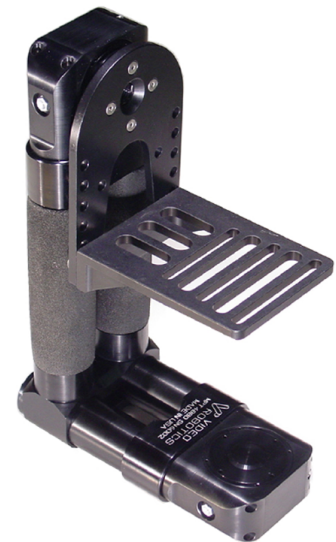


Mini Pan/Tilt for HD Cameras

With digital television fast approaching, camera manufacturers are flooding the market with new, lightweight units, but few companies are providing the professional equipment that goes with the upcoming change.

Up until 2006, the only broadcast-use professional motorized Pan/Tilts in the market were very heavy. This is because the equipment was built to hold analog video cameras, which could weigh as much as 50 kg and up. With February 2009 approaching, the final day of transition for digital TV, the leading HD camera manufacturers, Sony and Panasonic, have flooded the US market with new lightweight HD digital cameras, such as HDR-FX1 and AG-HVX200, respectively. These new, HD cameras weigh less than 4.5 kg, and that weight continues to drop as the use of flash memory storage devices continue to rise.

At the moment the demand became clear, Video Robotics (Gardena, CA) reacted to the need of being able to deliver small, lightweight, and professional quality Pan/Tilt heads. Soon afterwards, Video Robotics completed the design and release of its modular Pan/Tilt head, trade named Birdy.



PIC-1: The first lightweight Pan/Tilt head, Birdy, showed up on the market soon after the need for such devices became known.

New devices, new challenges

Although the company has over 15 years experience in building OEM motion control systems for video and TV broadcasting industries, the initial design and development of a new Pan/Tilt head represented various challenges for their design team. They needed to design a unit that was lightweight and easy to manufacture, while still providing a solid look and feel. Internally, the team had to provide an extraordinarily smooth motor control, minimize the noise from the gear transmission, and minimize backlash. Other challenges included extending the remote distance to at least 1000 feet, and separating the Pan and Tilt into independent modules in order to minimize overall costs. This meant that they'd have to break the traditional look of existing Pan/Tilt heads and develop something completely new.

Video Robotics used what they call a "right parts selection process," which allowed them to select a tubing structure that easily solved three of the challenges: minimizing weight, easy assembly of the modules, and provided a solid look and feel to the end product.

The most challenging task was choosing the right gear transmission and motor. According to Stefan Stanev, System Design Engineer, "Our prototypes used only a planetary gear head due to the compact size and cylindrical shape that fits easily into the tubes. But, if not balanced properly, the Tilt load was able to move the gear head when in a still position. Not only that, but

the diameter was too large and the output backlash was too high for professional Pan/Tilt usage. We tried using a worm gear head, but that didn't work out either. Neither method worked on its own."

At the end, the company decided to use both types of gear heads, thereby separating the gear transmission into two stages: a small worm gear head as the output stage and a small planetary gear head as the input stage. This choice, in turn, provided them with all the advantages from both gear head types, while virtually eliminating many of their disadvantages.

The first and main requirement was that both the motor and the planetary gear head had to fit into a 28mm internal diameter tubing. Secondly, the stall torque of the motor had to be a minimum of 200mNm in order to move easily and smoothly at very slow speeds and to reach the desired maximum speed (30°/sec. or faster) — all this while carrying a 4.5 kg (10 lb) camera.

"We searched across all known small motor manufacturers, but only Maxon Precision Motor was able to provide a motor that met our requirements," Stefan said. "The specifications for model RE26 well surpassed those of the competitors. The stall torque of 226 mNm and the 26mm diameter of the motor was a perfect fit to our application."

Unfortunately, the gear heads that had to fit this motor were the same or above the motor's diameter. Video Robotics needed a smaller gear head diameter in order to have the space for the sound insulation required in the design. "We called Maxon's local rep and were surprised and impressed with the fast, expert solution he provided," Stefan said. Maxon was able to match the small diameter planetary gear heads to bigger diameter motors in applications where the motor did not exceed the gear head torque, such as in the Video Robotics application. Furthermore, to reduce the audible noise from the planetary gear head, Maxon used a combination of plastic and metal planetary gears, without significantly sacrificing the output torque. The use of a smaller diameter planetary gear head gave Video Robotics an additional advantage of using more insulating material to further reduce any audible noise. To eliminate more noise from the gear transmission, the motor and planetary gear head were mounted using custom-designed and molded rubber fasteners.



The Maxon motor and gear head combination provided the perfect fit and function for Video Robotics' Pan/Tilt heads.

Designing the worm gear head also had its challenges. A unique adjusting and locking mechanism had to be designed to reduce the backlash of the worm gear transmission to a minimum. Also, to even further reduce the noise that resulted between the planetary gear heads' output shafts and the worm gears' input shafts, a unique axially extended coupling was custom-designed using rubber as a separating media.

To achieve professional quality smooth motion of the Pan/Tilt head, while improving upon the standard joystick design used across the industry, Video Robotics designed a triple antilogarithmic schematic (TAS) to control the motors. The TAS design eliminated the use of additional control knobs for setting maximum speed, as is used by proportional motor control from other manufacturers. TAS works like this: the first two thirds of the joystick movement will

move the camera at very slow and very smooth speeds; thereafter, further joystick movement will progressively accelerate the camera to faster speeds, up to the maximum speed.

Why is this a better product now?

Going back to the analog style of control, Video Robotics was able to reduce production costs and simplify the operation of the system — without forcing the user to have to learn software — while still achieving a premiere quality and performance level at a very competitive price.

The Birdy Pan/Tilt has countless special features that benefit the users experience and control. One example is the use of a special sensing schematic, which prevents the cameras from creeping when the joystick is not in use – a feature not available in other same-class Pan/Tilt devices. Additional features that outperform competitors include true smooth motion, compact size (175 mm x 90 mm x 260 mm), lightweight (2 kg), and one-minute assembly from the box. A multi-camera control console is also available to users.

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