

## Eyes @ Work

### Intelligent Robot Vision System with Ultra Compact USB Camera

Robots provide indispensable and tireless help in many areas today: From medical technology and industrial production to military operations, they perform highly precise, monotonous or dangerous tasks. To do difficult work, robot systems not only need flexible grippers and tools, however. They also need abilities similar to those of the human eye or brain. This is because modern robots have to recognize, distinguish and track objects, and derive the appropriate decisions from the data they gather. In the Eyes@Work robot vision system from AES motomation, an ultra compact, high-resolution USB camera from IDS acts as a high-tech eye and supplies the required image information to a powerful software.



Until just a few years ago, most robots could not even pick up irregularly placed objects off a conveyor belt or remove a particular object from multiple similar parts. No wonder, as they were literally “blind”. It was not until progress in industrial image processing that new possibilities and application areas opened up for robots. They learned to “see.” Today, robots have no trouble locating components that are not precisely at the predefined position. They are capable of detecting and avoiding obstacles, and inspecting parts for the absence or presence of specific characteristics. This adds speed and flexibility to the entire production process.

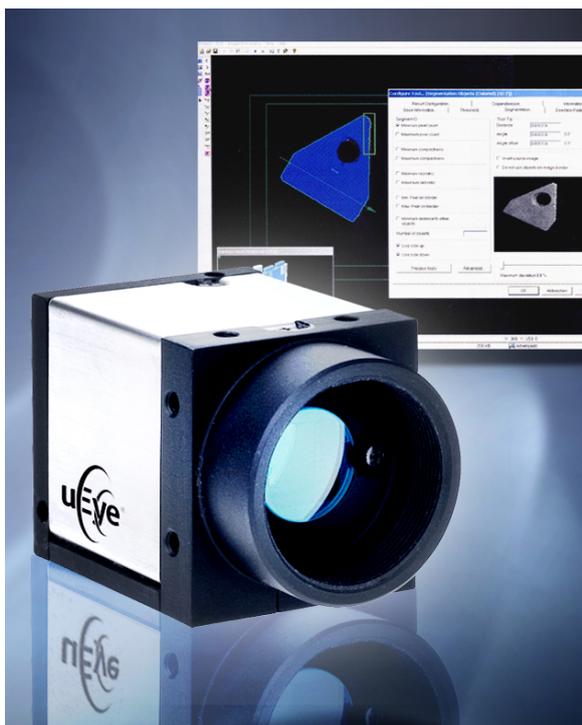
A vast variety of sensors can be used for robot control: for example, infrared, ultrasonic or tactile sensors. To enable machines to decide on work steps and motion sequences by themselves or to cooperate interactively, they need additional “human” abilities. Only the eye, which is essential for orientation to the surroundings, as well as a brain, which processes and links the visual information, makes intelligent action possible.

With the help of modern cameras and image processing, images can be acquired and evaluated in detail and at lightning speed. This allows robots to respond and adapt to variable situations and changing boundary conditions.

With Eyes@Work, the automation and robot control specialist AES motomation offers an intelligent, progressive image processing system for robots. This solution very quickly supplies the available position and angle data or information about changed boundary conditions for components. The robot arm uses these data to grab, load and mount production parts in a position-dependent manner. The scope of application ranges from classic assembly-line work as well as surface inspection and completeness checks in quality assurance all the way through to fault detection and recognition in process control.

For a machine manufacturer, for example, AES motomation has developed a new handling solution which can flexibly transfer parts from A to B. The industrial camera used in this solution captures the position and type of the part and passes this information to the software. The software automatically selects the gripper needed for the part from the tool magazine and moves the robot into position.

Like all vision systems, Eyes@Work offers efficient interaction between camera and software. The software — a proprietary development by AES motomation—communicates directly with the robot control via fieldbus, and with the machine via Ethernet. The camera is part of the uEye® series of the German



***The Eyes@Work robot vision solution from AES motomation provides powerful interaction between camera and software***

machine vision specialist IDS Imaging Development Systems.

The model chosen is a USB 2.0 camera with an ultra compact design. As it is inserted directly into the gripper of the robot or at the boom above the gripper, the size of the camera was a key criterion in the requirements specification of AES motomation. The employed uEye® 1440-M succeeded through ideal measurements, with a size of only 34 x 32 x 27.4 mm and just 62 grams in weight.

Small as it is, the camera provides all the features required for a task as demanding as this. It has a resolution of 1280 x 1024 pixels and works with a high-quality CMOS sensor. The high camera resolution has a direct influence on the precision of the gripper: If relatively small or complex parts are located on a large surface, only a high pixel resolution can supply accurate results.

A fast frame refresh rate was dispensed with in favor of resolution, as the achieved rate of 17 frames per second is absolutely sufficient for the gripper. Should other applications need faster frame refresh rates, the comprehensive uEye® range also provides versions with up to 86 frames per second in full-frame mode and over 500 frames per second in Area-of-Interest or Partial-Scan mode. Speaking of the product range: The uEye® series from IDS meanwhile comprises over 60 different camera models.

They come with CCD or CMOS sensors, with an image resolution from 640 x 480 to 2048 x 1536 pixels, with or without memory, etc. Even variants with a robust IP65/IP67 housing are available to meet the special requirements of harsh industrial or outdoor environments. Cutting-edge features such as windowing, binning, subsampling and image mirroring in the x and y directions complement the scope of functions. The uEye® camera used in the Eyes@Work system additionally includes an IR filter that can be removed to allow application also in the near-infrared area and with the corresponding illumination.

A further point in favor of a uEye® camera was the USB 2.0 connection which, in addition ensures easy handling. IDS was one of the very first manufacturers to develop and produce industrial cameras with a Universal Serial Bus. The models need no additional hardware and allow instant connection to any modern industrial PC, laptop or embedded computer. Power supply to the camera is also via the Universal Serial Bus



***Barely larger than a golf ball! With its compact design, the uEye® 1440-M USB camera easily fits in the smallest spaces***

Last but not least, the excellent software support was a strong argument for the use of a uEye® camera. Thanks to a flexible toolkit for software developers as well as the universal drivers, the high-tech eye smoothly integrated with the robot vision system. The software development kit (SDK) also comprises the corresponding source code written in C/C++. As it required only customization in most cases, it offered the developers a useful programming basis. The SDK is identical for all uEye® camera models, thus eliminating the need for reprogramming if the model is changed later on. A few minor adjustments to the application is all that is necessary to support new product features.

Standard drivers and interfaces for popular image processing libraries are also available besides the SDK. TWAIN, ActiveX and Direct Show (WDM) drivers support standard operating systems. Interfaces for ActivVision Tools, HALCON, Common Vision Blox or NeuroCheck are available from the relevant manufacturers and from IDS.



*With a choice of over 60 different models and the comprehensive software support, integrating the camera with custom applications is a simple task*

Contact:

IDS Imaging Development Systems GmbH  
Dimbacher Strasse 6  
74182 Obersulm  
[info@ids-imaging.com](mailto:info@ids-imaging.com)  
[www.ids-imaging.com](http://www.ids-imaging.com)