Fraunhofer IIS

Division Engineering of Adaptive Systems EAS of Fraunhofer IIS

Smart Multisensor Systems

Software-Defined Sensors for Demanding Industrial Image Processing

Today, many industrial fields of applications rely on image processing to bring quality and efficiency up to a level which was previously impossible. However, most conventional image processing systems show technical limitations in terms of processing speed, latency and dynamic range.

Fraunhofer IIS/EAS is working to solve these challenges by developing innovative methods and processing architectures as well as software-defined image sensors based on them (Vision Systems on Chip). These make it possible to design complete system solutions which combine high-performance camera hardware with algorithms which come fully ready for use but can still be flexibly adapted to your individual needs.

Our Approach

Our approach combines software-defined image capturing directly with image processing. Computationally intensive feature extraction is executed and controlled through software on the Vision System on Chip, allowing output data to be reduced to the relevant minimum.

The components integrated into our »software-defined smart camera« not only allow you to actually select a specific image processing algorithm, but also allow you to customize parameters including precision, resolution and sampling rate.

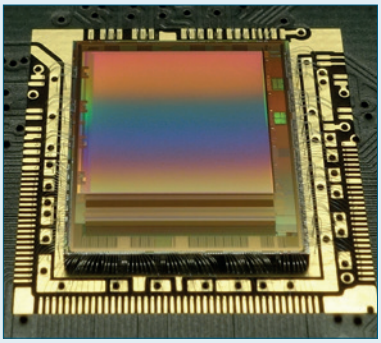
Our Services

- Feasibility studies on the application of optical measurement methods
- Development of algorithms and procedures for measurement and inspection tasks
- Implementation of high-performance image processing solutions based on specific software, FPGAs and ASICs
- Customized Vision Systems on Chip configurations
- Further development of existing hardware and software components

More information

Part of

Forschungsfabrik Mikroelektronik Deutschland



above:
Fraunhofer IIS/EAS sensor modules for high-speed laser light-sheet

Sensor characteristics:

- Vision System on Chip (VSoC)
- Sensor matrix with 1024 x 1024 pixels
- Pixel size: 8.75 µm x 8.75 µm
- Field of view of 9 x 9 mm²
- Dynamic range > 120 dB
- Exposure time 1 µs to 20 s
- Global shutter

High-speed data processing:

- Compressed sensing: laser light-sheet line position determined directly in the sensor
- 13000 profiles/second at 8000 height levels in 2016 columns
- Output through parallel digital interface
- 117 GOps at 60 MHz system cycle

Configuration by user:

- Configuration through SPI interface
- Parameter registers e.g. for exposure times, ROI, HDR
- Algorithms can be adapted to uncooperative surfaces
- Hardware triggers and GP-I/O for external peripherals

Vision sensor module

- VSoC with on-board firmware
- Flexible power supply, through an external supply unit
- Dimensions: 48 mm x 48 mm
- Power consumption < 1 watt in all operating modes

Your Benefits

Our many years of experience in designing, developing and applying innovative image capture and processing systems will benefit all areas of your enterprise, e.g. in:

- Planning and implementation of challenging optical measurement, inspection and control processes, bringing:
  - Response times in the µs range
  - Screen refresh rates in the kHz range
  - Dynamic range greater than 120 dB
  - Low requirements of space and power consumption
- Quality assurance via automated full testing
- Enhanced quality through optical process control
- Customized software-defined camera systems allowing for a flexible and efficient implementation of image capture and processing methods
- Optimization of overall system costs as well as product life cycle costs

Development of Customized Image Capture and Processing Systems

Fraunhofer IIS/EAS brings comprehensive know-how in the field of machine vision. We design and develop up-to-date, high-performance systems for image capture and processing which meet the growing demands of the industrial environment.

To that end, our work focuses on sensors and algorithms which rapidly and precisely measure 2D and 3D surfaces, e.g. using laser light-sheet. We develop energy-efficient systems for object detection which work on the basis of a multi-modal, texture-based processing of image sequences. In addition, we also apply methods for multi-spectral data analysis and data fusion (in the near-infrared and thermography areas as well), for purposes of quality monitoring and production process control.

Kontakt

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