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The need for accuracy statements in industrial Augmented Reality

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metaio GmbH

Agenda

1. Company profile
2. Position statement:
   The need for accuracy in industrial applications
3. Discussion/Questions

Our Mission: Turning AR into productive Tools!

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KPS Click&design

- Augmented Reality application for Consumers
- Test your favorite products in photos of your house or garden
- More then 7.000 Licences sold on the European market!

Company Key-Milestones

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02/2003	Spin-off from the industry-driven Research Project „ARVIKA“
09/2004	Partner in Research Project „ARTESAS“
04/2005	Release of the Unifeye SDK®
12/2005	Release of AR solution for product presentation KPS Click&design®
03/2006	Release of AR-factory planning tool Roivis®
09/2006	40 customers, Co-Work and Partnership with many research institutes

Range of Products and Services

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Unifeye SDK

Roivis

KPS Click&design

Bundesministerium für Bildung und Forschung

ARTESAS

ARVIKA

> Products

- For B2B and B2C Markets
- AR Software
- AR related Hardware

> Research & Development

- Customer specific System development
- Participation in governmental and EU-funded Research Projects

> Technical Consulting

- Conceptual design
- Feasibility studies
- Implementation
- Piloting
- Technical Support

Our Customers & Partners

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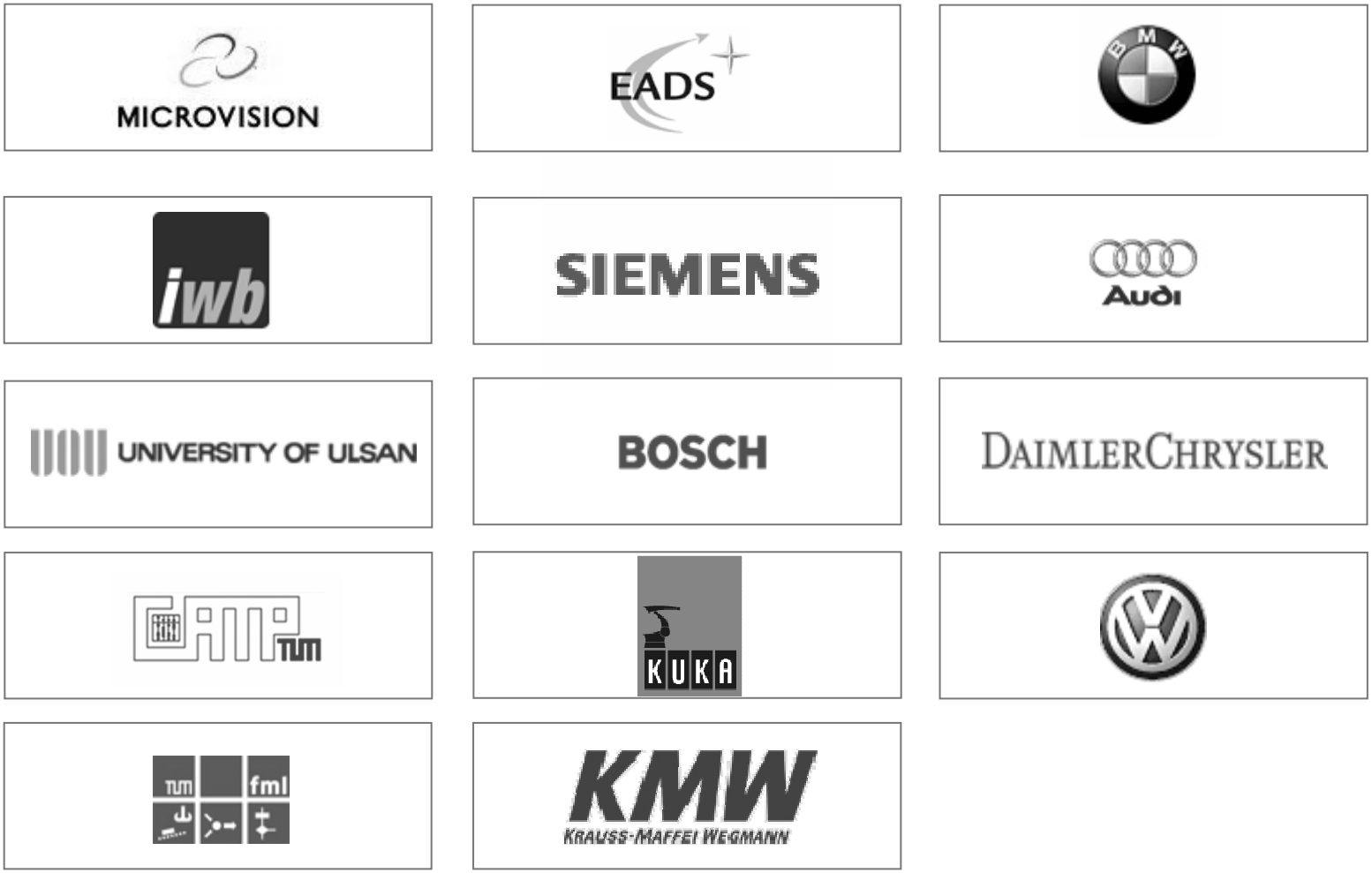

