Imaging with NI

Kalle Ryynänen

Project Manager, Test and Measurement Systems

Abstract

- Introduction
- Building your imaging application
- NI imaging hardware
- NI imaging software

OptoFidelity

Kalle Ryynänen, OptoFidelity

- MSc thesis (TUT 2006):
  - Paper roughness characterization with photometric stereo
- OptoFidelity and LabVIEW since beginning 2007
  - Monitoring and sensor fusion system
  - Video quality measurement
  - Display inspection solutions
  - Product line inspection solutions
  - WatchDog camera based event detector
- CLD

OptoFidelity

OptoFidelity Company

Founded 2005
- 22 persons,
- Turn over 2010: 1.6 M€, B2011:2M€
- 6 CLD (Certified LabVIEW Developers)
- Strong partner network

Business areas:
- Test- and Measurement Automation
- Engineering Services
  - for TOP 50 R&D companies listed in Finland
- Machine vision systems

Patented technology for user experience and video quality testing.

OptoFidelity

Example of OptoFidelity applications

- **OptoFidelity WatchDog**
  - UI performance latencies (visual, electrical)
  - UI feedback detection (haptics, audio)

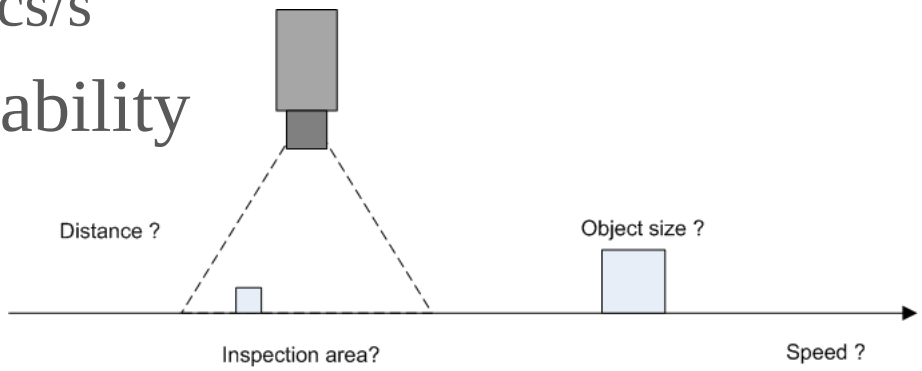
- **OptoFidelity Frame Rate Meter**
  - Video playback quality measurement
  - Easy setup and connectivity

- **OptoFidelity Touch Panel testers**
  - Functionality, linearity / response time
  - Writing Durability

OptoFidelity

Building your imaging application

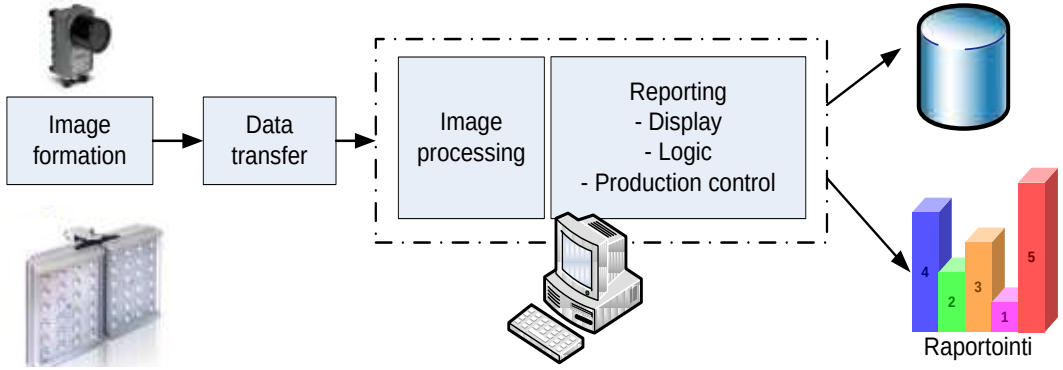
- Optical requirement
  - Accuracy m/mm/μm
  - Imaging distance and imaging area
- Computational performance
  - On-line / Off-line
  - Throughput time 1-100pcs/s
- Scalability and configurability
  - Calculation unit
- Reporting
  - Data storage
  - Traceability / User access



OptoFidelity

Your application components

- Illumination
- Imaging device
  - Optics
- Calculation unit
- Result output
- Data storage



