OCULAR ROBOTICS

HIGH PERFORMANCE VISION SYSTEMS

ROBOTICS BUSINESS REVIEW GAMECHANGER AWARDS WINNER 2015

RobotEye REV25 Vision

Two-Axis High Performance Vision System

Product Datasheet

RobotEye REV25 Vision Two-Axis High Performance Vision System

The RobotEye REV25 Vision is a two-axis high performance vision system with unprecedented motion bandwidth. RobotEye Vision systems are conceptually similar to conventional pan-tilt or gimballed systems in that they both effect the pointing of cameras about two axes, but that is where the similarity ends.

The RobotEye technology core on which the REV25 is based enables the view of the camera to be steered while both motors and the camera itself remain completely stationary. The implications of this are manifold and it means RobotEye Vision systems exhibit a number of properties that set them apart from alternative systems. In particular the following characteristics have significant impact on a wide range of common applications for directable camera systems, and the enabling of new applications not previously possible.

Motion Bandwidth - The most obvious way in which RobotEye systems differ from alternative systems is the motion bandwidth available to the user. RobotEye Vision systems significantly exceed, often by orders of magnitude the capabilities of alternatives in terms of speed and acceleration of the system aperture. With aperture accelerations up to 100,000°/s^2 and very high aperture slew rates, not only are common behaviours currently undertaken by pan-tilt and gimbals systems able to be completed much more rapidly and efficiently but a whole new range of applications become possible, including:

- High Performance and Multiple Object Tracking: Track very fast and erratically moving objects or any number of more slowly moving objects.
- Extreme Performance Stabilization: See our REV25-ST product on the Ocular Robotics website.
- Advanced Security and Surveillance Behaviours: Delivering greatly improved ability to capture important events as they occur on security/ surveillance networks.
- Nausea Free Telepresence/Teleoperation: The REV25's remarkable responsiveness allows use of head mounted displays without the usually associated nausea caused by latency in alternative camera pointing systems.
- Mapping and Panorama Capture: Rapidly map areas within the REV25's field of regard. See our REV25-PANO product on the Ocular Robotics website.

Accuracy - While some pan-tilt and gimbals systems are capable of very accurate motion, none are capable of simultaneous accuracy and high speed. In contrast to this, RobotEye based systems are capable of moving with very high speed and acceleration while simultaneously delivering precision pointing of a camera's field of view. This is because the RobotEye technology core addresses the central issue that limits the motion dynamics of alternative systems, the mass required to be moved to redirect the view of the camera.

Camera Choice Flexibility - Because the camera in a RobotEye Vision system is located on the system optical port and remains stationary at all times there is complete freedom to attach any C-mount camera to the REV25 that is needed for your application. Whether your camera is the size of a brick or a matchbox, 50 grams or 5 kilograms there is no difference in the pointing dynamics attainable with RobotEye Vision systems. Ocular Robotics is able to install a wide selection of cameras from the Allied Vision Technologies range or the user is free to install and use their own camera of choice.

RobotEye REV25 Vision Specifications

Mechanical		Optical	
Maximum Aperture Rate	10,000°/s*	Optical Field of View (diagonal)**	40°
Maximum Aperture Acceleration	100,000°/s^2	Optical Port	C-mount
Azimuth Axis Resolution	0.010°	**Software**	
Elevation Axis Resolution	0.010°	RobotEye C++ Development Library	Windows/Linux
Azimuth Range	360° Continuous	**Environmental**	
Elevation Range	70° (±35°)	Operating Temperature Range***	-20°C - +70°C
Accuracy	0.05°	IP Class Rating ****	65
Weight	1.6kg		
Electrical			
Communication	Ethernet		
Supply Voltage	24 VDC		
Power Consumption			
— Typical (average)	< 40 W		
— Maximum (transient)	200 W		

* At the maximum acceleration rate of 100,000°/s^2 more than a full rotation is required to reach 10,000°/s aperture slew rate.

** See details under Imaging Options in following pages

*** Does not include temperature rating of the camera used with the system

**** IP Rating valid only when supplied in an enclosure as shown in the adjacent image and both supplied power & optionally supplied weatherproof Ethernet cable connectors are fitted.

Specifications are subject to change without notice

Software

RobotEye C++ Development Library — The REV25 ships with a fully documented C++ class library for both Windows and Linux that can be used to simply and quickly interface to the vision system enabling rapid application development for RobotEye Vision Systems users. The library provides access to the entire range of REV25 features and its reference manual is available from the Downloads page of the Ocular Robotics website.