Wide spectrum of industry AR applications by metaio

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R&D → Production → Logistics → Service → Sales

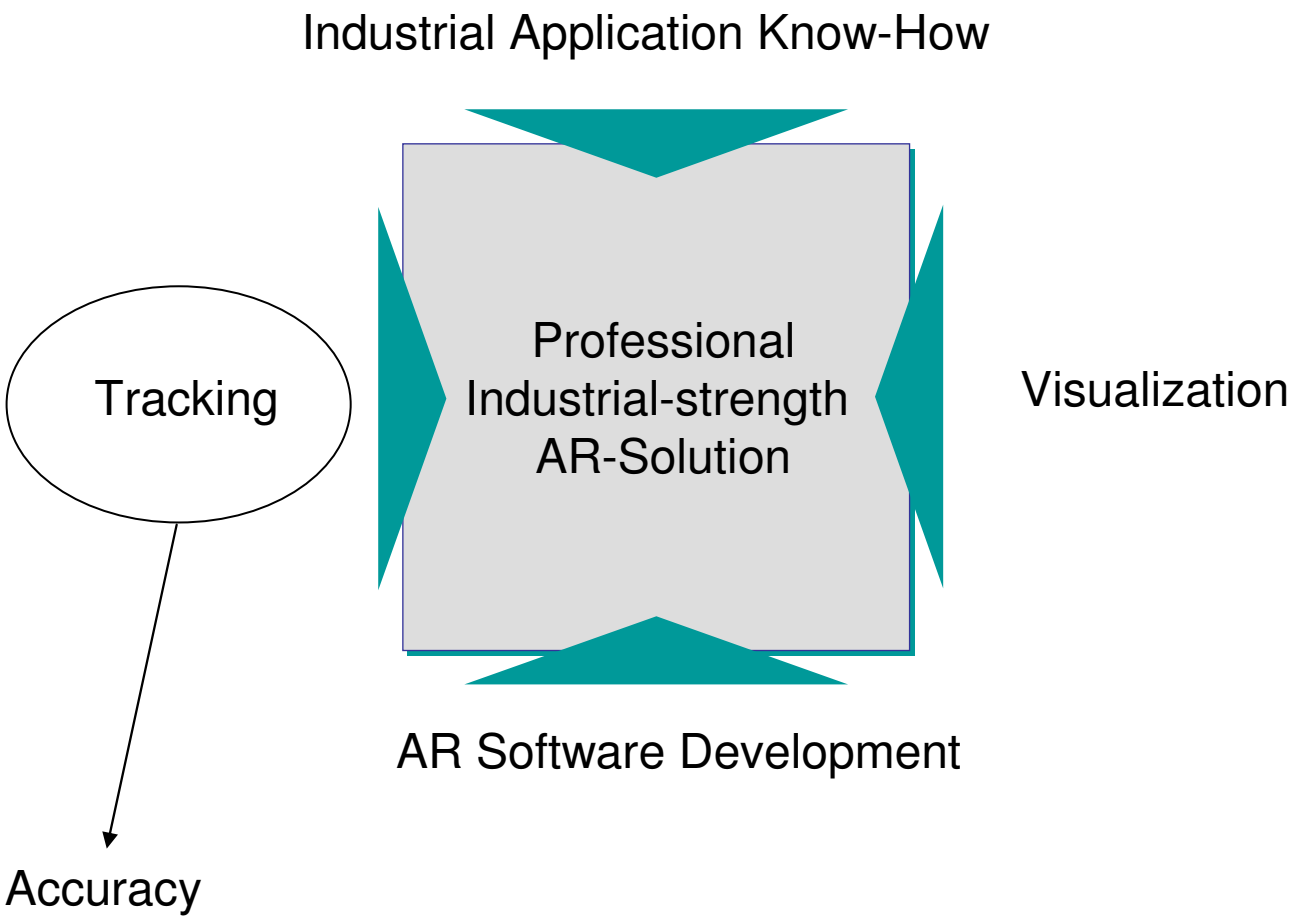
AR can support many applications in the typical industrial product pipeline!

