



younique solutions

COMPUTER VISION FOR INDUSTRIAL INSPECTION: THE EVOLUTION FROM PCs TO EMBEDDED SOLUTIONS

NET New Electronic Technology since 1996

Develop and offer smart vision solutions: industrial & medical applications

Consultancy: application-specific demand

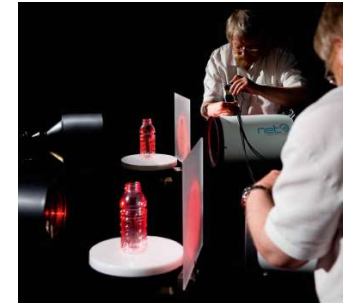
Growing demand for embedded vision

Sustainable technology & market trends

Product strategy: bringing visual intelligence to cameras



In-camera distortion correction



360° analysis in single image



Radar-aided 1D vision



Custom MIPI interface

What is the “right” vision system?

WHAT IS THE “RIGHT” VISION SYSTEM?

This has become more and more complex to answer for solution providers.

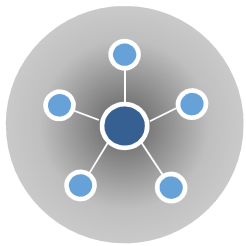
Topics:

- Learning from market developments
- Matching vision solution and strategy
- Successful approaches of solution providers for inspection systems
- Key findings and potentials of embedded solutions



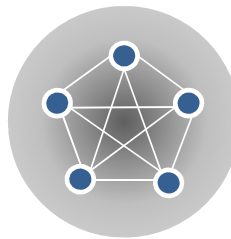
CLASSES OF VISION ARCHITECTURES

PC-BASED VISION



- PC-centered, 1:x
- Conventional image processing chain
- The PC does the job

EMBEDDED VISION



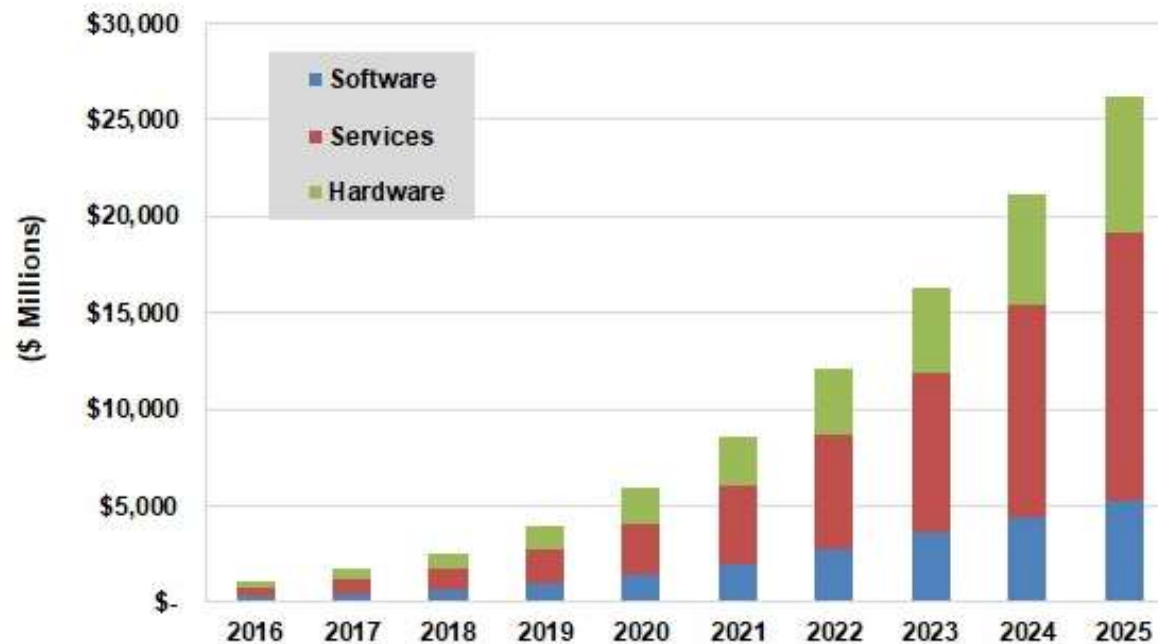
- Decentralized
- Stand-alone, networks x:x
- Change of workflow