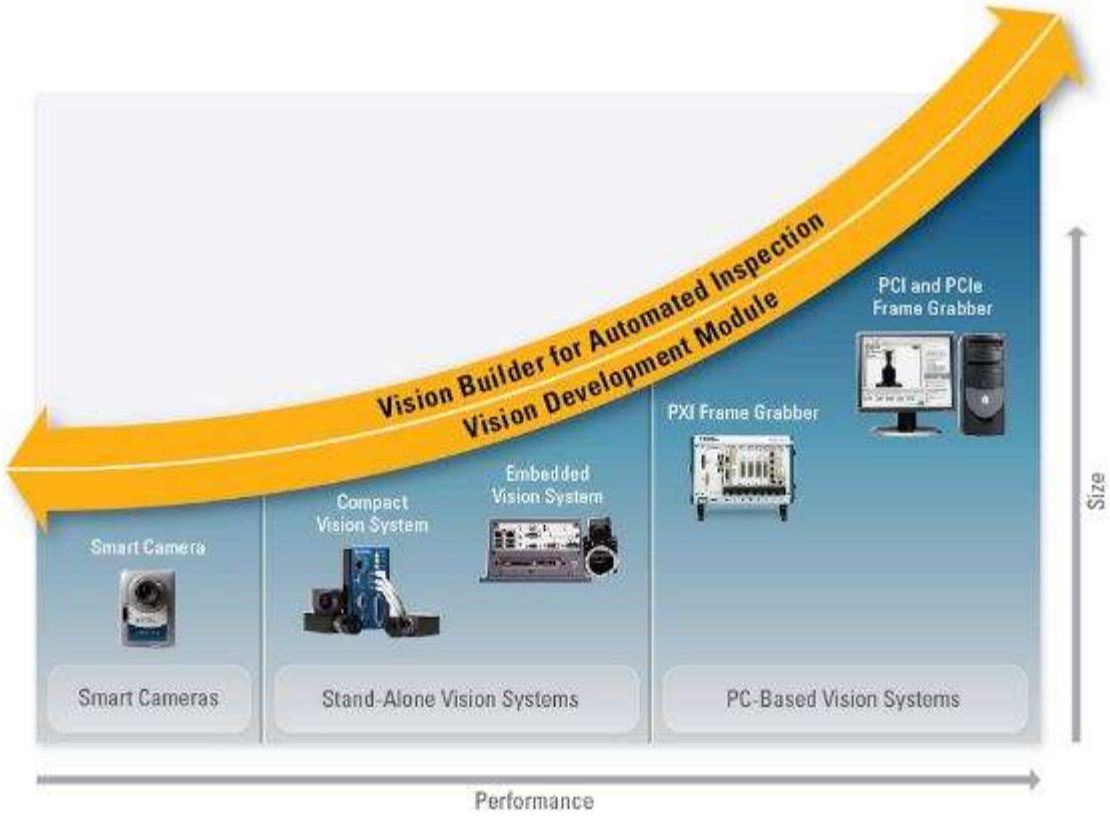
OptoFidelity

NI imaging hardware topics

- NI imaging hardware selection
  - Smart cameras
  - Stand alone vision systems
  - PXI Vision
  - PC based vision systems

OptoFidelity

NI imaging hardware selection



OptoFidelity

Smart cameras

- Sensor type product line inspection
- Pros:
  - Compact
  - No additional HW
  - I/O for light control
- Cons:
  - Limited image selection
  - Limited calculation capability

OptoFidelity

Stand alone vision systems

- Multi camera and third party camera compact vision applications
- Pros:
  - Multiple camera heads
  - Lots of I/O
- Cons:
  - Limited computational performance

OptoFidelity

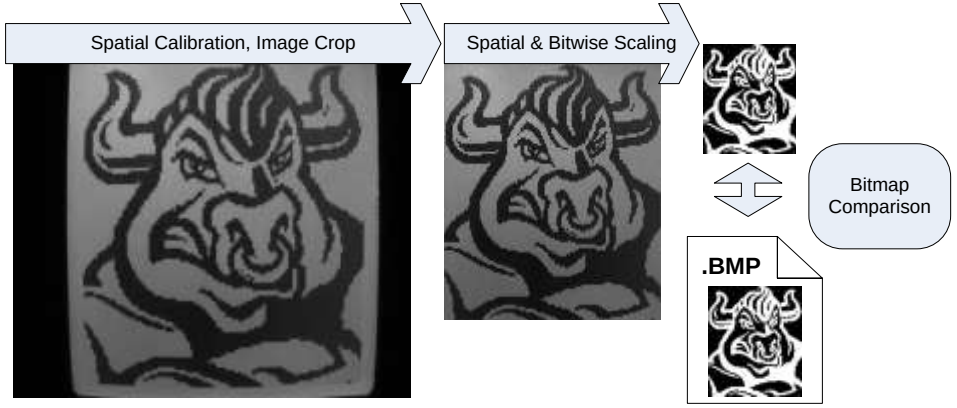
PXI Vision systems

- Fast image processing applications
- Pros:
  - Flex RIO enables customized acquisition interfaces
  - RT-environment
- Cons:
  - Limited to PXI
  - Price

