

Pan & Tilt Camera Control

Off-the-shelf Motion Solution Maintains Path To Lower Cost Custom Solution

Application Challenge

Pan & tilt systems for security, industrial, and military applications have to move faster, smoother, and more accurately than ever before. At the same time, these systems need to be cost effective, easy to program, and easy to reconfigure. How do we build a high performance pan & tilt system that meets these requirements and can still be brought to market quickly?

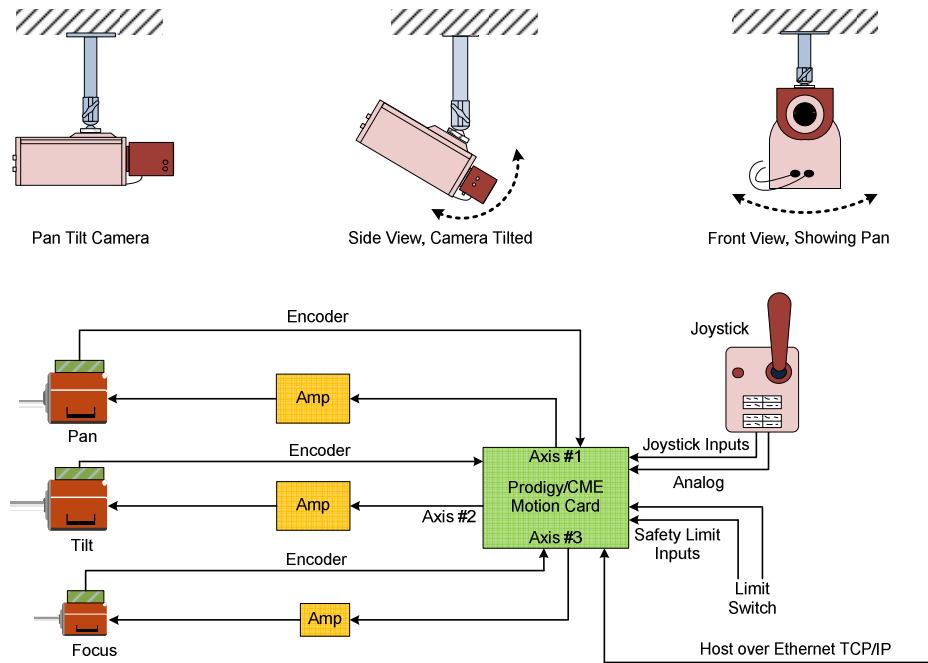


Figure 1: Pan & Tilt System Overview

Application Considerations

| Feature/Function | Units/Description |
|------------------|---|
| Motor Type | Low inertia slotless brushless DC motors |
| Motion Modes | <ul style="list-style-type: none"> Manual tracking with joystick Automatic tracking Point-to-point |
| Speed | Worst case point-to-point slew completed in 85 mSec |



Motion Control Solution

In this application, a **Prodigy/CME card** from PMD is used to provide pan, tilt, and a third axis for focus control of the lens. The Prodigy card acts as a complete stand-alone machine controller, running the user's C/C++ language application code directly on the card, and connecting to a joystick through an analog input port.

External off-the-shelf amplifiers drive the motors using +/- 10V signals from the **Prodigy card**. Encoder feedback is input to the Prodigy card, which provides all motion control functions via a 3-axis **Magellan Motion IC**.

This pan & tilt controller will function in a larger Ethernet-based control platform. To accomplish this, user code is written and loaded on the Prodigy card's CME (**C-Motion Engine**) that processes Ethernet TCP/IP commands. This code receives and sends Ethernet packets via the CME's high-level API (application programming interface) library and then directs the **Magellan IC** to operate the motors in the desired manner.

Safety limits for joystick operation are implemented via limit switch inputs connected to the motion control card. Various interface signals can be directly connected to other platform subsystems for safety command and data processing synchronization. Using standard **Prodigy motion card** functions, shutdown signals can be programmed to trigger when the servo lag exceeds a specific value or if various other motion conditions occur.

Motion speed and smoothness is optimized using PID (proportional, integral, derivative) control with feedforward and dual biquad filters in the servo pathway. Seven-segment S-curve profiles insure minimum mechanical jogging during fast point-to-point slews. Motion optimization can be performed 'on the bench' using PMD's **Pro-Motion** software development and motion verification system. This facility can record and display four motion parameters per axis from an available list of more than 60 parameters at the programmed servo sample speed of 10kHz.

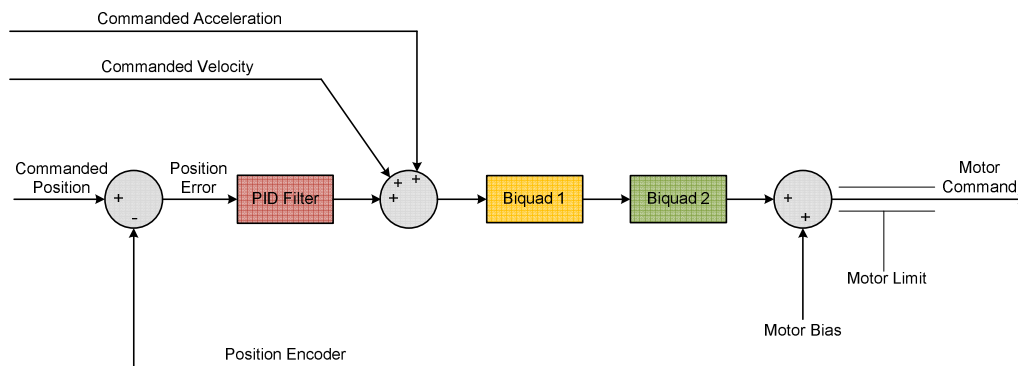


Figure 2: PID Loop

Going Further

The core of the **Prodigy/CME** card is the **Magellan Motion Processor IC** from PMD. This product can also be used in a user-designed motion control card. In this configuration, solderable amplifiers rather than off-board amplifiers are installed on the card, and custom connectors and hardware footprint are utilized to minimize size, improve serviceability, and dramatically lower per-unit cost.

The software and motion parameters developed with the **Prodigy/CME** card will function exactly the same as when loaded onto a custom Magellan-based card. This allows quick, off-the-shelf, prototyping of the mechanical hardware with a fast path to reduce the electronics cost and size for production units

The **Prodigy/CME card** is based on PMD's **Magellan® Motion Processor** and provides high performance motion control for multiple motor types. Running user code directly on the motion card to allow off-loading of the host and complete stand-alone machine controller functionality, Prodigy/CME cards are designed for demanding and precise applications such as this pan & tilt application and other automation and instrumentation challenges.



Contact our customer support team at +1 781 674 9860 for more information including details on Developer's Kits and application support. We would like to assist you in improving your motion system.