

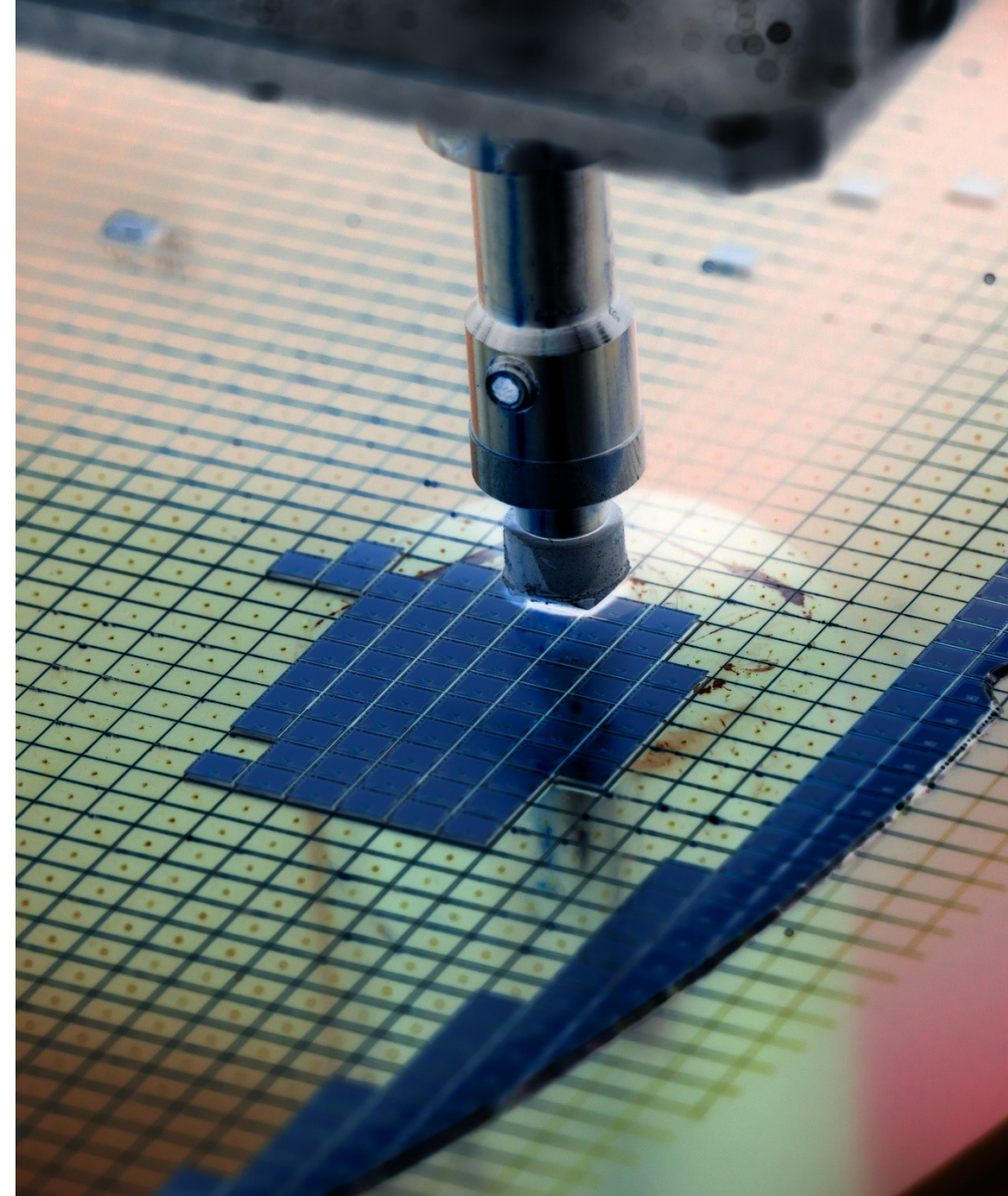


The Importance of Vision in Automation

Ryan Marti – Product Manager
Omron Week 2022

Agenda

- Machine Vision in Automation
 - What is Machine Vision?
 - Evolution of Image Sensing & Trends
 - History of Machine Vision
 - Trends Moving Forward
- Common Vision Applications in Automation
 - General Applications by Industry
 - Inspect, Locate, Measure, Identify
- Conclusion



Machine Vision Defined



The Technology and methods used to provide imaging-based automatic inspection and analysis for such applications as automatic inspection, process control, and robot guidance, usually in industry.