The RobotEye C++ Development Library supports a range of motion commands, two of which are the building blocks for most RobotEye motion behaviours relevant to RobotEye Vision systems.

SetApertureAngles - The SetApertureAngles command is used where it is required that the system aperture move accurately to point in a specific direction. Using the SetApertureAngles command it is possible to move the system aperture to over 10 distinct locations randomly distributed within the REV25's 360° x 70° field of regard every second. If the pointing locations are compactly distributed such as in a grid formation rates exceeding 25 locations per second can be achieved. The motion enabled by SetApertureAngles is important for mapping such as when building panoramas, monitoring several distinct locations with a single camera system, tracking multiple objects and many more.

TrackApertureAngles - The TrackApertureAngles command provides extremely high bandwidth control. It is most commonly used where the system aperture is required to follow a path or moving object. TrackApertureAngles commands can be streamed to the REV25 at up to 1kHz ensuring complex paths can be followed at high speeds. Typical uses for the TrackApertureAngles command are high performance tracking of a single object, stabilization using inertial or visual information, slaving for telepresence, etc.

Knowing where the system aperture is at any point is also important to many applications. The RobotEye C++ Development Library also provides two low latency methods for accessing the current system aperture direction. GetApertureAngles provides low latency access to the current system aperture position on request, while streaming is available to access the current position of the system aperture at rates of up to 1kHz.

Control & Communication

The REV25 vision system requires a 24VDC power connection, a 100 Megabit Ethernet connection for control and a suitable connection for the chosen camera. Communication with and control of the REV25 is achieved via the system's Ethernet port. Full control over the motion of the system aperture and system feedback including current aperture orientation is enabled through the RobotEye C++ Development Library. The connection to the camera is typically made to the computer which is controlling the REV25 so that application software can efficiently coordinate the behaviour of the REV25 and the camera.

Robustness

The RobotEye REV25 Vision has been designed to operate in the harshest environments. RobotEye systems have a natural immunity to shock and vibration transmitted through the platform to which they are attached making them ideal for extended service on ground, surface and air vehicles and other mobile equipment. This is achieved because the moving components in RobotEye systems are lightweight and supported at their periphery. In contrast to pan-tilt and gimbals systems have relatively large masses supported on shafts which under shock and vibration drive large forces back through the drive train shortening their serviceable lifetime. Other factors contributing to reliability of the REV25 include:

- The absence of any slip rings in the system which is due to the fact that all electronics including the camera remain completely stationary during operation eliminating the need to pass electrical signals through rotating joints.
- The camera, motors and all electronics are located below the blue mounting flange as seen in the image on the adjacent page in a single enclosure or internal to the platform on which the REV25 is mounted simplifying environmental protection.

Imaging Options

As discussed earlier in this datasheet a feature of the REV25 when compared to gimballed camera systems is the freedom to use any C-mount camera of your choice. The REV25 is offered with an option for wide or narrow field optics which enable the user to select the optical arrangement that best suits their chosen camera and their application. The adjacent table gives approximate fields of view for both wide field and narrow field optics when combined with common 4:3 aspect ratio CCD sizes.

The RobotEye REV25 Vision's field of view specification assumes a camera with a 2/3" CCD. The table below shows approximate diagonal fields of view for cameras with different (4:3 aspect ratio) CCD's

CCD Size	Diagonal Field of View	
	Narrow Field Optics	Wide Field Optics
1/4"	10°	15°
1/3"	15°	22°
1/2"	19°	29°
2/3"	27°	40°

System Customization

Supply to OEM's and integrators is an important part of the Ocular Robotics business and as such customization of our standard offering to meet the needs of particular applications or operating environments is central to our operations. Whether it is tailoring for operation in a particular service environment, enhancing performance specifications, altering the optical path characteristics or a complete ground up design for a particular application, all of these things can be achieved while retaining the trademark dynamic performance and other benefits of the RobotEye technology. Please contact Ocular Robotics for more information.

Standard System Components

- RobotEye REV25 Vision camera pointing head
- RobotEye control system boards
- Interconnecting cables
- 5 metre power cable

Optional System Components

- Choose from a range of AVT camera options, mounted and integrated into the REV25 system, see the Ocular Robotics website for details.
- System enclosure with RobotEye head, control system and cables installed.
- 10 metre weatherproof Ethernet cable

Ocular Robotics Ltd
Unit F1, 13-15 Forrester Street
Kingsgrove
NSW 2208 Australia

phone: + 61 2 9090 2630
fax: + 61 2 8094 9135
email: sales@ocularrobotics.com
web: www.ocularrobotics.com
twitter: @OcularRobotics