OptoFidelity

PC based vision systems

- Pros:
  - Camera connectivity possibilities (GigE, USB)
  - Frame grabbers with embedded image processing
  - Low hw cost possibilities
  - Computation performance
- Cons:
  - Limited lifecycle
  - OS dependency



OptoFidelity

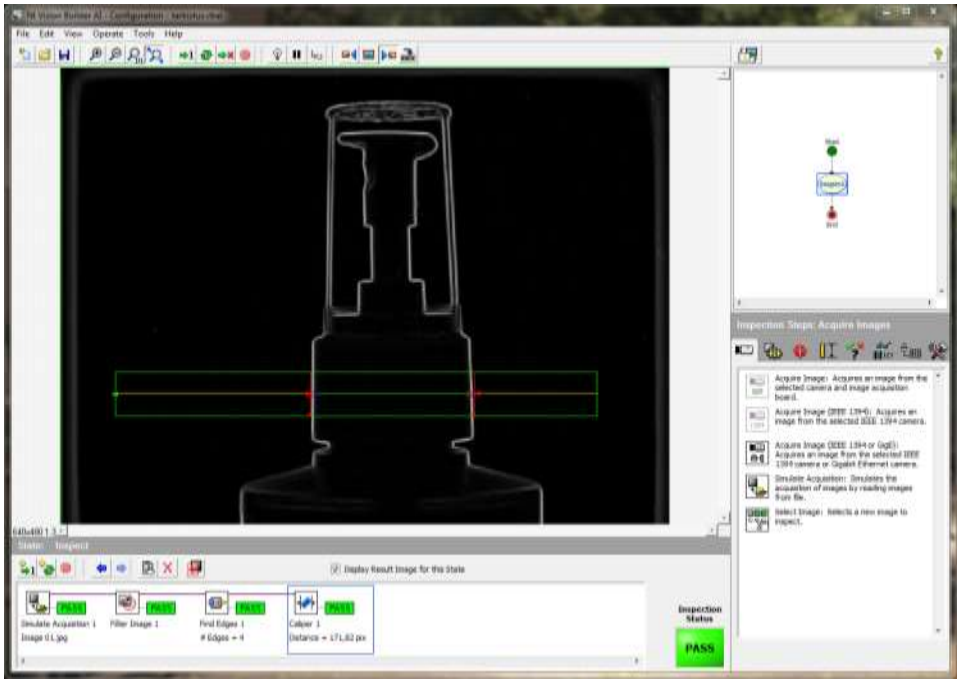
NI imaging software topics

- Vision builder AI
- NI Vision Development environment
  - NI Vision Assistant
  - NI Vision in LabView
- Image processing steps in LabVIEW
- IMAQ-object in LabVIEW

OptoFidelity

NI Vision builder AI

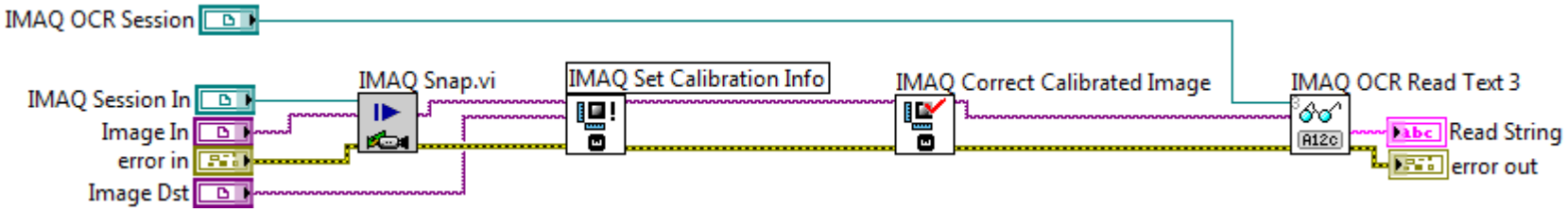
- Configurable machine vision software
- Building inspection applications
- Applications are easy and fast to start
- Good approach for smart camera and NI embedded vision systems