Dedicated image processing units for vision systems

VISION MARKET

SOLUTION DRIVERS

Computer Vision Total Revenue by Segment, World Markets: 2016-2025



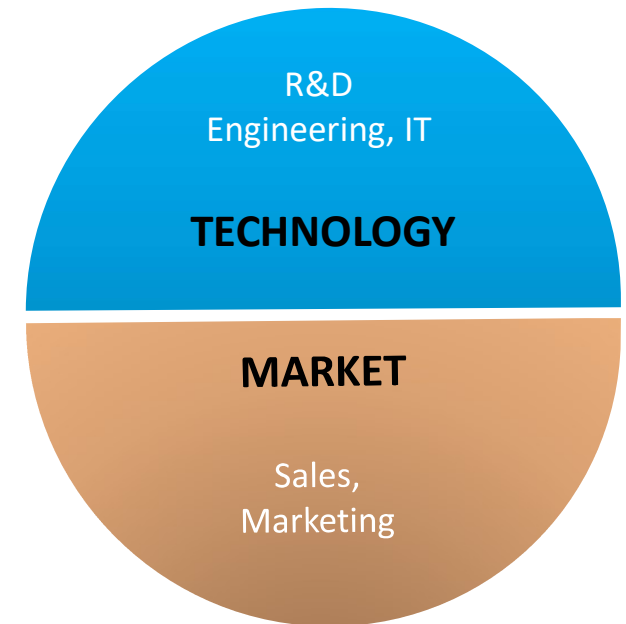
- Factor 26 (!) in less than a decade
- **Services**: a key driver for the solution
- **Hardware** falls relatively as embedded function grows
- **Software**: New image processing technologies (Deep Learning) are just beginning to take momentum

THE TWO SIDES OF A COIN

“[...] the fact that one can easily embed a computer vision-enabled chip in a camera opens up the field for countless applications.

The market for such cameras could easily reach into billions of dollars over the next several years.”

Anand Joshi, Principal Analyst at Tractica



EVOLUTION TO (INDUSTRIAL) EMBEDDED VISION

TECHNOLOGICAL DEVELOPMENTS & DECISION VARIABLES

Digital transformation

workflow and interfacing

Image processing units

performance vs. costs

Image sensors

size & information matters

Communication standards

reliability/ uncertainty, choice

IP functions

edge, cloud / property?

Form factors

if size matters

- ▶ Develop or buy
- ▶ Image processing
- ▶ Standards
- ▶ Adaptation
- ▶ Size
- ▶ Performance
- ▶ Price & availability
- ▶ Compliance

EVOLUTION TO (INDUSTRIAL) EMBEDDED VISION

MARKET DEVELOPMENTS & DECISION VARIABLES

Market strategy: growth, positioning, differentiation

Custom vs. standard
not primarily a cost issue

Buy or make
competence, resources

Automation
networked structures, decentralized IP, process control:
x:x architectures

Product cycles: time-to-market, flexibility

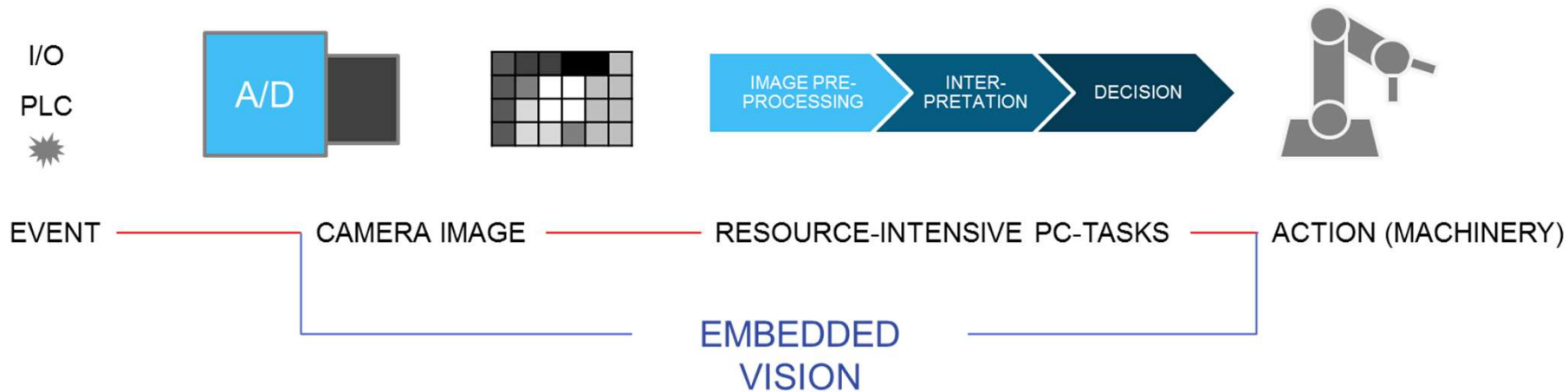
- ▶ Develop or buy
- ▶ Image processing
- ▶ Standards
- ▶ Adaptation
- ▶ Size
- ▶ Performance
- ▶ Price & availability
- ▶ Compliance

LEARNING FROM DEVELOPMENTS

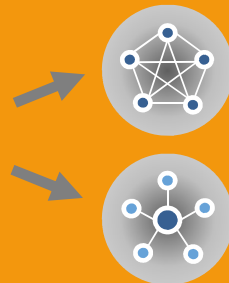
MATCH STRATEGY AND KNOWLEDGE OF DECISION VARIABLES



THE VALUE CHAIN OF VISION SOLUTIONS AS ANALYTIC TOOL



- Market demand
- Competitive advantages
- Solution approach
- First mover / innovator



Meet complexity with „services“
to create an optimal image processing value
chain!