Design Mockup

Factory Planning

Service & Maintenance

Company Competences for Industrial AR Solutions



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The need for Accuracy in industrial AR-applications

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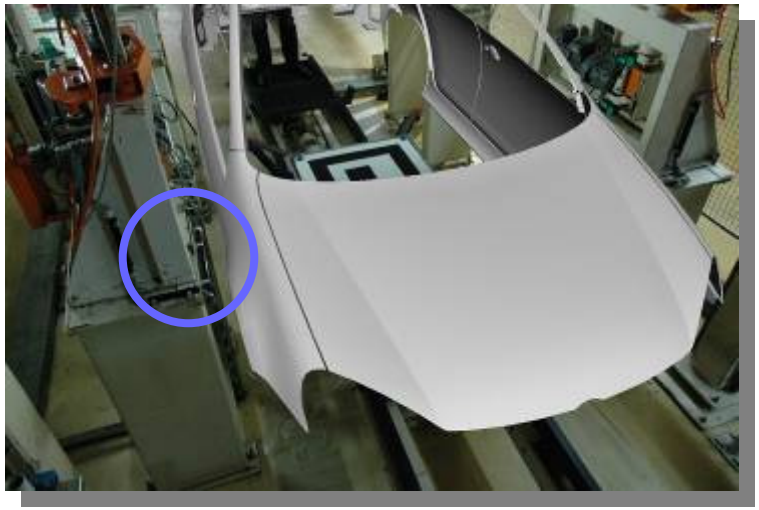
- AR in design, planning, training and maintenance
  - ARVIKA
  - ARTESAS
  - AR-Plan