OptoFidelity

NI Vision development environment

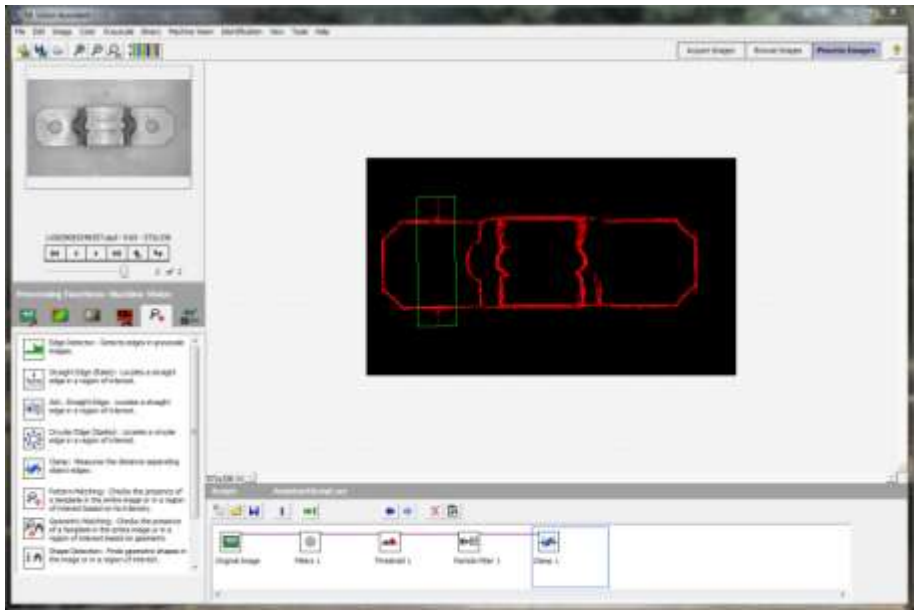
- As a part of large image applications
- Wide range of image processing components
- Requires understanding of image processing



OptoFidelity

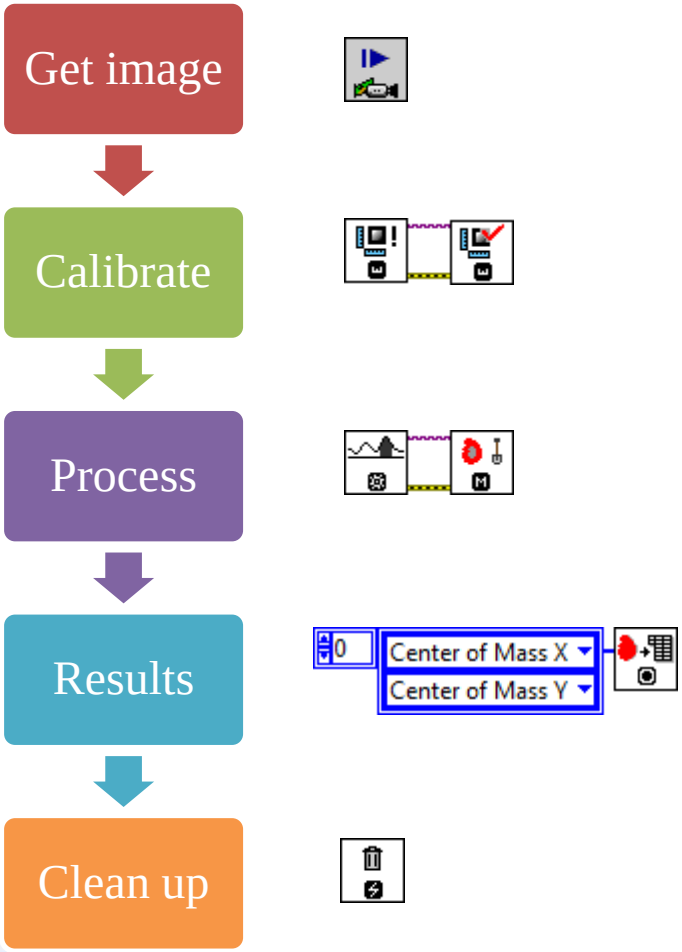
NI Vision Assistant

- Building your LabView image processing VI's with preview functionality
- Prototype test bench for NI Vision development module
- Possible VI reuse in LabView applications



