VISARD—Vision Automation Robotics Designer

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CSEM's VISARD offers a PC-based one-stop software solution for complex, special-purpose machines. Industrial automation faces many challenges: improving quality, increasing process reproducibility and lowering costs while fulfilling high customer expectations for flexibility and user friendliness. These demands are part of the Industry 4.0 trend, which aims at integrating traditional production with information and communication technologies. By applying state-of-the-art software design and introducing advanced control architectures VISARD enables efficient deployment of hardware-independent automation systems.

CSEM has created the Vision Automation Robotics Designer (VISARD) to drive special-purpose machines with minimum effort and maximum flexibility. The breakthrough was achieved by merging CSEM's industry-proven robotics and vision frameworks into a single tool. VISARD can be used in complex special-purpose machines as well as in simple measuring devices. It offers a smart PC-based solution for hybrid-control systems with heterogeneous hardware elements free of any Programmable Logic Controller (PLC).

VISARD uses a graphical, module-based approach that makes it flexible, extendable and easy to use by machine integrators, developers and end-users (Figure 1). Typical modules include cameras, robots, I/Os, logging, data management and algorithms for image or data processing (e.g. neural networks).
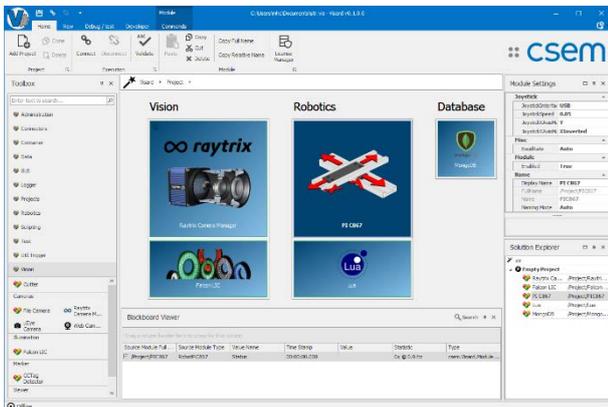

Figure 1: VISARD user interface.

The application's core is the control logic of a special purpose machine. Pure graphical descriptions of complex systems often result in confusing diagrams that are hard to maintain (e.g. LabVIEW). On the other hand, a framework that only offers low-level programming interfaces requires trained programmers and is not usable by machine integrators. VISARD provides multiple ways of linking modules. Simple and sequential processes can be connected graphically on the VISARD's user interface. More complex logic can be implemented using high-level scripting languages like Lua (similar to IEC 61131) also directly on the VISARD's user interface. Experts can write code in the underlying .NET framework (e.g. C# or Visual Basic).

The main challenge of a modern production system is to deal with slow, heavy data (e.g. images) and fast, light data (e.g. contact switch) in parallel. VISARD offers a novel data handling mechanism called the Blackboard (Figure 2).
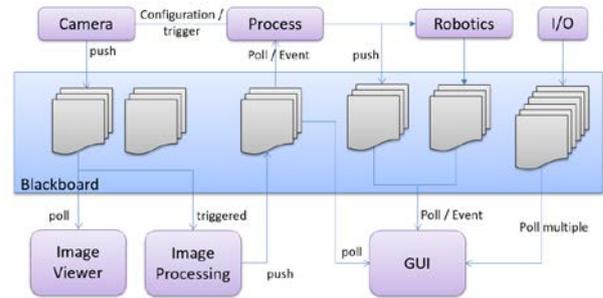

Figure 2: Blackboard data exchange mechanisms.

Source modules may push data to the Blackboard. Receiver modules may register to read this data by choosing whether to get the data by event, by polling or by a proprietary zero-miss polling that guarantees no data will be lost even when polled at low-frequencies. Memory is managed automatically by the Blackboard and the VISARD GUI allows monitoring its content live. The Blackboard implementation has been tested on a representative industrial PC and can handle more than 1.5 million transactions per second (Figure 3). A transaction may be an I/O change, an image or a measurement.
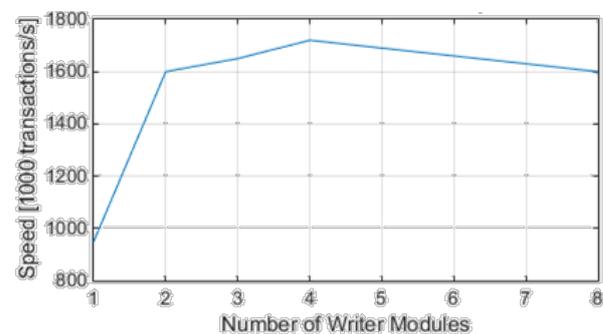

Figure 3: Blackboard transaction performance results.

SQL/NoSQL modules are available that store relevant system and process data. In combination with reporting modules, this allows VISARD's vertical integration into existing ERP systems and automatic generation of weekly management reports.

VISARD is a fast growing toolbox. The latest implementation provides full support for Raytrix [1] 3D light-field cameras with multi-GPU support and load scheduling. The system can handle three 3D quality gates in a high-speed production line, processing 6 parts per second per gate.

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[1]   www.raytrix.de