AR for Visualization tasks

AR for Measuring tasks

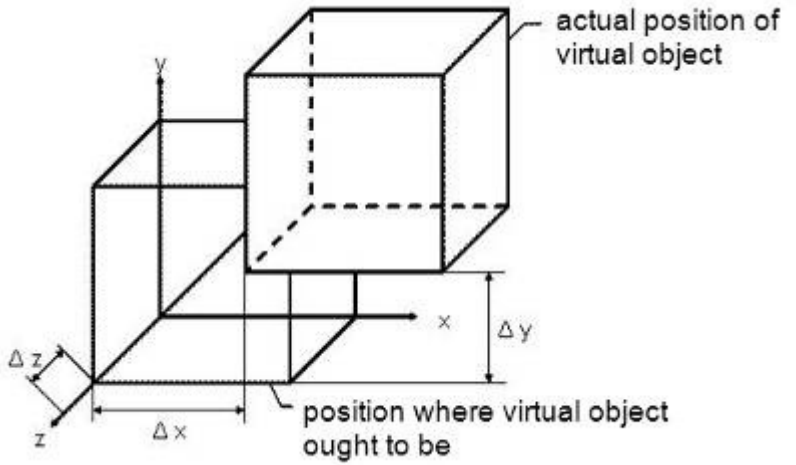
Importance of Accuracy



- AR-based measuring in industrial applications
  - Change management
  - Collision detection
  - Interfering edge analysis