Automated extraction of useful information from digital images

Machine Vision: A Compilation of Technologies

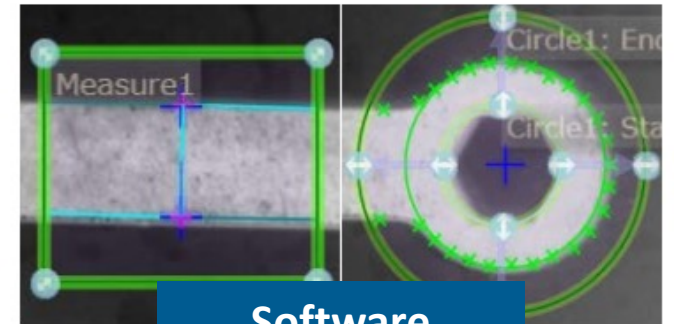
Machine Vision is not just a single product guiding Automation. Machine Vision requires the cooperation and intermingling of multiple technologies working together.



Optics



Lighting



Software

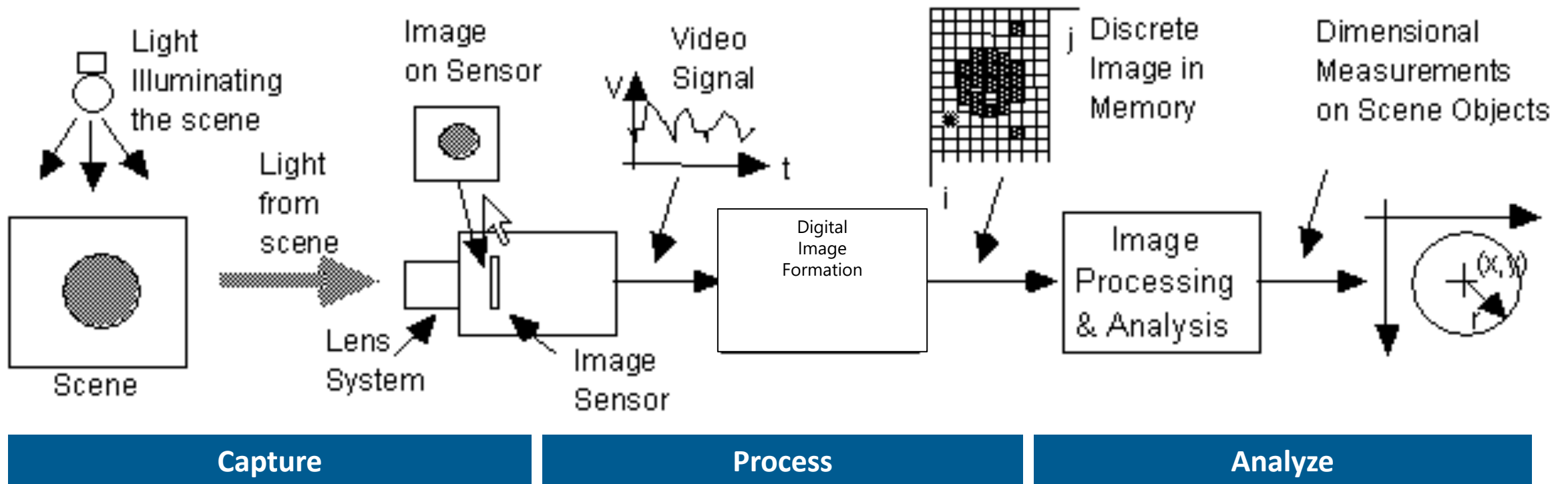


Cameras

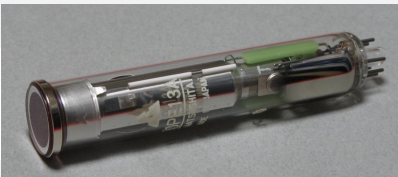


Processing

Diagram of Vision

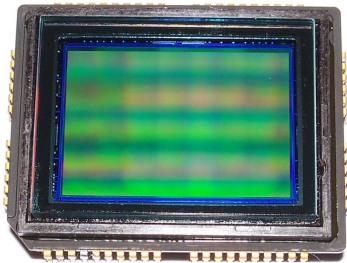


An Evolution of Image Sensing



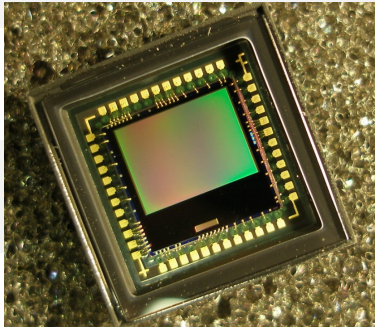
Videocon Tube

1950s to 1960s →



First CCD Imagers

1970s to 1980s →



CMOS Technology

1990s to 2000s →

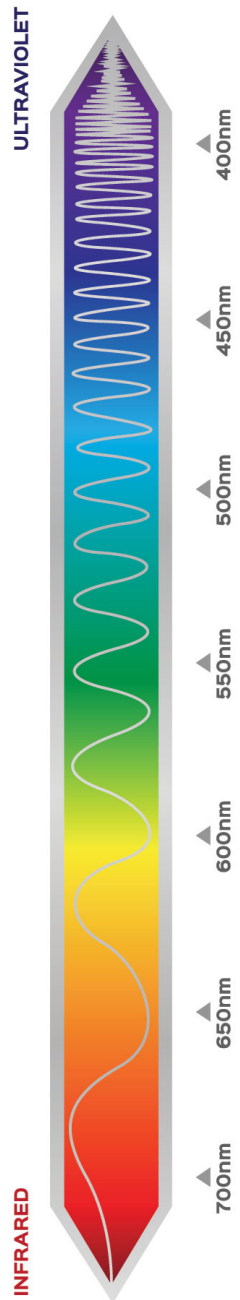


Consumer Technology helps drive CMOS ahead of CCD



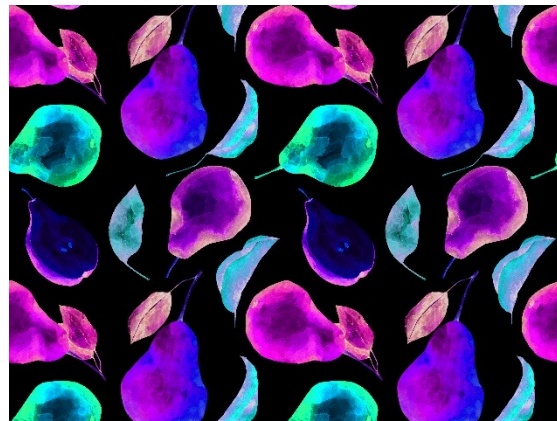
2010s →

SPECTRUM

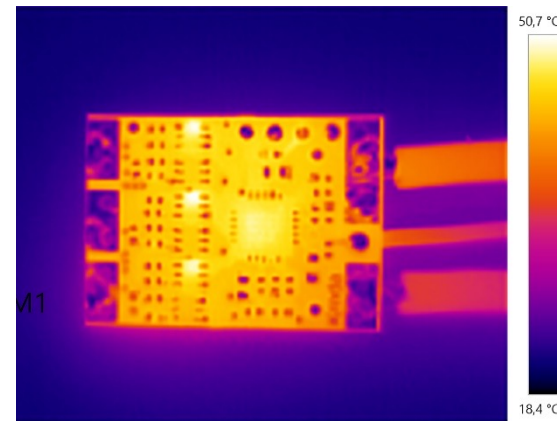


Visual Spectrums – Hyper Spectral Imaging