OptoFidelity

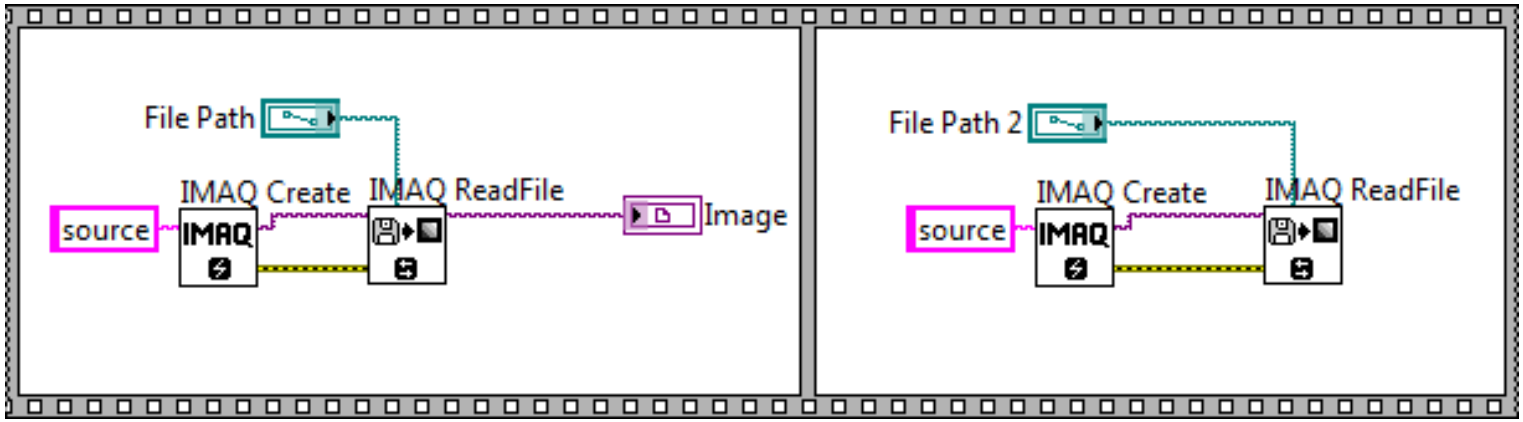
Image processing steps in LabView



OptoFidelity

IMAQ in LabView

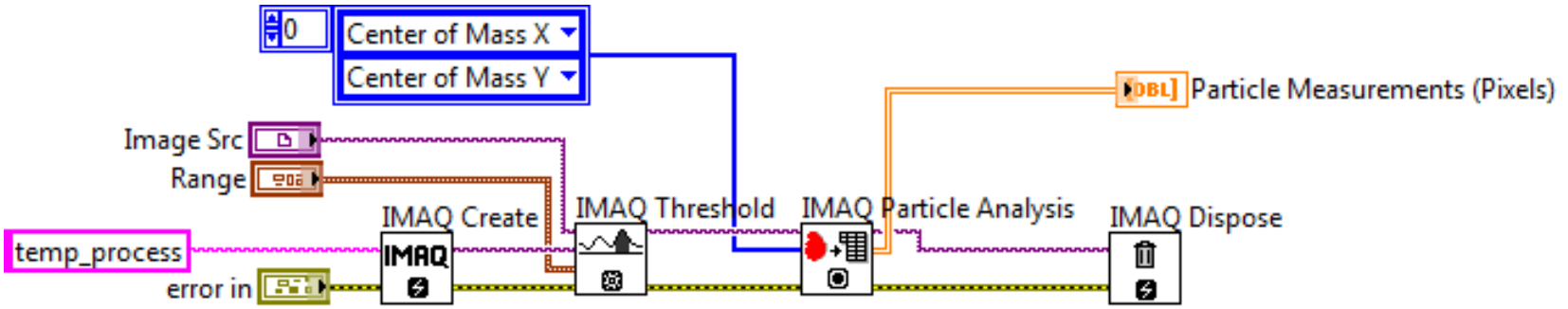
- IMAQ is a global variable in LabView
  - This can be utilized in image buffers
  - Dublicate names can create strange behaviour in applications