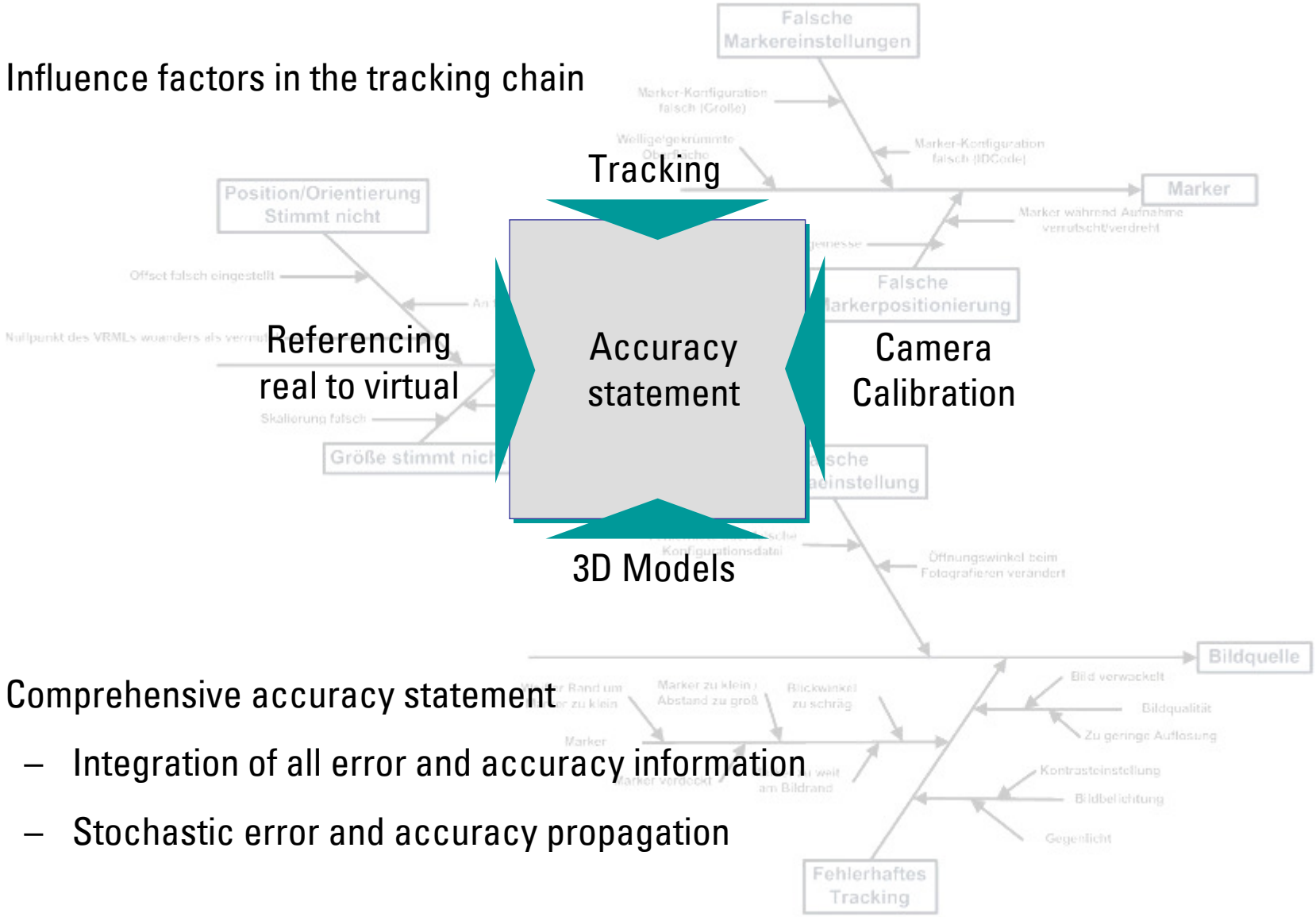
Meaning of Accuracy for AR-applications

- Measurements and Accuracy
  - Measurements are always estimated values!
  - Measurement + Accuracy = complete statement
- Accuracy for AR applications
  - AR systems which provide accuracy information
  - AR systems which provide high amount of accuracy



Application concept to the AR scenario

- Influence factors in the tracking chain



- Comprehensive accuracy statement
  - Integration of all error and accuracy information
  - Stochastic error and accuracy propagation

Accuracy for the AR scenario

- Integration of the influence factors with error and accuracy

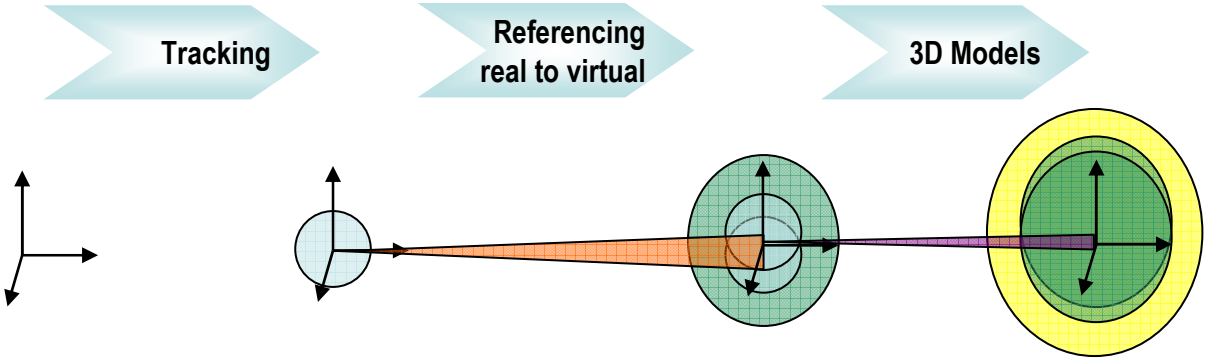
$$x = f(x_1, x_2, \ldots x_k)$$

$$x + e_x = f((x_1, e_{x_1}), (x_2, e_{x_2}), \ldots (x_k, e_{x_k}))$$

$$e_x = g(e_{x_1}, e_{x_k}, \ldots e_{x_k}) = f((x_1, e_{x_1}), (x_2, e_{x_2}), \ldots (x_k, e_{x_k})) - x$$