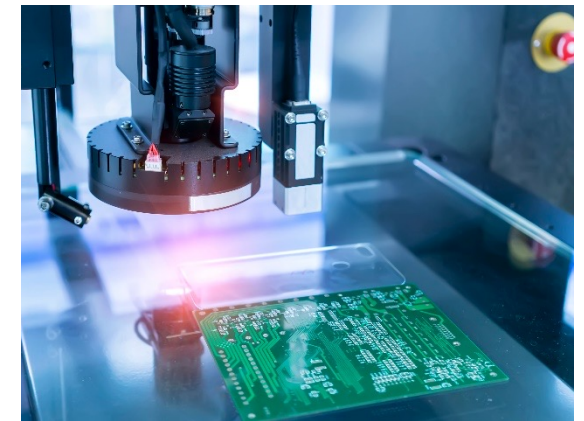
Traditional vision is done on the normal visual wavelength and can be delineated between Monochrome or Color image processing. New technology however has pushed Machine Vision to different visual spectrums.



Ultraviolet (UV)



Infrared (IR)



Short Wave Infrared (SWIR)



History of Machine Vision in Automation

- As early as the 1980s, Vision has been paired alongside Automation
- One of the early examples of Vision, the Autovision II by Automatix utilized early computer processing to showcase blob detection
- Automation and Machine Vision have been linked ever since the golden age of Machine Vision in the 1980s.



Interfaces & Processing

- Speed, Speed, Speed
 - 10GigE
 - CoaX 2.0
 - Increased bandwidth for data processing
- Higher Resolutions
 - Image sensing technology keeps pushing the boundaries in resolution
- Processing
 - High speed cameras require high speed processing.