OptoFidelity

IMAQ in LabView

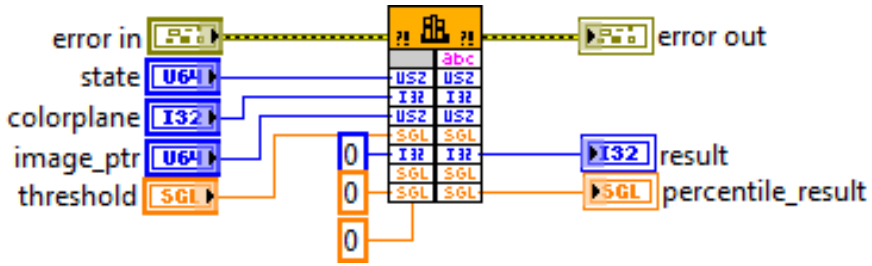
- Control your IMAQ-objects
- Create and clean your objects in sub vi’s

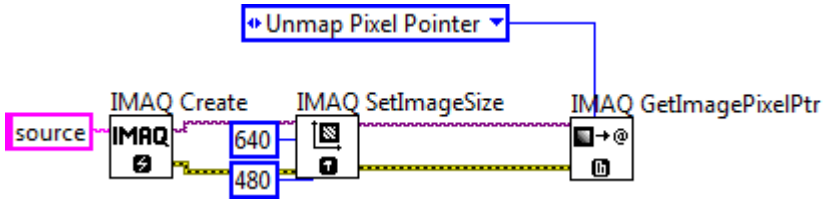


OptoFidelity

LabView and external tool utilization

- Easy to utilize 3rd party software
- Example cases of my external tool utilization:
  - Preprocessing
  - Disk buffers
  - OptoFidelity's own imaging tools

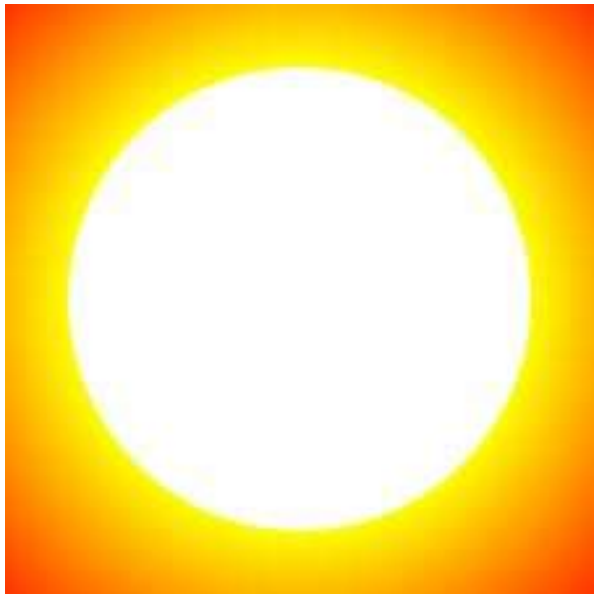


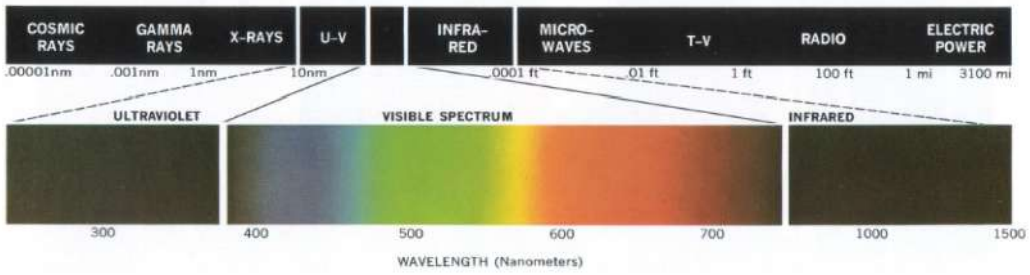


OptoFidelity

Tips for machine vision system

- Its all about light
- Specify your optical characters
  - Select your illuminance
  - Select camera system
  - Select optics
- Select your software





OptoFidelity

OptoFidelity
Machine vision laboratory

Machine vision laboratory

- Multiple type light sources
- Optics for different scales
- Matrix cameras
- 3xCCD colour line scan camera
- NI smart camera
- 3D camera, Sick IVP
- Linear movement

Machine vision development libraries

- NI Vision Library
- MvTec Halcon
- Cognex Vision Pro
- Matlab Imaging Library
- Open CV
- Imatest camera measurement software

Together over century experience of applied machine vision and optical measurement

OptoFidelity

Thank You!

For more information:

kalle.ryynanen@optofidelity.com