Application Note

Industry: Military

Application: Pan & Tilt Positioning System

Challenges:

- Counteracting vibrations to attain controlled targeting
- Precise apparatus positioning regardless of base movement

Situation

Pan and tilt systems, or azimuth and elevation control systems, are often used to aim cameras, laser distance sensors, or artillery at specified targets. The pan and tilt base may be on a stationary or moving vehicle and in some cases the target may also be moving. As a result, controlling the pan and tilt of what you are aiming to keep fixed on the moving target requires locating your target and compensating for any movement at the base of the pan and tilt.

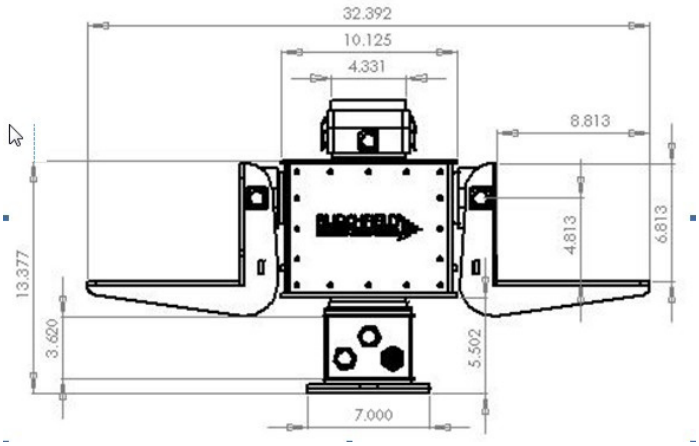
Problem

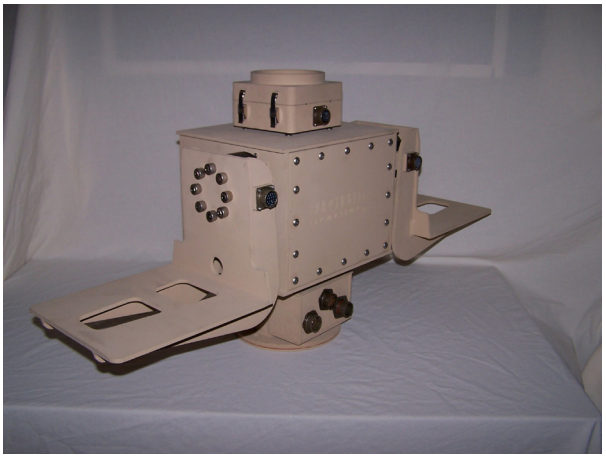
Target tracking systems typically use worm gear reduction and open-loop steppers or DC brushed motors. The problem is that steppers often vibrate too much for steady targeting, and worm gear reduction has backlash, friction, and wear and tear issues that fall far short of harmonic gear reduction. Both of these factors cause targets at a distance to be difficult to track and leave the end image shaky and unclear. Many applications need a pan and tilt system that can compensate for the elevation and azimuth changes of the apparatus, while still being able to counteract vibration from the base and produce a clear, focused picture.

Solution

Two SmartMotors were used to compensate for elevation and azimuth change with the Phase Offset feature as a vibration dampening measure to create stabilization on the pan and tilt system. The Phase Offset feature created a differential velocity between the external gyroscopic measurement of the pan and tilt system and the SmartMotor's internal encoder. This allowed the physical measurement of the gyroscopic position sensors to tie in directly to the closed loop of the servo thus counteracting the apparatuses' vibration. An integrated SmartMotor with the phase-offset feature, paired with a properly sized harmonic gear reducer, provided the stiffness and accuracy needed with closed-loop precision.

This same solution with Phase Offset feature can also be used to allow arm end effectors to remain parallel to the made while the mid arm section moves. Phased origin stays referenced to the base allowing commanded moves to be dynamically independent of the phase axis.communications.





Full case study available at www.animatics.com/applications

Video available at: http://www.youtube.com/watch?v=L08_Yk-n4F0&list=UUniHZ8VqIcEjEkcOUsLq5JA&index=2&feature=plcp