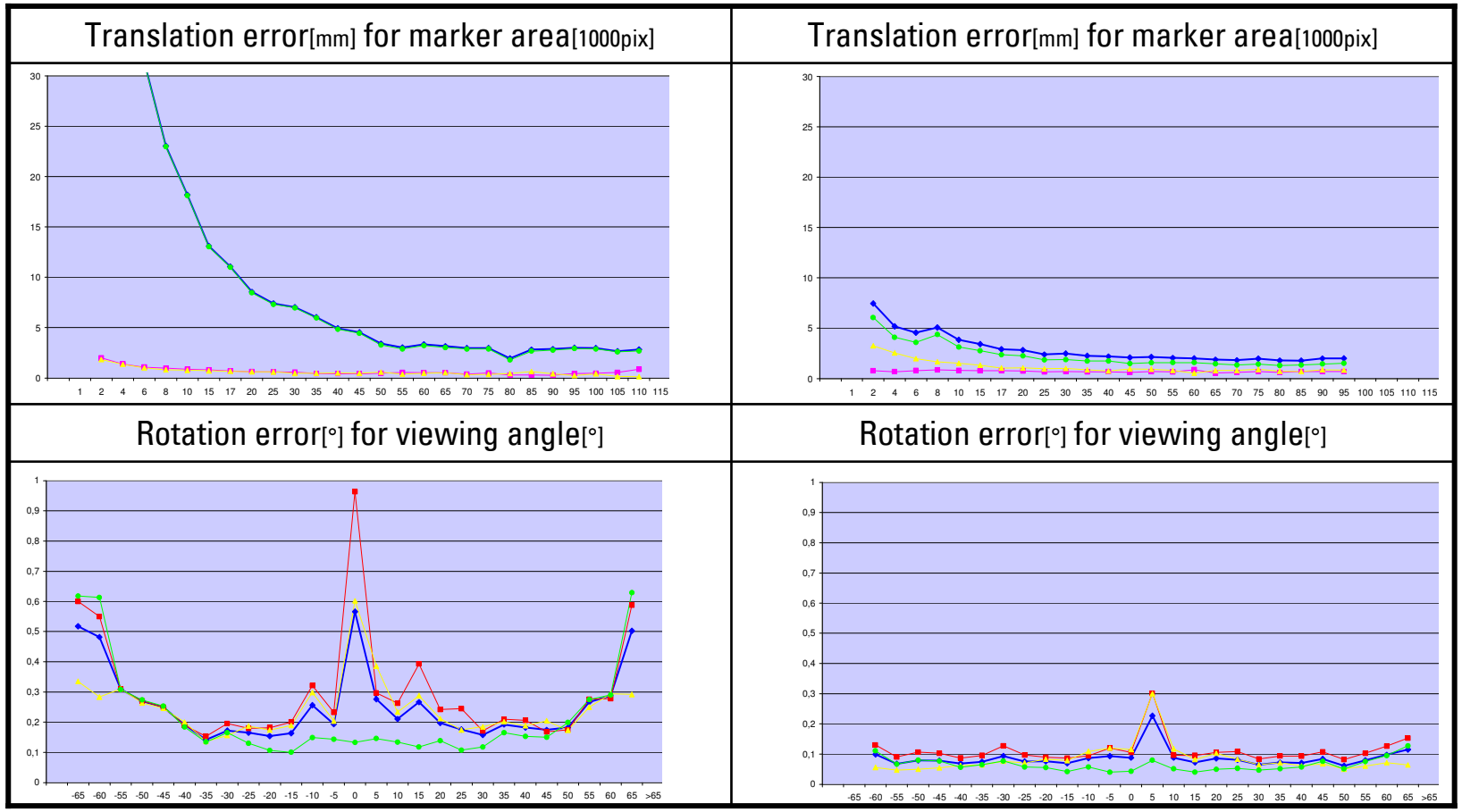
- Stochastic error and accuracy calculation
  - Error $\overline{e_x} = g(\overline{e_{x_1}}, \overline{e_{x_2}}, \ldots \overline{e_{x_k}})$
  - Accuracy $C_{e_x} = \sum_{i=1}^{k} J_i C_{e_i} J_i^T$ where $J_i = \frac{\partial g}{\partial \overline{e_{x_i}}}$