 - Driven by data acquisition, IPCs and smart cameras need to be capable of handling larger amounts of bandwidth.



Data Acquisition & Artificial Intelligence

Data Processing for Machine Vision is done on either the camera side or through a data processing device such as an industrial PC.

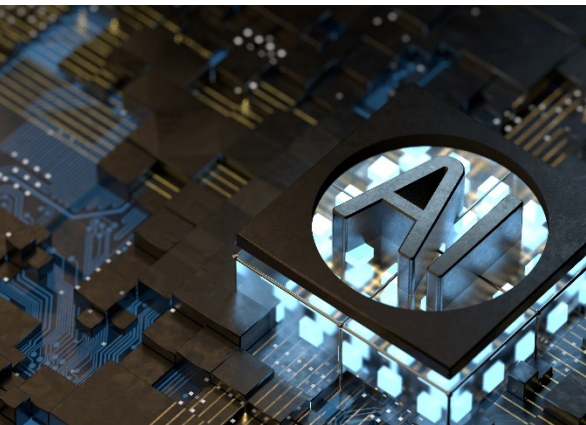
EtherNet/IP™

EtherCAT®

IO-Link

Artificial Intelligence & Machine Learning:

- In order to achieve any level of AI, data must be processed over a long period of time in order to teach the software how to function.
- Leaps in AI for Machine Vision are driven by the amount of data that can be acquired and processed.



Flexible Automation

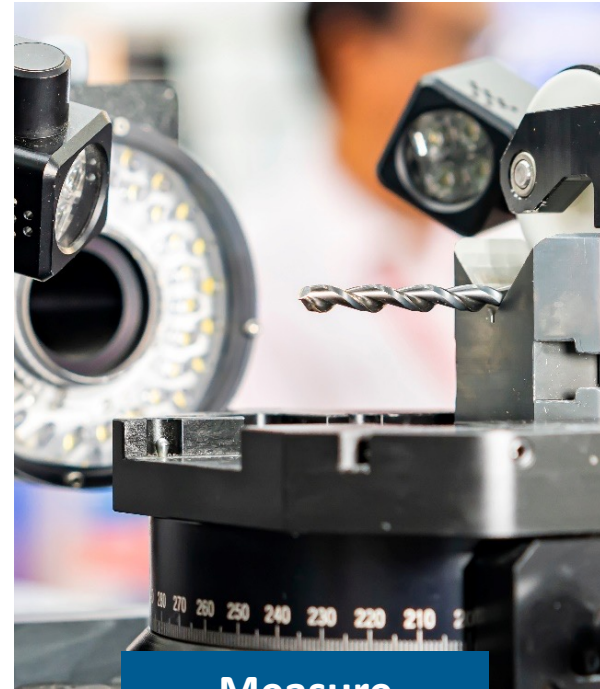
Flexible manufacturing demands mobile intelligence, and developments in autonomous intelligence will dramatically change the manufacturing floor. While logic controls manufacturing processes, it is motion and robotics that bring manufacturing processes to life.



