designed to use AR technologies to assist service personnel and end users in troubleshooting, commissioning, maintenance and repair in the field or through direct interaction with the service center. A scene for inspection services is implemented for power

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<sup>1</sup> [www.arvika.de](http://www.arvika.de)

plants to show AR advantages supporting service teams.

To implement these visions for the fields of application development, production and service, ARVIKA has chosen an integrated approach: (1) Augmented Reality with object identification and information attachment on the identified object. (2) Information Delivery for AR applications as a function of the working context (3) Interaction, i. e. ARVIKA considers different input/output devices, speech input and output for handsfree operations and designs new user interfaces for mobile IT.

The solutions that can already be demonstrated today testify to a good progress of the project in terms of the enabling technologies such as AR, i.e. marker-based tracking, interaction and AR-oriented delivery of information and workflow, but they also show challenges for further development.

Because a satisfactory solution to meet the known requirements for the registration in AR systems has yet to be found, tracking methods need to be improved and newly developed. In the field of tracking, methods are under development that recognize additional features

from the images, e.g., the text on a sign, and that determine the necessary tracking data entirely without markers by using reference images.

With regard to requirements and tests in industrial applications and scientific research, the interdisciplinary consortium which comprises different business ensures the realization of the ambitious objectives: Enterprises in the area of automobile manufacture and aircraft construction: Airbus Deutschland, EADS, DaimlerChrysler, VW, Audi, BMW and Ford. Mid-sized enterprises in the area of tools and machine production, such as DS Technologie, Hüller-Hille, Gühring, Index, and Ex-Cell-O. A representative for process and power plant industries such as Framatome ANP, and specialized companies, such as Zeiss, A.R.T, UID, and VRCom. For IT technologies: Fhg-IGD, ZGDV, and TUM, for applications: Laboratory for Machine Tools and Production Engineering (WZL) and the Institute of Industrial Engineering and Ergonomics (IAW) of the RWTH Aachen, and Siemens as a system integrator and the consortium leader.