- Propagation along the tracking chain



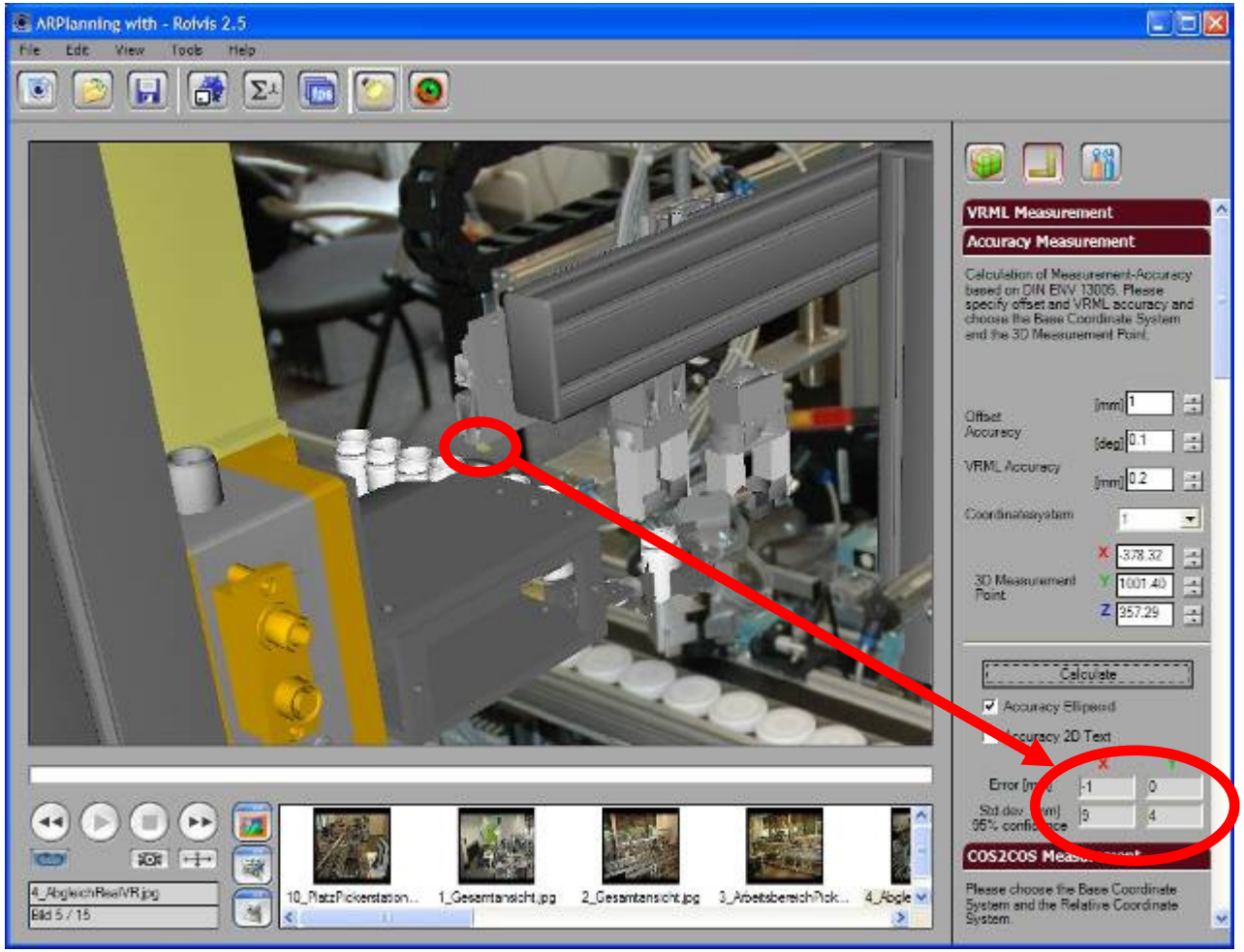
Accuracy Analysis and Product-Improvements at metaio

- Tracking Accuracy Analysis: Unifeye SDK Version 2.4 vs. Unifeye SDK Version 2.5



Implementation of Accuracy statements into User-Concept

- Roivis™ - Accuracy statements for photo-based factory planning



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Thank you for your attention!