Inspect



Locate



Measure

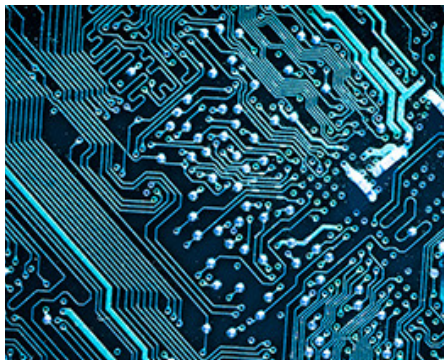


Identify

Common Machine Vision Applications



Electronics / Semiconductor



- Alignment
- Wafer Inspection
- Wire Bonding



Logistics & Warehouse Automation



- Automated Storage
- Palletizing
- Automated Guided Vehicles



Life Sciences



- Quality Inspection
- Label Compliance
- Measurement



Food & Beverage



- High Speed Inspection
- Waterfall Sorting
- Bottle Inspection

Inspect

Quality Inspection

- Requires the ability to detect defects or incorrectly made products
- Used heavily in the Food & Commodity / Life Science industries to increase the quality of products.
- Helps to protect consumers from defective and potentially dangerous products.
- Vision allows companies to automate the detection of defects where typically manual labor would be needed

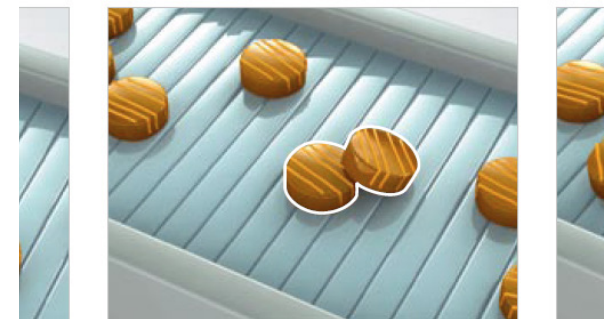


ion in one system



Detection of dirty or overlapping objects

Edge



Detection of partially hidden objects

Comp

Locate

Pick & Place / 3D Bin Picking

- Robots are used heavily in automation today, primarily for replacing monotonous and repetitive tasks traditionally done by human labor.
- One of the most common applications combining robotics and vision is Pick & Place.
- Vision provides the data the robots need in order to properly accomplish their tasks.
- Without Vision it would be difficult to properly guide robotics.
- 3D Vision makes the ability to properly locate objects in 3D space even easier and with higher accuracy.

Measure

Liquid Level Inspection:

- Companies need to be able to provide a consistent amount of product, whether that is in soda bottles or household cleaners.
- Utilizing Machine Vision engineers are able to measure the exact level of the liquid in containers to ensure the highest quality.
- SWIR is a great example of a new image technology driving innovation for this field.

Identify

1D & 2D Barcode Reading & Compliance

- Companies want to be able to confirm the product is what it is supposed to be, barcodes allow for product and supply chain tracking, regulatory requirements and quality control.
- Utilizing Vision, companies can scan multiple products at a time, and even accomplish more tasks than just barcode reading for their applications.
- Track, Trace, & Control
- Barcodes will also be verified for accurate information, which can only be accomplished with Vision.



Conclusion

- Machine Vision & Automation are a symbiotic relationship
 - When Machine Vision technology innovates, automation becomes more efficient
- Vision is not Rocket Science
 - While certain applications and tasks in Machine Vision can be daunting, the reality is that there are many applications that can be solved simply and with incredible ease.
- Vision is the **eyes** of automation



thank
you

Ryan Marti – Product Manager
ryan.marti@omron.com