SOLUTION APPROACHES FOR INDUSTRIAL INSPECTION

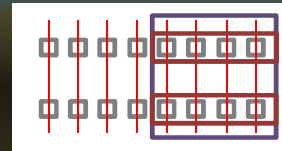
PART INSPECTION



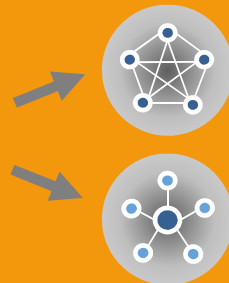
WEB INSPECTION



ABSENCE / PRESENCE



- Market demand
- Competitive advantages
- Solution approach
- First mover / innovator



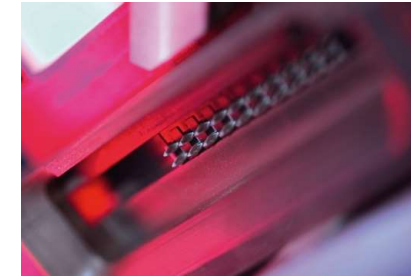
Meet complexity with „services“
to create an optimal image processing value
chain!

NEVER CHANGE A RUNNING SYSTEM – REALLY?



PC-based vision

Inline and random
inspection of connectors
Process reliability, quality
Geometry, order, positioning, orientation



Evaluation

From era with low performing embedded IP units
Architecture solves task without drawbacks
Market: advanced entry inspection
Solution: camera-embedded functions possible with running system

FOCUS ON CORE COMPETENCIES

WEB INSPECTION



OWN
IP

CUSTOM
SOLUTION

STANDARD
OPTICS

GiGE
VISION

Embedded vision

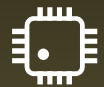
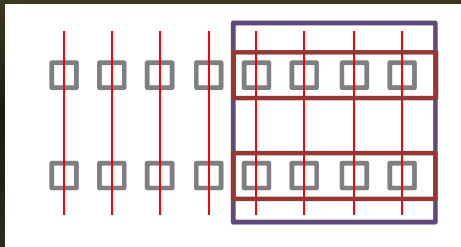
- Textile cutting machines, print inspection
- Quality finishing, surface control, 2D /3D
- 2D /3D, markings, color, position, orientation, height

Evaluation

- Decentralized IP solves effectively data processing of real-time multi-camera application
- Protection of IP cores, cost-effective
- Market: maximal application flexibility
→ adaption of own functions, scalability

FOCUS ON CORE COMPETENCIES

ABSENCE / PRESENCE



OWN
IP

CUSTOM
SOLUTION

STANDARD
HARDWARE

GIGE
VISION

Embedded vision

- Testing logic IC handler
- Process control
- Absence / presence

Evaluation

- PC-based solution would lead to violation of law
- Embedded vision made solution possible in first place (legal facts)
- Performance advantages with embedded vision: reduction of data rate lead to disruptive application improvements

BREAKDOWN OF SOLUTION APPROACHES

PART INSPECTION



„The running system“

- The PC does the job
- Application-wise sufficient
- +EV: market potentials

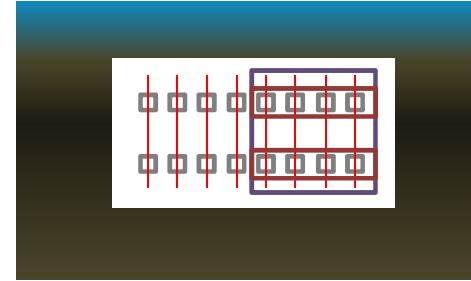
WEB INSPECTION



„Core competencies“

- Embedded IP for handling of real-time multi-camera apps
- Protection of IP cores
- Cost-effective
- Maximal flexibility

ABSENCE / PRESENCE



„Disruptive improvements“

- EV made solution possible
- Data reduction lead to disruptive improvements

IMPLICATIONS FOR THE “RIGHT” VISION SYSTEM

- Knowledge of decision variables as necessary condition for assessment
- Services important part of the solution as standard would not do (here)
- Confirmed ambivalence (technology + market) for evolution
- The value chain of vision solutions as analytic tool offers potentials to lift competitive advantages
- Existing IP cores with EV: market development as to improved positioning
- Vision follows strategy: the right vision system to be individually answered

RESOURCES

Slide 6: <https://www.embedded-vision.com/industry-analysis/market-analysis/computer-vision-hardware-software-and-services-market-reach-262-bi>, Embedded Vision Alliance, found April 3, 2018

Slide 7: <https://www.embedded-vision.com/industry-analysis/market-analysis/edge-intelligence-computer-vision-market>, Anand Joshi, Principal Analyst at Tractica, Embedded Vision Alliance, found April 3, 2018



younique solutions